MRI REPORT

GUIDELINES FOR PERMIT APPLICATIONS AND DEMONSTRATION TEST PLANS FOR PCB DISPOSAL BY ALTERNATIVE METHODS

WORK ASSIGNMENT NO. 6

DRAFT INTERIM REPORT NO. 2

EPA Contract No. 68-02-3938
MRI Project No. 8501-A(06)

June 10, 1986

Revision No. 3

For

U.S. Environmental Protection Agency
Office of Toxic Substances
Field Studies Branch
TS-798
Washington, D.C. 20460

Attn: Dr. Joseph Breen, Project Officer
Mr. Daniel T. Heggem, Work Assignment Manager

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By

Roy M. Neulicht, Rajendra V. Shah, Gary Kelso,
Bonnie L. Carson, and Mitchell D. Erickson

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MIDWEST RESEARCH INSTITUTE 425 VOLKER BOULEVARD, KANSAS CITY, MISSOURI 64110 • 816 753-7600

DISCLAIMER

This document is a preliminary draft. It has not been released formally by the Office of Toxic Substances, Office of Pesticides and Toxic Substances, U.S. Environmental Protection Agency, and should not at this stage be construed to represent Agency policy. It is being circulated for comments on its technical merit and policy implications.

PREFACE

This report provides supplementary guidance to those organizations applying to the Office of Toxic Substances for permits to dispose of PCBs by methods alternative to incineration. The report was prepared under MRI Project No. 8501-A, Work Assignment No. 6, "Technical Assistance for Evaluation of Mobile or Multiregional PCB Disposal Facilities," for the Environmental Protection Agency (EPA Contract No. 68-02-3938). Two revisions of the document were previously issued: one was issued on May 17, 1983, as Draft Interim Report No. 5 under MRI Project No. 4901-A, Task 51, "PCB Analytical Methodology Task," for the Environmental Protection Agency (EPA Contract No. 68-01-5915); the other was issued April 16, 1985, as Draft Interim Report No. 1, Revision No. 2, under MRI Project No. 8201-A, Work Assignment 6, "Guidelines for PCB Destruction Permit Applications and Demonstration Test Plans" for the U.S. EPA (EPA Contract No. 68-02-3938). This report was prepared by Mr. Roy Neulicht, Ms. Bonnie L. Carson, Dr. Mitchell D. Erickson, Mr. Rajendra V. Shah, and Mr. Gary L. Kelso, with assistance from Dr. John S. Stanley, Mr. Thomas L. Ferguson, Mr. Paul G. Gorman, and Ms. J. Kay Turman.

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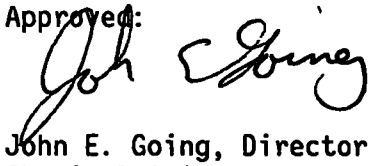
MIDWEST RESEARCH INSTITUTE

Paul C. Constant
Program Manager

Approved:



John E. Going, Director
Chemical Sciences Department

June 10, 1986

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ABBREVIATIONS

AA: Assistant Administrator for Pesticides and Toxic Substances.

°C: Degrees Celsius.

CFR: Code of Federal Regulations.

CWA: Clean Water Act. See 40 CFR 129.

DD/EED: Division Director, Exposure Evaluation Division

DVE: Data variance estimate.

ECD: Electron capture detector.

EIMS: Electron impact mass spectrometry (low resolution).

EPA: U.S. Environmental Protection Agency.

FID: Flame ionization detector.

g: Grams.

gal.: Gallons.

GC: Gas chromatography.

GC/FID: Gas chromatography with flame ionization detection.

GC/ECD: Gas chromatography with electron capture detection.

GC/MS: Gas chromatography/mass spectrometry.

GPC: Gel permeation chromatography.

h: Hours.

HCl: Hydrochloric acid.

HECD: Hall electrolytical conductivity detector.

H_2O: Water.

HRGC: High resolution GC, also termed capillary GC.

in.: Inch(es).

kg: Kilograms.

lb: Pounds.

mg: Milligrams.

min: Minutes.

MS: Mass spectrometry.

NEPA: National Environmental Policy Act.

NPDES: National Pollutant Discharge Elimination System.

OPTS: Office of Pesticides and Toxic Substances.

OSHA: Occupational Safety and Health Act. See 29 CFR 1910.1.

OTS: Office of Toxic Substances, a suborganization of OPTS.

PCB: Polychlorinated biphenyls.

PCDD: Polychlorinated dibenzo-p-dioxin.

PCDF: Polychlorinated dibenzofuran.

PGC: Packed column gas chromatography.

pH: Measure of acidity or alkalinity.

ppm: Parts per million.

QA: Quality assurance.

QC: Quality control.

RA: Regional Administrator.

RCRA: Resource Conservation and Recovery Act. See 40 CFR 122-124 and 260-265.

sec: Seconds.

TCDD: Tetrachlorodibenzo-p-dioxin.

TCDF: Tetrachlorodibenzofuran.

TSCA: Toxic Substances Control Act, PL 94-469 (1976). See 40 CFR Part 761.

GLOSSARY

Analyte: Chemical compound or element which is the subject of an analysis.

Aroclor: Commercial mixture of PCBs previously manufactured by Monsanto.

Authorized use: Any PCB use or servicing which can be conducted in accordance with 40 CFR 761.30.

Data variance estimate (DVE): Either a numerical value such as a standard deviation, or a qualitative evaluation such as "good."

Demonstration Test: A test to demonstrate system performance, commonly called a process demonstration test.

Electron impact mass spectrometry (EIMS): Low resolution mass spectrometry operated in the electron impact ionization mode.

High resolution gas chromatography: Gas-liquid chromatography performed using a capillary column, typically 10-50 m long x 0.2 mm ID, coated on the interior with a liquid phase.

Isomer: Any compound which has the same molecular formula, but different positional substitutions. For example, for PCBs, 2,2'-dichlorobiphenyl and 2,3-dichlorobiphenyl are isomeric; 4-chlorobiphenyl and 2,3,4-trichlorobiphenyl are not.

Liquid: A substance is a liquid if it its melting point is less than 20°C and does not pass the structural integrity test (> 15% free liquid content) (Weller 1982).

Method: A series of techniques or procedures which form a specific, well-defined destruction, sampling, chemical analysis, or other procedure for a specified compound(s)/matrix(ces) combination.

Polychlorinated biphenyl (PCB): One of 209 individual compounds having the molecular formula $C_{12}H_nCl_{10-n}$, where n = 0-9. This definition includes monochlorobiphenyls.

Polychlorinated dibenzo-p-dioxin (PCDD): One of 75 individual compounds having the molecular formula $C_{12}H_nCl_{8-n}O_2$, where n = 0-7. This definition includes monochlorodibenzo-p-dioxins.

Polychlorinated dibenzofuran (PCDF): One of 135 individual compounds having the molecular formula $C_{12}H_nCl_{8-n}O$, where n = 0-7. This definition includes monochlorodibenzofurans.

Packed column gas chromatography (PGC): gas-liquid chromatography performed using a column, typically 180 cm long x 2 mm ID, packed with a liquid phase on a granular solid support material.

Part per million (ppm): One part in 10^6. For gaseous mixtures, a volume/volume (v/v) basis is typically used and:

$$ppm = mg/m^3 \times \frac{RT}{MW}$$

where RT = 22.4 liter/g-mole at 0°C and 1 atm
= 24.5 liter/g-mole at 25°C and 1 atm
and MW = molecular weight of compound, i.e., g/g-mole

For low concentration aqueous samples, a weight:volume (w/v) basis is most commonly used and 1 ppm = 1 mg/liter (1 mg/kg for liquids with density 1). For nonaqueous liquids and solid materials, a weight:weight (w/w) basis is most commonly used and 1 ppm = 1 mg/kg.

Quality assurance (QA): The total integrated program for assuring the reliability of monitoring and measurement data. A system for integrating the quality planning, quality assessment, and quality improvement efforts to meet user requirements.

Quality control (QC): The routine application of procedures for obtaining prescribed standards of performance in the monitoring and measurement process.

QC blank: A sample processed and analyzed to obtain background concentrations of the analytes.

QC control: A sample containing a known amount of analyte which is processed with sample batches to monitor recoveries.

Solid: A substance is a solid if its melting point is greater than 20°C and it passes the structural integrity test (Weller 1982).

Technique: Specific destruction, laboratory, or sampling operation usually conducted as part of a method. GC/EIMS and Soxhlet extraction are techniques.

1.0 INTRODUCTION

The Code of Federal Regulations, Title 40, Part 761 (40 CFR 761) (USEPA 1985) establishes rules on the disposal of PCBs and PCB items. Under these rules, organizations or persons wishing to dispose of PCBs are required to use approved methods and must obtain a permit.

This document provides guidance for persons applying to the EPA for approval of PCB disposal by methods alternative to incineration (§761.60(e)). This document presents and discusses the format, content, and level of detail required for permit applications, demonstration test plans, and demonstration test reports.

Alternative methods of PCB destruction include, but are not limited to, catalytic dehydrochlorination, chlorolysis, plasma arc, ozonation, catalyzed oxidation, microbiological, and sodium-catalyzed decomposition of the PCB molecules. Methods for decontamination of PCB-contaminated materials by removal and concentration of the PCBs also are considered alternative methods of PCB destruction. An example of this technique is fractional distillation of PCB-contaminated dielectric fluid or rinse solvent.

These guidelines address only permit requirements for the disposal of PCBs as regulated under TSCA. Other laws such as RCRA, CWA, and OSHA regulations may apply to PCB disposal methods and may have different or additional permit requirements.

Section 2.0 provides a brief summary of pertinent EPA procedural requirements and guidance as well as a summary of pertinent Part 761 regulations. Section 3.0 describes the EPA Office of Toxic Substances (OTS) permitting procedures. Sections 4.0 and 5.0 provide guidance regarding preparation and submission of permit applications and demonstration test plans, respectively. Section 6.0 briefly discusses conducting a demonstration test. Section 7.0 provides guidance regarding preparation of a demonstration test report. Section 8.0 lists the references for this document. Appendix A provides checklists for the applicant to use in determining if all pertinent areas have been addressed prior to submittal to the Agency. Appendix B is a summary listing of sampling/analytical methods for PCBs. Appendix C provides guidance to the applicant in the form of answers to some frequently asked questions. Appendix D lists the addresses for OTS Headquarters and for the 10 Regional Offices. Appendix E is an annotated bibliography of sources of related information.

2.0 SUMMARY OF 40 CFR 761 REGULATIONS AND GUIDANCE

This section summarizes pertinent provisions of Title 40 of the Code of Federal Regulations, Part 761 (40 CFR 761) related to the disposal of PCBs. Part 761 establishes prohibitions of and requirements for the manufacture, processing, distribution in commerce, use, disposal, storage, and marking of PCBs and PCB items in the United States. These regulations were promulgated under authority of the Toxic Substances Control Act (TSCA, PL 94-469). 40 CFR 761 was promulgated May 31, 1979 (44 FR 31514). All references in this document refer to the revised 40 CFR 761 as of July 1, 1985.

2.1 General

The major sections of 40 CFR 761 are outlined in Table 1. The storage and disposal of PCBs is addressed in 40 CFR 761, Subpart D. In Subpart D, Paragraph 761.60, disposal requirements are differentiated according to waste type and PCB concentration; Table 2 summarizes the disposal options of §761.60.

This guideline document is intended to provide guidance only for approval of alternative disposal methods (§761.60(e)) which may require approval by the Division Director, Exposure Evaluation Division of the Office of Toxic Substances (DD/EED). A companion document, "Guidelines for Permit Applications and Demonstration Test Plans for PCB Incinerators" (Neulicht et al. 1986), also prepared by Midwest Research Institute for EPA/OTS, Washington, D.C., provides guidelines for approval of incinerators by the DD/EED. Disposal by chemical waste landfills (§761.75) or high efficiency boilers (§761.60(a)(2),(3)) is not addressed, since their disposal methods are approved by the appropriate regional administrator (RA). Also, storage of PCBs for disposal (§761.65) or decontamination (§761.79) is not addressed.

2.2 Approval Authority

Approval authority for PCB disposal facilities is stipulated in Section 761.60. Table 3 summarizes EPA approval authority for PCB disposal facilities. Addresses for EPA headquarters and the regional offices are provided in Appendix D.

2.3 §761.60(e) Alternative Methods of Disposal

According to §761.60(e) any person may submit a written request to the DD/EED or RA for an exemption from the incineration requirements of Part 761 (see Table 2). Section 761.60(e) states that the applicant for an alternative method of destroying PCBs must show that: (a) the method can achieve a level of performance equivalent to §761.70 incinerators or §761.60(a)(2)(iv) high efficiency boilers and, (b) the method will not present an unreasonable risk of injury to health or the environment. These two requirements must be taken into consideration by the applicant and must be appropriately addressed in the permit application. Because alternative methods of PCB destruction usually differ significantly from incineration, it is difficult to define "equivalent level of performance." For processes which destroy PCBs in contaminated liquids, the agency has generally required the applicant to show

Table 1. Outline of Major Sections of 40 CFR 761[a]

Subpart A - General
- 761.1 Applicability
- 761.3 Definitions
- 761.19 References

Subpart B - Manufacturing, Processing, Distribution in Commerce, and Use of PCBs and PCB Items
- 761.20 Prohibitions
- 761.30 Authorizations

Subpart C - Marking of PCBs and PCB Items
- 761.40 Marking Requirements
- 761.45 Marking Formats

Subpart D - Storage and Disposal
- 761.60 Disposal Requirements
  - (a) PCBs
  - (b) PCB Articles
  - (c) PCB Containers
  - (d) Spills
  - (e) Alternative Methods
  - (f) Written Notice
  - (g) Testing Procedures for PCB Concentration
  - (h) Export/Import for Disposal
  - (i) Approval Authority for Disposal Methods
- 761.65 Storage for Disposal
- 761.70 Incineration
  - (a) Liquid PCBs
  - (b) Nonliquid PCBs
  - (c) Maintenance of Data and Records
  - (d) Approval of Incinerators
- 761.75 Chemical Waste Landfills
- 761.79 Decontamination

Subpart E - Exemptions

Subparts F to I - [Reserved]

Subpart J - Records and Reports
- 761.180 Records and Monitoring

[a]Note: Some subparts are outlined in greater detail than others.

Table 2 Disposal Options by PCB Waste Categories (USEPA 1985)

PCB waste category	CFR section	PCB concentration (ppm)	Disposal method: Incinerator (§761 70)	Chemical waste landfill (§761.75)	High efficiency boiler (§761 60)	Alternative method (§761 60(e))	Method approved by region	Drain, dispose as solid waste	Decontamination
Mineral oil dielectric fluid	761.60[a][2]	50-500	x	x	x	x			
Other liquids	761 60[a][3]	50-500	x	x	x	x			
Nonliquids (soil, rags, debris)	761.60[a][4]	≥ 50	x	x					
Dredged materials and municipal sewage sludge	761.60[a][5]	≥ 50	x	x			x		
PCB transformers (drained and flushed)	761.60[b][1]	NS[a]	x	x					
PCB capacitors[b]	761.60[b][2]	≥ 500	x						
PCB capacitors	761.60[b][4]	50-500	x	x					
PCB hydraulic machines	761.60[b][3]	≥ 50						x[c,d]	
PCB contaminated electrical equipment (except capacitors)	761 60[b][4]							x[e]	
Other PCB articles	761.60[b][5]	≥ 500[f]	x	x[g]					
Other PCB articles	761.60[b][5]	50-500						x[e]	
PCB containers	761 60[c]	≥ 500[f]	x	x[d]					x[h]
PCB containers	761 60[c]	< 500						x[d]	x[h]
All other PCBs	761.60[a]	≥ 50	x			x			

[a] Not specified
[b] Exemptions for some small capacitors
[c] Must also be flushed if hydraulic fluid contains > 1,000 ppm PCBs and flushing solvent disposed of in accordance with §761 60(a)
[d] Drained liquid must be disposed of in accordance with §761.60(a).
[e] Must be drained of all free-flowing liquid The disposal of the drained electrical equipment and other PCB articles is not regulated by 40 CFR 761 All liquids must be disposed of in accordance with paragraph (a)(2) or (3) of §761 60 [in an incinerator (§761 70), chemical waste landfill (§761 75), high efficiency boiler, or by an alternative method (§761 60(e))]
[f] Due to a typographical error, 40 CFR 761 [July 1, 1985, p 163] erroneously states this value as 50 ppm, refer to Federal Register, 44, 31514-31568 (May 3, 1979) (USEPA 1979).
[g] Drained of any free-flowing liquid and liquid incinerated in §761 70 incinerator
[h] Decontaminated in compliance with §761 79

Table 3. Summary of Permit Approval Authority

Type facility	Approval permit authority
Alternative disposal methods which are mobile or are of identical design to be used in more than one EPA Region	Assistant Administrator for Pesticides and Toxic Substances (AA)[a]
Research and development methods disposing of > 500 lb PCB-containing material	AA[a]
Research and development methods disposing of ≤ 500 lb PCB-containing material	Regional Administrators (RAs)
Site-specific alternative disposal methods to be used in only one EPA Region	RAs

[a]Authority has been delegated to the Division Director, Exposure Evaluation Division, Office of Toxic Substances (DD/EED).

that the concentration of any individual PCB congener in the product (decontaminated) liquid is no more than 2 ppm. Fractional distillation of PCB-containing liquids must remove PCBs to a level of < 2 ppm total PCBs, quantitated using the original formulation (e.g., Aroclor 1260) as a standard. Any aspects of the process that may pose certain risks of injury to persons or environment must be addressed in the application. Examples of such risks include: (a) emission of toxic solvents to the atmosphere and (b) explosion/fire hazards from sodium reagent.

Section 4.0 of this guideline document presents and discusses the suggested contents of an application for a permit to operate an alternative method for PCB disposal.

3.0 OFFICE OF TOXIC SUBSTANCES (OTS) PERMITTING PROCEDURES

The Code of Federal Regulations, Title 40, Part 761 (40 CFR 761) specifies that the Assistant Administration (AA) for Pesticides and Toxic Substances has approval authority for certain PCB disposal facilities [this approval authority has been delegated to the Division Director, Exposure Evaluation Division of the Office of Toxic Substances (DD/EED)]; Regional Administrations (RAs) have approval authority for other facilities. Facilities for which the DD/EED has approval authority include PCB treatment processes that are mobile or of identical design and intended to be used in more than one EPA region. Also included are certain research and development (R&D) methods that dispose of more than a total of 500 lb PCBs or PCB-contaminated material. RAs retain approval authority for site-specific facilities such as landfills, stationary incinerators, high-efficiency boilers, and research and development into PCB methods involving a total of 500 lb or less of PCB materials.

This section describes the process used by EPA/OTS to issue an operating permit or an R&D permit to the applicant. Figure 1 shows the major steps in the operating permitting process. Figure 2 gives a more detailed process diagram which also includes the loops at various points in the operating permit process when additional information is required. Figure 3 shows the process for obtaining an R&D permit from OTS.

3.1 Establish Communications With the EPA Permit Writer

The permit applicant can facilitate the permitting process by establishing good communications with the EPA permit writer as early as possible. Good communication will minimize requests for additional information as well as submission of unnecessary information. Early in the process, the applicant and permit writer can discuss any special circumstances and also the necessity for submitting optional information discussed in these guidelines. In addition, advance notice of submissions will allow the permit writer to schedule the review in an orderly fashion.

3.2 Apply for an R&D Permit (Optional)

The purpose of a research and development (R&D) permit is to assist the facility operator in bringing the destruction process from conception to commercial operation. R&D permits can be issued for bench-scale operations, for pilot-scale systems, and for full-scale commercial systems. First-time applicants who do not have experience operating their systems, or who have not yet used their systems to destroy PCBs, are encouraged by EPA to obtain an R&D permit for "shakedown" of the process by conducting studies on a limited quantity of PCBs, prior to the commercial demonstration test.

An R&D permit application should consist of all of the applicable elements described in Table 4 in Section 4.0 (except as noted). The R&D application need not contain the detail required for an operating permit, but must be sufficient to demonstrate that the R&D activity will not present an unreasonable risk of injury to health or the environment. The applicant should also supply information on the specific objectives of the R&D activity.

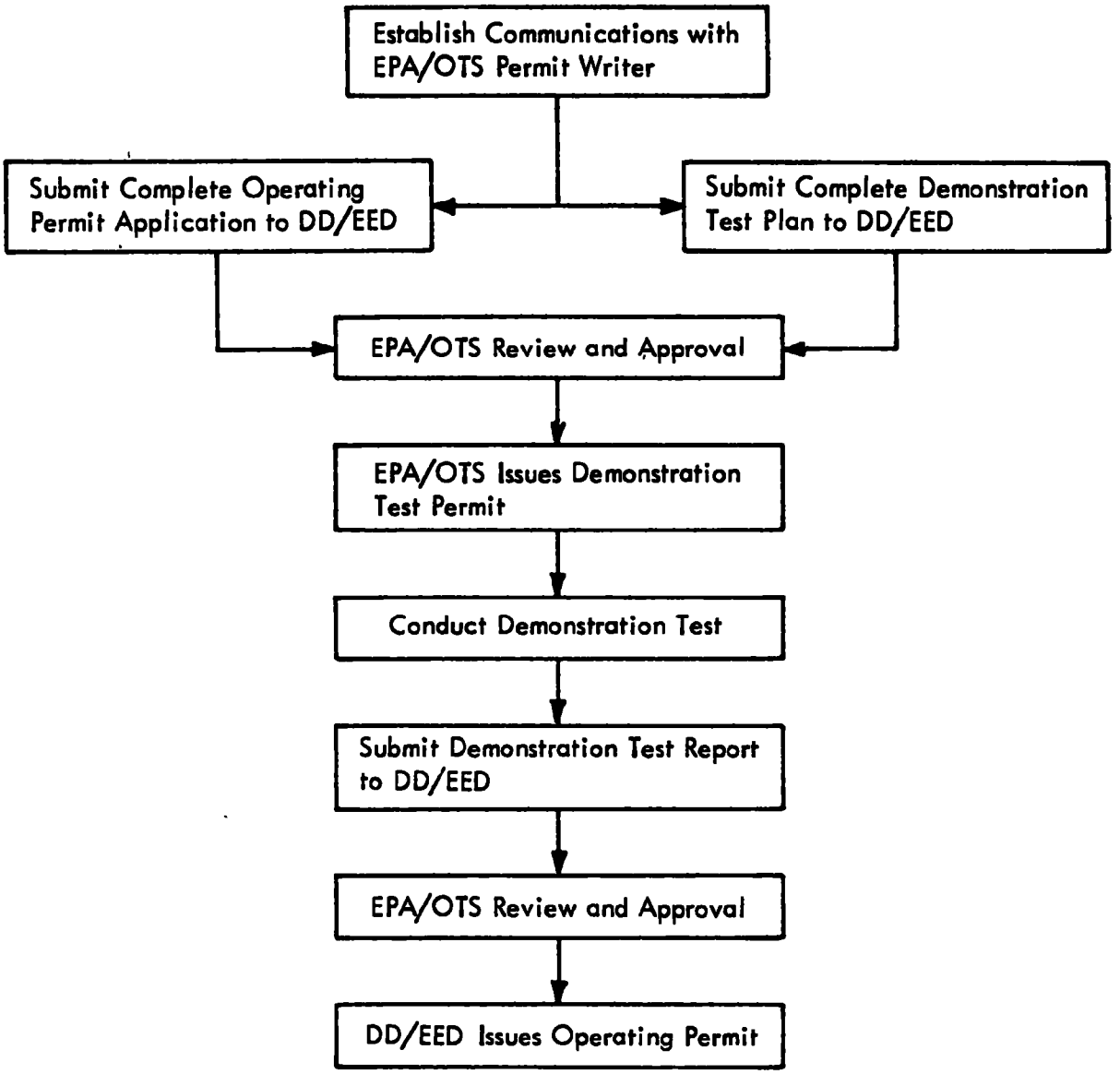

Figure 1. Major steps in the OTS operating permit process.

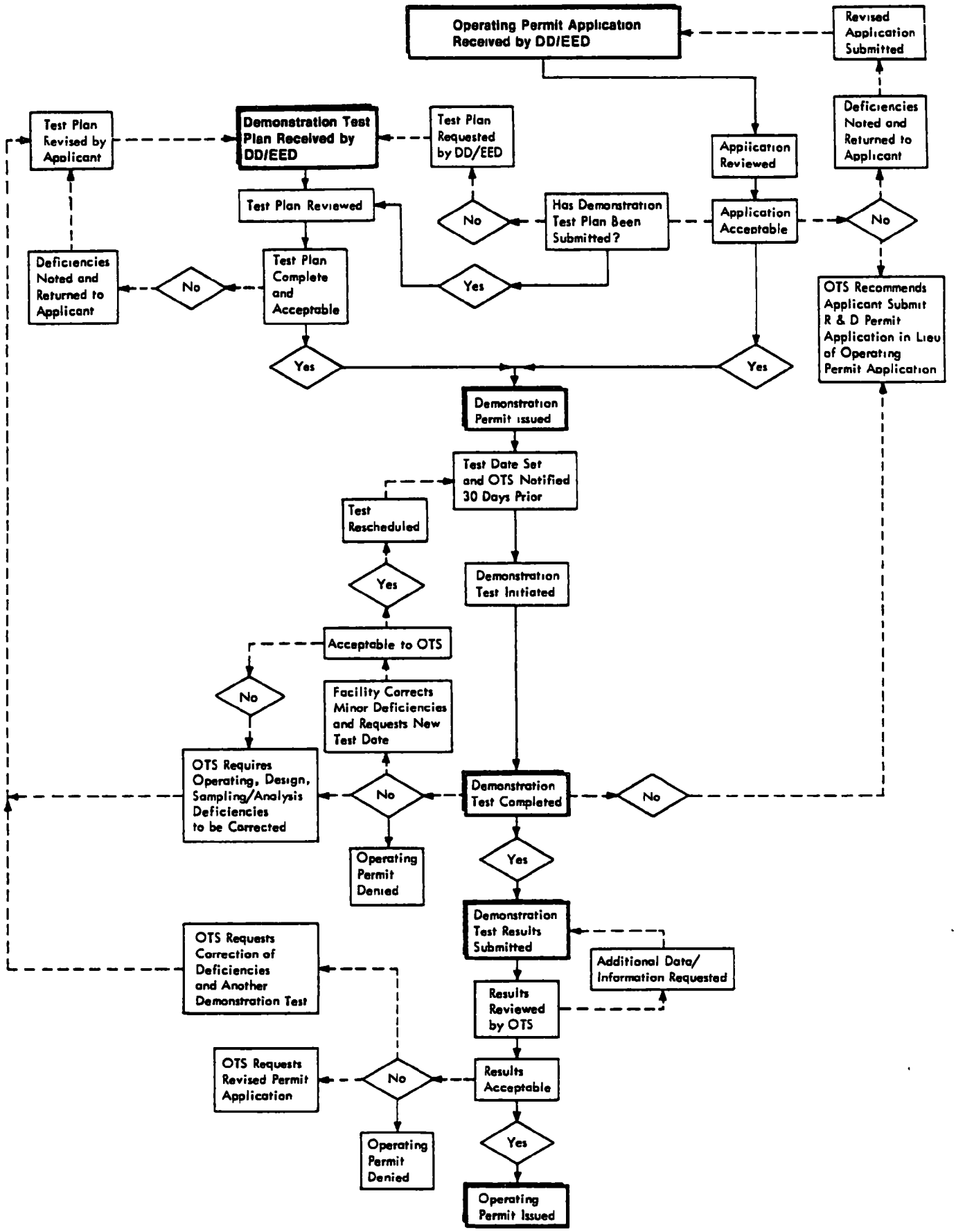

Figure 2. Process to obtain an operating permit from OTS.

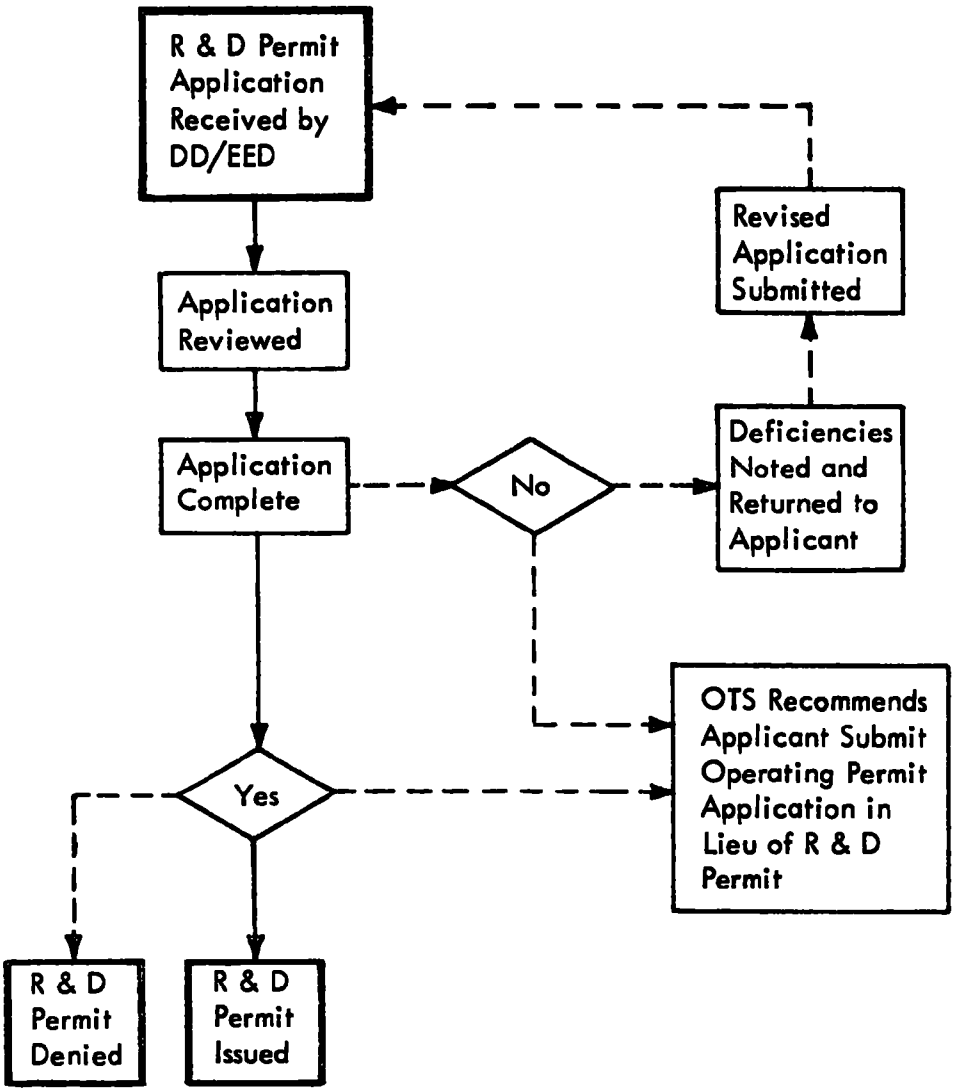

Figure 3. Research permitting process.

The R&D activity should provide process information and operating experience needed for application for an operating permit. The R&D results should be used for planning a full-scale demonstration such that there is a high probability of a successful demonstration. The R&D results may be appropriate for inclusion in the application for the operating permit.

R&D permits can be issued by the appropriate EPA Regional Administrator for the destruction of a total of 500 lb or less of PCB-containing material (regardless of PCB concentration), or by the Division Director, Exposure Evaluation Division of the Office of Toxic Substances (DD/EED), for the destruction of more than 500 lb of PCB-containing material. R&D permit applications can be submitted at any time, even if an application for a permit to operate commercially has already been submitted.

Upon receipt of an R&D permit application, EPA will review the document. If the application is incomplete or contains deficiencies, a notice of deficiencies will be sent to the applicant, who must then revise and resubmit the application. In some cases, EPA/OTS may recommend that the applicant submit an operating permit application in lieu of the R&D permit application, depending upon the circumstances involved. When a complete R&D permit application is approved by EPA/OTS, an R&D permit is issued.

According to 40 CFR 761.60(f), before commencing R&D work, a 30-day notice must be given to EPA regional, state, and local officials. After completion of the R&D activities, a report giving the results of the activities and test results must be submitted to EPA.

3.3 Submit Operating Permit Application and Demonstration Test Plan to DD/EED

The permit applicant must submit both an operating permit application and demonstration test plan to DD/EED in order to receive a demonstration permit. Generally, the permit application and demonstration test plan should be separate, complete documents.

The permit application should be submitted as early as possible. Partial submissions are acceptable if the submission clearly indicates the portions of the application to be submitted later, and if the applicant and EPA permit writer agree that a preliminary review of a partial submission will be productive. The demonstration test plan may be submitted with or after the permit application. In any event, both the application and demonstration test plan must be determined by EPA to be complete before a demonstration permit can be issued.

The suggested format for an operating permit application, based on the §761.70(d)(1) incinerator requirements, is presented in Table 4 in Section 4.0 of this document. A complete application must address each topic in the format given in Table 4. As an aid to the applicant in determining if all requirements for an application have been addressed, a checklist is provided in Appendix A.

A Demonstration Test Plan is a document prepared specifically for the demonstration tests and provides details of how the test will be conducted. A complete plan must include all the required information given in Table 6 in Section 5.0 of this document. Appendix A provides a checklist to aid the applicant in determining whether all required items have been addressed.

3.4 EPA/OTS Review of Permit Application and Demonstration Test Plan

EPA/OTS reviews the permit application and demonstration test plan for completeness, accuracy, clarity and technical viability. If either document is unacceptable to EPA, a notice of deficiencies will be sent to the applicant. The deficiencies must be corrected in a revised application or test plan, and the revised document(s) must be submitted to the DD/EED. In some cases, this process may need to be repeated more than once.

3.5 EPA/OTS Issues Demonstration Test Permit

After the EPA approves the permit application and demonstration test plan, the DD/EED will issue a demonstration permit. A demonstration permit is required prior to destroying any PCBs in a process demonstration. The demonstration permit will specify a limited amount of PCB-containing material which can be destroyed during the demonstration and other conditions based on the applicants permit application and demonstration test plan. The time period for which the demonstration permit is valid also will be limited.

3.6 Conduct Demonstration Test

A demonstration test is scheduled at a date agreeable to both the applicant and EPA/OTS. It is desirable that EPA/OTS have at least 60 days' notice prior to the test; 30 days' notice is required. The RA of the EPA region where the demonstration will be conducted, state officials, and relevant local authorities should be notified.

If any modifications to the test plan are required prior to the demonstration test, EPA/OTS (permit writer) should be notified in writing at least 14 days prior to the test. Also, if events require that the plan be significantly modified during the test demonstration, then the permit writer should be contacted immediately to discuss the implications of any modifications. As with normal operation, any significant deviations from or alterations in the test plan must be documented in writing to EPA/OTS (permit writer) within 10 days after the event. Throughout the test demonstration, an "event log" should be maintained. This log should be submitted as part of the demonstration test report.

The test should be conducted under conditions simulating normal commercial operations. Operating permit requirements usually reflect the systems' operating conditions during the demonstration test, and conditions used in the tests become conditions allowed in the operating permit. Therefore, the applicant should give very careful consideration to the design and conduct of the demonstration test.

If the demonstration test is initiated, but cannot be completed for some reason, EPA/OTS can exercise several options. The first option is to deny the operating permit without further consideration, which is rarely done. A second option is to recommend that the applicant submit an R&D permit application in order to have a chance to correct operating deficiencies prior to another demonstration. A third option is to reschedule the test, which is usually done when minor deficiencies in the operating process cause the problem. A fourth option is to require that the application or test plan be revised and resubmitted before issuing another demonstration permit; this option is usually used when major design changes must be made or major operating deficiencies must be corrected before another demonstration test can be performed.

3.7 Submit Demonstration Test Report to DD/EED

After a complete demonstration test has been performed, a report of the results must be made and submitted to the DD/EED. The format and required contents of the report are shown in Table 10 in Section 7.0 of this document. The test report must contain all the information described in Section 7.0 of this document.

3.8 EPA/OTS Review of the Demonstration Test Report

Upon receipt, EPA/OTS will review the demonstration test report submitted by the applicant. If the report is incomplete or unclear, EPA will request that the applicant submit any additional information or data needed. If the results of the test are unacceptable, EPA may deny the operating permit, request that another demonstration test plan be submitted for approval prior to conducting another demonstration test, or require that a revised permit application be submitted for approval. If the test results and other information are acceptable, EPA/OTS will issue an operating permit to the applicant.

3.9 DD/EED Issues and Operating Permit

An operating permit allows the operator to operate commercially. After acceptance of the permit application and demonstration test results, the DD/EED will issue a final operating permit. Generally, the final operating permit will specify the type of PCB-containing material which can be processed, an upper limit on PCB concentration in the feed, and an effective period of up to 3 years from the date of issuance.

For a renewal approval, additional information and/or testing of the process may be required. In order to continue the effectiveness of a permit pending EPA action on reissuance of the permit, the operator must submit a renewal request letter to EPA at least 90 days, but not more than 180 days, prior to the expiration date of the permit.

4.0 PERMIT APPLICATION FORMAT

This section describes the information required in permit applications for alternative methods of PCB destruction. EPA's supplemental guidance (48 FR 13181, March 30, 1983) (USEPA 1983a) establishes the required contents of an application for a permit to operate an alternative method for PCB destruction. The suggested format for the permit application is presented in Table 4. Each major item of the permit format is discussed in the following sections.

A checklist is provided in Appendix A to aid the applicant in determining, prior to submittal, if all requirements for an application to operate an alternative method for PCB destruction have been addressed.

A preliminary, partial application may be submitted to initiate communication between the applicant and the EPA at the earliest possible moment. Early communications can be helpful to both parties: unnecessary submissions can be avoided; needed engineering changes can be made while the facility is being designed or constructed; and provisions can be made for site visits during construction or shakedown. If a preliminary permit application is submitted, the applicant should clearly identify in the body of the preliminary application those sections or items to be provided at a later date.

A research and development permit application should follow the same format as an operating permit application. Although the R&D application need not contain the detail required for an operating permit, it must be sufficient to demonstrate that the R&D activity will not present an unreasonable risk of injury to health or the environment. The applicant should also supply information on the specific objectives of the R&D activity.

4.1 Permit Application Cover

Each submission must have a permit application cover. The application cover format is presented in Figure 4. If the application or the appendices must be bound separately (i.e., multiple volumes), number each volume of the submission in order in the upper right hand corner of the cover ("Volume m of n)". The cover of each volume should have the full cover information. The principal manager is the person identified by the applicant as the primary contact for written or verbal communications from the EPA permit writer.

4.2 Section I - Summary

The applicant is encouraged to begin the permit application with a short summary presenting the document organization and any pertinent background information.

Table 4. Format for Permit Applications for Alternative Method of PCB Destruction

i	Permit Cover
ii	Table of Contents
I.	Summary
II.	Project Organization
III.	Waste Description
IV.	Process Engineering Description
V.	Sampling and Monitoring Plan
VI.	Sampling Procedures
VII.	Sample Analysis Procedures
VIII.	Monitoring Procedures
IX.	Waste Handling and Disposal
X.	Data Reporting/Recordkeeping
XI.	Inspection Procedures
XII.	Spill Prevention Control and Countermeasure Plan
XIII.	Safety Plan
XIV.	Training Plan
XV.	Demonstration Test Plans[a]
XVI.	Test Data or Engineering Performance Calculations
XVII.	Other Permits/Approvals
XVIII.	Schedule of Preoperation Events
XIX.	Quality Assurance Plan
XX.	Standard Operating Procedures
XXI.	Closure Plan

[a]For a research and development application, this section would present the planned research activities.

Volume m of n

(PRELIMINARY) PERMIT APPLICATION

PCB DESTRUCTION UNIT
[Type and location]
[Test site for mobile units]
Submission date: _____

Submission number [sequential numbering, beginning with 1]

Submitted by:

[Company name and address]
[Principal manager and phone no.]

Submitted to:

Division Director, Exposure Evaluation Division
c/o Document Control Officer (TS-790)
Office of Toxic Substances
U.S. Environmental Protection Agency
Room E-201
401 M Street S.W.
Washington, DC 20460

Figure 4. Example permit application cover.

4.3 Section II - Project Organization

Briefly describe the organization for operating the facility. Provide an organization chart identifying key individuals (position titles and actual personnel, if known). The organizational chart should primarily address those personnel directly involved in the project. The corporate structure (e.g., relationship of company officers) is only necessary if it impacts on the chain of command for the PCB destruction facility. Personnel who should be identified include:

- Person(s) responsible for obtaining permit;
- Project manager;
- Facility manager;
- Operations supervisor;
- Reviewing engineer;
- Maintenance supervisor;
- Quality assurance officer;
- Safety officer;
- Laboratory personnel;
- Person(s) responsible for training;
- Person(s) responsible for demonstration test;
- Person responsible for operation of monitoring system; and
- Person responsible for record keeping and reporting.

4.4 Section III - Waste Description

A description of the waste(s) intended to be destroyed in the unit should be provided. As a minimum provide the following information:

- The type (liquid or solid) of waste to be destroyed;

- The proposed total waste and PCB feed rates; and

- The matrix and composition of the waste, including major and minor constituents, and expected PCB concentrations. Heating value, viscosity, Cl, ash, water content, and other characteristics of the waste material should be included, if appropriate.

4.5 Section IV - Process Engineering Description

The agency needs sufficient information about a PCB destruction process to be able to evaluate the permit application. This information will include detailed descriptions of the facility site, PCB and PCB-item handling, process design and operation, pollution control equipment, and anticipated performance. To this end, a list of parameters to be described in the plan is presented below for guidance. The list is not necessarily inclusive. Permit applicants should provide additional information where appropriate.

4.5.1 General

- Process flow diagram and narrative description of the system;
- Description of the theoretical basis for the destruction process;
- Layout diagram and description of the plant or mobile unit;
- Detailed engineering drawings;
- Intended location of the mobile unit or facility (e.g., by waste lagoons or at transformer substations); and
- Intended location of where the unit will be stored when not in use (if mobile unit).

4.5.2 Waste Feed System

- Narrative description of the waste feed system (e.g., procedure for unloading the PCB-containing material, storage of waste, and transfer from storage to the process operations);
- Description of waste preparation, if applicable (e.g., filtration, blending with reagents, solvents, preheating, shredding, and/or hammering). Note: §761.1(b) prohibits treatment which dilute PCB wastes during treatment. Any step which involves dilution must be specifically permitted;
- Waste volume expected to be handled at the facility per month or other time period;
- Waste feed storage capacity and average waste feed stored at the location (e.g., gallons, number of days' supply); and
- Description of method for measurement of the waste feed rate.

4.5.3 Automatic Waste Feed Cutoff System

- Description of the automatic waste feed cutoff system when process conditions deviate beyond the stated limits for required destruction efficiency or beyond safe operating limits and delay time prior to cutoff; and
- Description of the procedures to shut off the waste feed line and the whole process in the event of an equipment malfunction.

4.5.4 Destruction System

- Narrative description of the destruction system (e.g., description of chemical reactions, stoichiometry, reagents, catalysts, process design capacity, etc.);
- Engineering diagrams;
- List of products and by-products and their concentrations;
- Description of how essential parameters (e.g., temperature, pressure, flow rate, etc.) are monitored and the design values;
- Description of reactant/oxidant/fuel/catalyst/feed rates and how they are monitored;
- Design capacity of the system;

- Detailed description of the unique engineering features of the process (e.g., high temperature, pressure, long residence time, heat transfer, etc.); and
- Description of any regeneration/recycling processes applied in the process.

4.5.5 Pollution Control System (PCS)

- A description of the pollution control system for process effluents (air emissions, liquid effluents, sludge, solid waste, etc.);
- Design parameters; and
- The important operating parameters of the PCS and how they will be monitored.

4.5.6 Summary of Process Operating Parameters

Provide a summary which lists target values as well as upper and lower boundaries for all major measured operating parameters, instrument settings, and control equipment parameters. All values must be reported in common, consistent units. The application must also describe the action to be taken whenever the parameter deviates outside the control limits. These actions may include adjusting the operating conditions, stopping the PCB feed, shutting down the process, etc. The time allowable for corrective action before shut-down or other action must be specified.

4.6 Section V - Sampling and Monitoring Plan

The applicant must develop a sampling and monitoring plan to monitor process operation and to verify that the PCB destruction is equivalent to destruction in §761.70 incinerators. In most cases, GC/ECD is adequate to determine the PCB content of product oils or related matrices. In some cases, surrogate parameters for PCB destruction (such as the $CO-CO_2$ ratio allowed for §761.70 incinerators) may be applicable; in most cases, actual measurement of PCB concentration is necessary. A PCB screening method such as infrared spectroscopy, or a total chloride detection kit (e.g., Chlor-N-Oil® or McGraw-Edison PCB field test kit), a chlorine-specific detector, or ultraviolet spectroscopy may be appropriate for measurement of PCB concentration in some cases, while in other cases, GC/EIMS analysis may be required.

For thermal destruction units, the regulations specify the parameters which must be monitored. Since each alternative method for destruction of PCBs is different, it is up to the applicant to specify the process parameters which will be monitored (continuously or routinely) and the effluent streams which will be sampled routinely during operation to demonstrate performance. In general, EPA will require monitoring and sampling of every waste stream, unless the applicant can show that it is inappropriate. The plan should include:

- Process parameters to be monitored;
- Monitoring locations;
- Monitoring methods;

- Monitoring frequencies;
- Effluent streams to be sampled;
- Sampling locations;
- Sampling methods;
- Sampling frequencies;
- Analysis methods; and
- Acceptable limits for result.

A schematic diagram can be used to illustrate the sampling and monitoring locations; Figure 5 is an example. The specific location of each sampling point should be discussed briefly in the narrative. Other important parameters of the sampling and monitoring plan can be concisely presented in a tabular format. Table 5 is an example of a sampling and monitoring plan summary.

The sampling plan must include:

- A description of the system or process being sampled and a breakdown of the process into discrete sampling units (stack emissions, liquid waste, product, etc.).
- The objective of the sampling for each unit (e.g., collect a "representative" sample; follow an EPA test protocol; or collect a "worst case" sample).
- The parameters to be tested: List the compounds, physical measurements, frequency, and media.
- The sampling design for each unit. This may require a mathematical sampling design or simply a reference to a standard protocol. The frequency (e.g., every 15 min), size (e.g., 10 m^3), timing (e.g., any time after reaching steady-state), number of replicates (e.g., triplicates for 10% of the samples or 2 samples, whichever is greater), number of surrogate-spiked samples, and total number of samples should be listed for each sample type.
- An estimate of the sample representativeness. This may be based on data (e.g., historical data on replicates) or scientific/engineering judgment (e.g., a sample from an actively mixed feed tank could be characterized as "highly" representative).
- Contingencies for action if samples cannot be collected according to plan (e.g., alternate sites or times or an entirely new sampling plan).

4.7 Section VI - Sampling Procedures

Details of the sampling methods to be used on a routine basis should be discussed in this section. Include an explanation of the apparatus, calibration procedures, and maintenance procedures, if applicable.

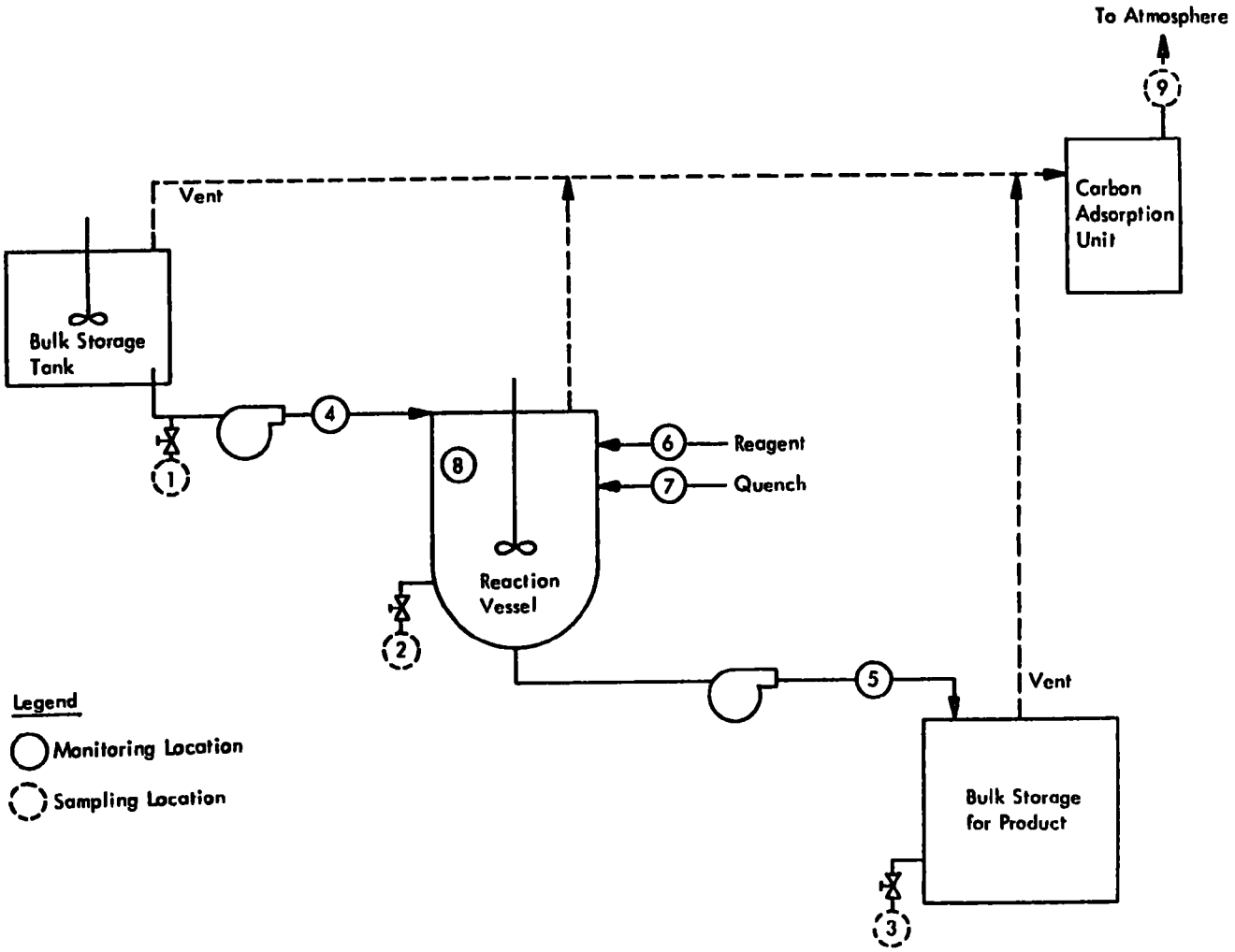

Figure 5. Schematic of sampling and monitoring locations for a chemical dechlorination process.

Table 5. Example of a Sampling and Monitoring Plan Summary for a Chemical Dechlorination Method

Parameter	Sampling (monitoring) method	Frequency	Location[a]	Analysis parameters	Analysis methods	Limit	Contingency
A Waste feed	Grab sample from line tap	Once per batch	1--Storage tank line tap	PCB homologs	GC/ECD	< 2 ppm	Dip from reaction vessel
B. Process product	Grab sample from reactor tap	Once per batch	2--Reactor vessel line tap	PCB homologs	GC/ECD	< 2 ppm	Hold batch until sample obtained and analyzed
	Grab sample from storage tank	At end of demonstration	3--Product Storage tank	PCB homologs	GC/ECD	< 2 ppm	-
C Waste feed rate	Positive displacement meter	Each batch	4--Storage tank line	L/min	-	-	Discontinue operation until repaired
D. Product rate	Positive displacement meter	Each batch	5--Product tank line	L/min	-	-	Discontinue operation until repaired
E Reagent feed rate	Positive displacement meter	Each batch	6--Vessel feed line	L/min	-	-	Discontinue operation until repaired
F Quench feed rate	Positive displacement meter	Each batch	7--Vessel feed line	L/min	-	-	Discontinue operation until repaired
G Reaction vessel pressure	Pressure gauge	15 min.	8--Vessel	mm Hg	-	-	Discontinue operation at end of batch
H. Reaction vessel temperature	Thermometer	15 min	8--Vessel	°C	-	-	Discontinue operation at end of batch
I. Vent emissions to ambient air	Total hydrocarbon analyzer	Continuously	9--Carbon adsorption vent	Total hydrocarbon	GC/FID	< 1 ppm	Discontinue operation at end of batch

[a]Refers to Figure 5.

When "standard methods" will be used, they may be referenced and included as an appendix. However, any deviations from standard procedures must be noted. Furthermore, when the standard method allows different procedural variations to be used, the applicant must be specific as to the procedures which will be followed.

The discussion of sampling and analysis methods should include:

- Sampling equipment;
- Sampling equipment calibration;
- Sampling procedures;
- Sample recovery, storage, and preservation;
- Sample transport and custody;
- Analytical equipment;
- Reagents;
- Reagents preparation;
- Calibration standards; and
- Calibration procedures.

Appendix B to this document provides guidance on sampling and analytical methods.

4.8 Section VII - Sample Analysis Procedures

Summarize the analytical procedures (including sample preparation) which will be used for each sample. The summary should include the analytical method, apparatus, data reduction procedures, data storage, equipment calibration, and equipment maintenance. Specific details of the analytical procedures need not be included in this section, but should be referenced (if standard published procedure) or should be included as an appendix, if unpublished or if the publication is not readily available.

4.9 Section VIII - Monitoring Procedures

Provide a summary of the procedures which will be used to monitor the parameters presented in the sampling and monitoring plan. Include a discussion of the methods and apparatus which will be used, as well as the data reduction, data storage, equipment calibration, and equipment maintenance procedures which will be followed.

4.10 Section IX - Waste Handling and Disposal

The permit application must identify any by-product wastes (both PCB and non-PCB) that will be generated and how the wastes will be disposed, e.g., in-line filters for the PCB waste feed line.

4.11 Section X - Data Reporting/Recordkeeping

The permit application shall explicitly state what data are to be recorded (including units) and how the data records are to be maintained.

Include example calculations, units of measurements, and example record reporting forms. Paragraph 761.180(b) establishes the minimum data record requirements for disposal and storage facilities. Minimum records include a summary report for the previous calendar year which contains:

- Date PCBs and PCB items were received and from whom;
- Date PCBs and PCB items (including process waste which has not been demonstrated to be free of PCB contamination) were disposed of or transferred;
- Summary of the total weight (kg) of PCBs and PCB articles in containers and PCBs in transformers which have been received, transferred to other facilities, and retained at the facility; and
- Summary of the total number of PCB articles or PCB equipment not in containers which have been received, transferred to other facilities, and retained at the facility.

The following information also must be maintained on site:

- The demonstration test results;
- Additional information as specified in the operating permit by the RA or DD/EED.

4.12 Section XI - Inspection Procedures

The permit application shall identify the routine inspection procedures used to identify problems and malfunctions associated with the facility. The frequency of inspections also should be addressed. Inspection procedures should be identified for items such as:

- Waste feed system;
- Destruction system;
- Waste feed cutoff system;
- Pollution control system;
- Process alarms; and
- Fire extinguisher system

4.13 Section XII - Spill Prevention Control and Countermeasures Plan

Describe the procedures (including system design) which will be used to prevent spills of PCBs. Also describe the procedures which will be followed should a spill occur. Coast Guard regulations specifying spill prevention control and countermeasure plans (40 CFR 112.7) can be used as an example for the type of information which should be addressed; however, the plan provided in the permit application need not be in the format or detail specified in 40 CFR 112.7.

4.14 Section XIII - Safety Plan

This section addresses the safety program which will be initiated to protect workers and other humans from PCB exposure or other health hazards. Identify specific items (e.g., protective clothing) of the program for ensuring safe routine operations. Procedures for preventing worker/population exposure in the case of an equipment malfunction also should be addressed; procedures for stopping waste feed, shutting down the process, and controlling emissions in the event of a malfunction should be addressed. Provisions for prevention and control of fires, explosions, electrical outages, etc., also should be addressed.

4.15 Section XIV - Training Plan

The permit application should present a description of the training program which will be initiated to assure workers are trained in items appropriate to their jobs including:

- Equipment operation (in accordance with standard operating procedures);
- Emergency shut-down procedures;
- Use of protective clothing;
- Waste handling;
- Spill prevention/control;
- Fire control; and
- Hazards of PCBs.

4.16 Section XV - Demonstration Test Plans

This section of the permit should briefly summarize the applicant's plans for conducting a demonstration test; a separate detailed plan is required prior to conducting a demonstration test (see Section 5.0 of this document). However, summary information which should be presented in this section includes:

- Tentative date (month/year) for the test;
- Tentative location for the test;
- Parameters to be tested;
- Type waste to be used; and
- Expected date for submittal of test demonstration plan.

If the applicant feels a test demonstration may not be needed for this facility, the applicant should present a rationale for not conducting a demonstration. It is rare that a demonstration test will not be required. One of the few reasons for not requiring a demonstration test is that an identical unit has been previously tested and permitted.

4.17 Section XVI - Test Data or Engineering Performance Calculations

The applicant should present a summary of any relevant test data from R&D activities, non-PCB tests, or other sources, or any engineering calculations which support the ability of the system to destroy PCBs. Detailed

test results need not be presented in this section, but instead may be provided as an appendix, or referenced if already on file with the Office of Toxic Substances.

4.18 Section XVII - Other Permits/Approvals

List other permits/approvals which have been obtained or are being sought for this unit; identify the permitting agency and the person to contact for additional information (permit writer). Relevant permits include PCB research and development permits, operating permits issued by an RA, state or local permits to operate, RCRA permits, NPDES permits, and DOT permits.

4.19 Section XVIII - Schedule of Pre-Operation Events

Provide a proposed schedule (month and year) for complying with the regulatory requirements associated with approval of the facility. Scheduled items to be addressed include: beginning construction date, construction completion date, submittal of demonstration test plan, equipment shakedown period, initiation of demonstration test, submittal of demonstration test results, and initial operating date.

4.20 Section XIX - Quality Assurance Plan

Each permit application must include a Quality Assurance (QA) Plan. Note that the QA plan must address all data-generating activities (e.g., process monitors and controllers), not just chemical laboratory analysis. This plan should conform to the specifications established in "Interim Guidelines and Specifications for Preparing Quality Assurance Project Plans" (USEPA 1980) and must address all measurement (i.e., monitoring) parameters. Additional guidance in the preparation of QA project plans is available in "Quality Assurance Program Plan for the Office of Toxic Substances" (USEPA 1983b).

The purpose of the Quality Assurance Plan is to establish a specific program to: (a) help assure that the monitoring data meet specific quality objectives, and (b) routinely assess the quality of the monitoring data. Appropriate QA is imperative. If the data (physical or chemical measurement) are of unknown quality, the data are unacceptable and cannot be used to show a facility is operating within permit requirements. Data of poor quality, as long as the quality is known, may be acceptable depending on whether or not the parameter is critical to PCB destruction.

The Quality Assurance Plan should address the following items:

- Organization and responsibility for QA;
- Quality assurance objectives for each measurement parameter (e.g., process temperature, pressure);
- Monitoring procedures (brief description);
- Sampling procedures;
- Analytical procedures;
- Sample custody;
- Specific calibration procedures and frequency;

- Procedures for data reduction, validation, and reporting;
- Specific internal quality control checks and frequency;
- Audit procedures and frequency;
- Preventative maintenance procedures and frequency;
- Specific routine procedures to assess accuracy, precision, and completeness;
- Procedures for corrective action; and
- Quality assurance reports to management.

Each of these items is discussed in "Interim Guidelines and Specifications for Preparing Quality Assurance Plans"; the applicant is advised to follow this document.

4.21 Section XX - Standard Operating Procedures

A summary of the standard operating procedures (SOP) should be included in this chapter. The SOP should consist of the procedures available to the facility operators for use in plant operations. The complete SOP should be included as an appendix. Applicants may submit a copy of the process operating manual to satisfy this requirement.

Applicants should be required to develop an SOP (standard operating procedure) and submit to EPA two weeks prior to the demonstration. The SOP:

- Assures that applicants have reviewed the operations in detail;
- Gives EPA opportunity to review and become familiar with the operations prior to the on-site audit; and
- May be used as a tool for training new employees, which gives some assurance that the employees have received a minimum of training.

An SOP should be a step-by-step procedure; however, details of procedures such as the use of sampling or monitoring equipment may be omitted but must be referenced. Divergence from the SOP during trials or commercial runs should be documented and significant modifications should be submitted to EPA. For convenience of use, lab procedures should be separate from system operational procedures.

The SOP should be part of the training plan. Each employee should sign and date a statement indicating that the employee has read and understood the SOP.

4.22 Section XXI - Closure Plan

The closure plan for the facility should address two situations:

- For mobile units, closure of the facility at each site prior to moving to a new site; closure must address items such as decontamination of equipment, placarding any contaminated equipment, and disposal of any wastes generated from decontamination/cleanup procedures.

- For both mobile and stationary facilities, permanent closure (i.e., removal from service).

The closure plan(s) should address:

- Responsible personnel;
- Disposal of by-product wastes on a routine basis;
- Disposal of equipment; and
- Financial responsibility of the company.

5.0 DEMONSTRATION TEST PLANS

This section presents the suggested format for a Demonstration Test Plan and briefly discusses the major items of information which must be submitted in the plan.

A Demonstration Test Plan is a document prepared specifically for the demonstration tests and provides details of how the test will be conducted. This includes details of: when and where the demonstration will be conducted and by whom; process/pollution control operating parameters to be maintained during the test; waste feed quantity and type; parameters to be monitored/sampled; sampling/monitoring locations, frequency, and methods; sample analysis methods; equations for calculating results; and quality assurance procedures.

5.1 General

For alternative methods of destruction, the applicant must show that the method will not present an unreasonable risk (§ 761.60 (e)). Supplemental Guidance to Part 761 (48 FR 13181, March 30, 1983) (USEPA 1983a) for procedures to approve alternative methods indicates that a process demonstration may be required by the AA prior to approval. The supplemental guidance specifies the minimum information required for a process demonstration test plan as follows:

- Time, date, and location of the demonstration;
- Quantity and type of PCBs and PCB items to be processed;
- Parameters to be monitored and location of sampling points;
- Sampling Plan and Quality Assurance Plan including sampling frequencies, methods, and schedules for sample analysis; and
- Name, address, and qualifications of persons who will review analytical results and other pertinent data, and who will perform technical evaluation of the process demonstration effectiveness.

Subsection 5.2 of this section provides the demonstration test plan format and describes the required contents of a Demonstration Test Plan. Appendix B summarizes and discusses applicable methods for monitoring and sampling process feed streams, effluent products, and emissions.

5.2 Contents of a Demonstration Test Plan

The Demonstration Test Plan must contain all the required information as described in this document. Table 6 presents the format for a Demonstration Test Plan. Contents of the Demonstration Test Plan, prepared according to the recommended format, are discussed in the following paragraphs. Appendix A provides a checklist to aid the applicant in determining whether all required items have been addressed.

5.2.1 Test Demonstration Plan Cover

A cover must be provided for the Demonstration Test Plan. Figure 6 presents the cover format to be used. If multiple volumes are submitted,

Table 6. Format of Demonstration Test Plans for Nonthermal Destruction Systems

i	Test Plan Cover
ii	Table of Contents
I.	Summary
II.	Project Organization
III.	Process Engineering Information (new information to application)
IV.	Process Operation
V.	Sampling and Monitoring Plan
VI.	Sampling and Analysis Procedures
VII.	Monitoring Procedures
VIII.	Data Reporting
IX.	Miscellaneous Tests
X.	Waste Handling and Disposal
XI.	Test Schedule
XII.	QA Plan (addenda to Permit QA Plan)
XIII.	Standard Operating Procedures (addenda to Permit SOP)

Volume m of n

(PRELIMINARY) DEMONSTRATION TEST PLAN

PCB DESTRUCTION UNIT
[Type and location]
[Test site for mobile units]
Proposed test dates: _____
Submission date: _____

Submission number [in sequence with permit application submissions]

Submitted by:

[Company name and address]
[Principal manager and phone no.]

Submitted to:

Division Director, Exposure Evaluation Division
c/o Document Control Officer (TS-790)
Office of Toxic Substances
U.S. Environmental Protection Agency
Room E-201
401 M Street S.W.
Washington, DC 20460

Figure 6. Cover for the Demonstration Test Plan.

provide a cover for each volume and number each volume in the upper right hand corner, "Volume m of n."

5.2.2 Section I - Summary

The applicant should begin the plan with a short summary of the document. The summary should indicate when, where, and by whom the test will be conducted. A brief background discussion on the unit to be tested also is useful (e.g; type of unit, intended use, summary of previous tests or operations).

5.2.3 Section II - Project Organization

Provide an organizational chart and narrative description, as necessary, to identify the key personnel for the project. Identify personnel who have overall authority/responsibility for conducting the demonstration test and their relationship to key personnel having overall authority/responsibility for the project. It is not necessary to repeat detailed information on overall project authority/responsibility that has previously been submitted in the permit application. However, a consolidated organizational chart is generally advisable so that lines of authority can be identified. Key areas of responsibility which should be identified include:

- Overall project responsibility;
- Facilities manager;
- Test demonstration coordinator/manager;
- Operations manager;
- Sampling crew chief;
- Monitoring systems operator;
- Analytical manager/key analyst;
- Quality assurance officer;
- Safety officer; and
- Operators and laboratory technicians.

Qualifications of the key individuals who will be operating the system and conducting the sampling, monitoring, and analysis are to be provided with the Demonstration Test Plan.

5.2.4 Section III - Process Engineering Information

This section provides a general overview of the process, including a simplified flow diagram. Detailed information about the process should be in the permit application and may be referenced. However, if modifications have been made to the system since the permit application, these modifications should be addressed. Similarly, if any modifications to the normal process systems will be required during the demonstration, these should be addressed; for example, if waste will be pumped from 55-gal. drums during the demonstration, in lieu of using a bulk feed storage tank which will be used during normal operation, this deviation must be noted and explained.

5.2.5 Section IV - Process Operation Test Parameters

This section presents the operating parameters to be maintained during the Demonstration Test. Information which should be presented includes:

- Operational plan;
- Process operating parameters;
- Anticipated emission levels; and
- PCBs or PCB items to be fed as waste.

A brief operational plan should be provided. This plan may take the form of a detailed schedule of events. In the operational plan explain the operating parameters which will be maintained while bringing the unit on-line, while conducting the demonstration, and while taking the unit off-line. For example, will a non-PCB "waste feed" first be used to demonstrate safe operation?

The process operating conditions and anticipated emissions can be summarized in a tabular format. Table 7 is an example "test parameter summary" for a chemical dechlorination process. Note that control limits (i.e. acceptable ranges) are presented for key operating parameters.

Identify the waste feed which will be used during the demonstration test. State the type of feed, physical state, and composition including anticipated PCB concentration. State the total quantity of feed to be used during the demonstration. Explain how the waste feed used for the demonstration compares to the waste which will normally be processed during routine operation; i.e., the same, worst case condition, or mixture of anticipated wastes. Explain the provisions established for storage of the wastes prior to and during the demonstration, if different from normal.

5.2.6 Section V - Sampling and Monitoring Plan

This section presents the sampling and monitoring plan for the demonstration test. The plan should be detailed and specific to the demonstration. The plan should address all sampling and monitoring which will be conducted during the demonstration; i.e., both sampling/monitoring which will be routinely conducted during normal operation and sampling/monitoring which will be conducted only during the demonstration test. A tabular format, with narrative explanation, as necessary, can be used to summarize the sampling and monitoring plan. The sampling/monitoring plan should include the following elements:

- A description of the system or process being sampled or monitored (including sampling location) and breakdown of the process into discrete sampling units, liquid waste, product, etc.).

- The number of tests to be conducted and the schedule. Generally, three tests have been conducted on successive days for incinerators. For batch-type operations, a minimum of three batches generally is processed.

Table 7. Example Summary of Anticipated Test Parameters for a Batch Chemical Dechlorination Process

Parameter	Anticipated value	Control limits	Required[a] value
Waste feed			
Waste feed rate (kg/batch)	1,000	850-1100	NA[b]
Waste feed rate (gal./batch)	275	250-300	NA
PCB concentration in feed (mg/kg)	5,000	NA	NA
Total chlorine in feed (mg/kg)	3,500	NA	NA
PCB feed rate (kg/batch)	5	NA	NA
Chlorine feed rate (kg/batch)	3.5	NA	NA
Destruction conditions			
Batch residence time (h)	2	< 12	NA
Reactor temperature (°C)	40	35-45	NA
Reactor pressure (mm Hg)	800	760-880	NA
Emissions			
Final PCB concentration (µg/g/peak)	< 2	< 2	< 2
Pollution control			
Not applicable			
PCB content of waste products			
Water (mg/L/peak)	0.005	< 2	< 2
Filter (µg/g/peak)	< 2	< 2	< 2
Sludge (µg/g/peak)	< 2	< 2	< 2

[a]Required by regulation or OTS policy.
[b]NA (not applicable)

- The objective of the sampling or monitoring for each unit (e.g., collect a "representative" sample; follow an EPA test protocol; or collect a "worst case" sample).

- The parameters to be tested: List the compounds, physical measurements and media.

- The sampling or monitoring methods: List the methods to be used. Detailed description of the methods may be presented in this section or an appendix.

- The sample analysis method: List the analytical methods to be used. Detailed description of the methods may be presented in this section or an appendix.

- The sampling or monitoring design for each unit. This may require a mathematical sampling design or simply a reference to a standard protocol. The frequency (e.g., every 15 min), size (e.g., 10 m^3), timing (e.g., any time after reaching steady-state), number of replicates (e.g., 10% of the samples or 2 samples, whichever is greater, collected in triplicate), number of surrogate-spiked samples, and total number of samples should be listed for each sample type. The sample size is usually dictated either by the amount of sample required to detect the analyte or by convenience (e.g., 1 L for water).

- An estimate of sample representativeness. This may be based on data (e.g., historical data on replicates) or scientific/engineering judgment (e.g., a sample from an actively mixed feed tank might be characterized as representative).

- Contingencies for action if samples cannot be collected according to the plan (e.g., alternative sites or times, an entirely new sampling plan, or repeat tests).

The parameters which typically should be included in the sampling/monitoring plan are discussed below.

The applicant must propose a set of sampling/monitoring parameters to verify that PCB destruction is equivalent to disposal in §761.70 incinerators. At a minimum this will include measurement of PCBs in the final product and effluent streams (wastewater, filters, vent gas, etc.). In many cases for alternative methods of PCB destruction, destruction equivalent to a §761.70 incinerator has been defined as a measured effluent stream concentration of not greater than 2 µg/g/resolvable chromatographic peak. The other monitoring sampling parameters will depend upon the process design and the type of waste feed/effluent streams. Process operating parameters (e.g., feed rate, reaction temperature and pressure) must be monitored. The applicant should include all applicable operating parameters in the sampling/monitoring plan. If applicable, pollution control system operating parameters should be included in the sampling/monitoring plan.

For physical separation processes where PCBs are concentrated into a fraction for subsequent destruction by an approved method, the applicant must propose a set of sampling/monitoring parameters to verify that (a) the residual "clean" fraction contains ≦ 2 μg/g (ppm) total PCBs, (b) no PCBs are emitted from the system through drains, vents, etc., and (c) the process does not present an unreasonable risk of injury to health or the environment. Process operating parameters (e.g., feed rate, reaction temperature and pressure) must be monitored. The applicant should include all applicable operating parameters in the sampling/monitoring plan. If applicable, pollution control system operating parameters should be included in the sampling/monitoring plan.

The agency may require applicants to amend the sampling and monitoring list. The parameters which may be required include, but are not limited to, PCDDs, PCDFs, and other chlorinated organics.

5.2.7 Section VI - Sampling and Analysis Procedures

Specific details of any sampling and analysis procedures which will be used during the demonstration test but were not previously addressed in the permit application must be included in the Demonstration Test Plan. This section should review the methods previously given in the corresponding section of the permit application and any additional details or new information at the time of the demonstration test.

5.2.8 Section VII - Monitoring Procedures

Specific details of the monitoring procedures to be used during the demonstration test must be included in the Demonstration Test Plan. If these procedures have been completely described in the permit application and have not changed, the permit application may be referenced. The following information must be included:

- Type of instrumentation;
- Manufacturer, model number;
- Sample conditioning system, if applicable;
- Calibration standards; and
- Calibration procedures.

Brief descriptions of some monitoring procedures which typically have been used for PCB destruction systems are presented in Appendix B to this report.

5.2.9 Section VIII - Data Reporting

Present a summary of the data to be obtained during the demonstration test and to be presented in the final test report. Example calculations and reporting units should be presented. Include information for process data; pollution control system operation (if applicable); and the PCB concentrations for the waste feed, effluent waste, and product streams.

All chemical analytical values must be reported as concentrations, expressed as:

- Micrograms per liter for water; and
- Micrograms per gram for nonaqueous liquids or solids.

PCB values in waste feed are to be reported as "total PCB" (a sum of all 209 congeners). A breakdown of the total PCB value by homolog or congener may be useful for certain destruction tests. PCB values in product oil, liquid waste, solid waste, and other streams must be reported in micrograms per gram (µg/g) per resolvable chromatographic peak. In many cases for alternative methods of PCB destruction, destruction equivalence to a Section 761.70 incinerator has been defined as a measured effluent stream concentration of not greater than 2 µg/g/resolvable chromatographic peak. If this or some other maximum allowable concentration of the effluent stream(s) is used to demonstrate equivalency, measured values less than the allowable limit may not need to be reported (i.e., it is acceptable to report results as "less than 2 µg/g/peak"). The analytical results may not be reported in terms of Aroclor (or other mixture) concentrations, even if an Aroclor is used to calibrate the instrument (as in the waste feed) unless EPA gives prior approval.

5.2.10 Section IX - Miscellaneous Tests

The proper operation of the automatic waste-feed cut-off and other emergency systems must be demonstrated. Describe the procedures to be used during the demonstration test to check operation of alarm and emergency systems, including:

- Waste feed cut-off system;
- Alarm systems (e.g., high temperature); and
- Fire extinguisher system.

These tests must be included on the schedule (see Section 5.2.12 below).

5.2.11 Section X - Waste Handling and Disposal

The demonstration test plan must identify any by-product wastes (both PCB and non-PCB) that will be generated and how the wastes will be disposed, e.g., in-line filters for the PCB waste feed line.

5.2.12 Section XI - Test Schedule

Provide a detailed schedule of the proposed demonstration test period. The schedule should be of sufficient detail to determine what activities are planned for each day. Table 8 is an example demonstration test schedule. The schedule should be realistic in the sense of including sufficient time to address problems which can be expected to occur in operating a new process.

Table 8. Example: Proposed Schedule for Demonstration

Day	Tentative date	Activity
0	xx/yy/zz	AM • Inventory waste feed AM/PM • Begin system shakedown using non-PCB feed
1		AM/PM • Destruction test no. 1
2		AM/PM • Destruction test no. 2
3		AM/PM • Destruction test no. 3 • Test of emergency systems • Shut unit down at completion of test according to to closure plan

5.2.13 Section XII - Quality Assurance Plan

Each Demonstration Test Plan must include a Quality Assurance Project Plan. If an adequate Quality Assurance Project Plan has been submitted with the permit application, then only addenda to the QA plan specific to additional sampling, monitoring, and analysis for the test demonstration, need be submitted with the Test Demonstration Plan. Those portions of the QA plan which apply to normal operations and those which apply only to the demonstration test must be clearly identified. In any event, the QA plan, with addenda, must address all measurement parameters (e.g., destruction vessel temperature, distillation column temperature) not merely PCB sampling and analysis.

The QA plan must conform to the specifications established in "Interim Guideline and Specifications for Preparing Quality Assurance Project Plans" (USEPA, 1980). A QA plan prepared according to these specifications will address the following items:

- Organization and responsibility for QA;
- QA objectives for each measurement parameter (precision, accuracy, completeness, representativeness, and compatibility);
- Sampling and monitoring procedures;
- Sample custody;
- Calibration procedures and frequency;
- Analytical procedures;
- Data reduction, validation, and reporting;
- Internal quality control checks and frequency;
- Performance and system audits and frequency;
- Preventive maintenance procedures and schedules;
- Specific routine procedures to assess data precision, accuracy, and completeness;
- Corrective action; and
- QA reports to management.

Additional guidance in the preparation of QA project plans is available in "Quality Assurance Program Plan for the Office of Toxic Substances" (USEPA 1983b).

For most sampling and analysis plans, a minimum of 10% or 2, whichever is greater, of the samples must be collected in triplicate; a minimum of 10% or 2 of the samples, whichever is greater, must be QC controls; and a minimum of 10% or 2 of the samples, whichever is greater, must be QC blanks.

5.2.14 Section XIII - Standard Operating Procedures

Provide any addenda to the standard operating procedures which were submitted with the permit application, if necessary.

6.0 CONDUCTING A DEMONSTRATION TEST

Once the Agency has determined that the Demonstration Test Plan is complete, a demonstration will be scheduled at a date agreeable to both the applicant and the Agency. Before the demonstration can commence, the agency will issue an approval for a demonstration, i.e., a demonstration permit. The approval will contain certain conditions, including notification of the demonstration to other appropriate authorities (e.g., Regional Administrator), PCB-containing material(s) to be treated, sampling, analysis, waste disposal, QA, site security, record keeping, and reporting requirements. A copy of the demonstration permit must be on site and adhered to during the demonstration.

If any modifications to the test plan are required prior to the demonstration test, the Agency (permit writer) should be notified in writing within 14 days prior to the test. Also, if events require that the plan be significantly modified during the test demonstration, then the permit writer should be contacted immediately to discuss the implications of any modifications. As with normal operation, any significant deviations from or alterations in the standard operating procedure must be documented in writing to the Agency (permit writer) within 10 days of the event. Throughout the test demonstration, an "event log" should be maintained. This log should be submitted as part of the demonstration test report.

Provided that other local, state, and federal regulations allow it, one or more pre-tests may be conducted using a non-PCB feed to shake down the facility. Furthermore, an R&D permit may be advisable to allow the applicant to test the facility with PCBs in the field prior to a full-scale process demonstration (see Section 3.2).

Prior to the test, the facility must be prepared. All instruments, controls, devices, etc., must be in working order and calibrated. Sufficient supplies of PCB waste, fuel, reagents, etc., must be on hand. The facility should be cleaned (remove all waste, etc.) to prevent contamination from previous tests or other use.

The test should be conducted under conditions simulating normal operations. Permit requirements usually reflect the operating conditions during the demonstration test. Therefore, the applicant should give very careful consideration to the design and conduct of the demonstration test. Each demonstration usually consists of the following three steps:

6.1 Start-up

The facility is prepared for operation with no PCBs in the system. Conditions should be noted and samples collected to characterize background conditions if appropriate.

6.2 PCB Waste Destruction

The PCB waste is introduced into the facility at expected normal feed rates and expected maximum PCB concentrations. During the test, samples should be collected and records kept of the readings of process monitors,

gauges, and meters. Visual observation of the effluent should also be made, where appropriate. The number and the length of individual test runs required depends on the process. For example, the demonstration test for a batch type destruction process might consist of test runs on three batches. For a continuous distillation process, the demonstration test might consist of 8 h of continuous operation with samples of the final product stream taken at 2-h intervals and a sample of the final product batch taken at the end of the test.

6.3 Shutdown

Waste feed is terminated and the facility is then shut down per normal procedures or kept running on non-PCB feed at the discretion of the operator.

7.0 DEMONSTRATION TEST REPORT

After the demonstration test has been performed, a report of the results must be prepared and submitted to the DD/EED. The format and the required contents of the test report are presented in this section.

7.1 Format and Contents

Table 9 presents the format for the demonstration test report. The following paragraphs briefly describe the report contents. The test report must contain all of the required information as described in this document.

7.1.1 Demonstration Test Report Cover

Figure 7 is the specified format for the report cover. If the report or the appendices must be bound separately, number each part of the submission in order (Volume m of n). The covers of each volume should have the full cover information as described above.

7.1.2 Certification Letter

This letter, signed by an authorized official, must certify on behalf of the applicant that the test was carried out in accordance with the approved test plan and the results of all determinations are submitted in the report.

7.1.3 Section I - Summary

The report should begin with a short summary. The summary contains table(s) summarizing the pertinent test results. Table 10 is an example summary table for a chemical dechlorination demonstration test. A brief narrative should summarize whether or not the facility met all performance requirements. Major problems encountered and major deviations from the test plan should be mentioned.

7.1.4 Section II - Process Operation

7.1.4.1 General

Provide a general overview of the process using simplified flow diagrams and a brief narrative. Detailed information on the process should be in the permit application and may be referenced.

7.1.4.2 Operation During the Test

Summarize the operating parameters of the process during the destruction test. Include physical characteristics of the feed, PCB content of the feed, feed rates, total feed quantity, temperatures, pressures, effluent stream flow rates and volumes, and pollution control system operating parameters (if applicable).

Table 9. Format for the Demonstration Test Report

i	Report Cover
ii	Table of Contents
iii	Certification Letter
I.	Summary
II.	Process Operation
III.	Sampling and Monitoring Procedures
IV.	Analytical Procedures
V.	Test Results
VI.	QA Summary
VII.	Visits and Audits
VIII.	Closure
IX.	Waste Disposal Manifests
	Appendices

Volume m of n

DEMONSTRATION TEST PLAN

PCB DESTRUCTION UNIT
[Type and location]
[Test site for mobile units]
Proposed test dates: _____
Submission date: _____

Submission number [in sequence with permit application submissions]

Submitted by:

[Company name and address]
[Principal manager and phone no.]

Submitted to:

Division Director, Exposure Evaluation Division
c/o Document Control Officer (TS-790)
Office of Toxic Substances
U.S. Environmental Protection Agency
Room E-201
401 M Street S.W.
Washington, DC 20460

Figure 7. Demonstration Test Report cover.

Table 10. Example Demonstration Test Results Summary for a Batch Chemical Dechlorination Process

	Test 1	Test 2	Test 3
Date			
Time test begun			
Time test ended			
Operating parameters:			
Waste feed rate (kg/h)			
Batch volumes waste feed (kg)			
Batch volumes waste feed (gal.)			
PCB concentration in feed (g/kg)			
PCB feed (kg)			
Reaction start time (24-h clock)			
Reaction end time (24-h clock)			
Reaction time (h)			
Final batch size (kg)			
Final batch size (gal.)			
Average reactor temperature (°C)			
Average reactor pressure (mm Hg)			
Sampling/Analysis Results			
Final PCB concentration of product (µg/g/peak)			
PCB concentration of wastewater (mg/L/peak)			
PCB concentration of filters (µg/g peak)			
PCB concentration of sludge (µg/g/peak)			

A tabular format with explanatory narrative, as necessary, is preferred. Detailed data such as tables of 15-min temperature readings and the process operator's log, should be relegated to an appendix.

7.1.4.3 Deviations from Test Plan

Any events such as upsets, shutdowns, or other deviations from normal operations, along with the corrective actions taken must be described. These deviations should have been previously reported to the permit writer, verbally during the test and as a separate written incident report within 14 days of the incident. These incident reports should be presented in an appendix. This section should summarize the incidents, discuss their effect on the test results, and discuss their effect on the overall ability of the system to routinely operate within permit conditions.

Also describe non-incident-related changes such as site location, amount of PCBs treated, and use of an independent laboratory for analysis. The purpose or reasons for these types of changes should be explained in this section.

7.1.5 Section III - Sampling and Monitoring Procedures

Describe the sampling and monitoring procedures used. Standard procedures may be referenced, but any deviations or modifications from referenced methods must be described. Lengthy method descriptions should be placed in the appendix.

Summarize the type, location, time, volume, and number of samples collected. Any significant deviations from the Demonstration Test Plan must be noted and the potential effects on the results discussed.

7.1.6 Section IV - Analytical Procedures

Describe the analytical procedures used for each parameter (e.g., PCBs in water). Standard procedures may be referenced but any deviations or modifications from referenced methods must be described. Identify deviations from the Demonstration Test Plan. Lengthy descriptions should be placed in an appendix.

7.1.7 Section V - Test Results

Present concise summaries for all pertinent parameters such as:

- Influent and effluent stream analyses;
- Analyses of filters, wastewater, and other by-products; and
- System performance results.

Discuss the test and QC results and analysis system performance as necessary. All results should be traceable to the original test data. As a minimum, identify how the results were calculated (formulae and data used). Detailed sample calculations should be presented in the appendix and referenced.

Identify and discuss any anomalies in the system operation, sampling, monitoring, or analyses that may have significant impact on the test results.

Raw data and the raw analytical results (e.g., chromatograms, mass measurements) also should be presented in the appendices.

7.1.8 Section VI - Quality Assurance Summary

Summarize the QA results (blanks, replicates, audit results). Identify any serious problems (e.g., unacceptable audit results, failure to calibrate instrumentation) or deviations from QA protocol. A separate QA report must be presented, authored and signed by the QA officer. The QA report should address all the QA objectives, including whether or not precision and accuracy objectives were met, as well as results of quality control samples, performance audit samples, and systems audits.

7.1.9 Section VII - Visits and Audits

This section should contain a list of visitors and auditors and the affiliation, address, and phone number of those who were on site during the demonstration. The list should include all visitors or auditors from state, local, or federal agencies, their contractors, applicant management, QA personnel, and independent consultants. Where possible, the purpose of these visits and any significant results should be summarized. If audit reports, engineering certifications, etc., were issued by any visitors, they should be appended to the demonstration test report.

7.1.10 Section VIII - Closure

The applicant should summarize the facility closure after the demonstration. Any deviations from the closure plan should be discussed. Applicant should provide documentation (copies of manifest) to show that all wastes generated during the process test were properly disposed according to TSCA and RCRA regulations. Applicant should be aware that all the waste generated during the test should be disposed of by incineration and not landfilling, unless compliance with the landfill restrictions can be demonstrated.

7.1.11 Section IX - Waste Handling and Disposal

The demonstration test report should provide documentation that all wastes generated during the demonstration test were properly disposed in accordance with TSCA and RCRA. Manifests should be included in the test report, when applicable.

7.1.12 Appendices

Supporting information (e.g., detailed procedures, analytical results, sample calculations, QA report) should be presented in the appendices. Include the chronological demonstration test events log and any incident reports.

7.2 Review

The permit writer will review the report to determine if it contains all necessary elements and if the demonstration has met the objectives of the test.

7.3 Approval

Upon acceptance of the process demonstration test report and a determination that the process operates within all of the pertinent requirements of 40 CFR 761 and the conditions of the demonstration permit, the DD/EED shall issue a final permit to operate commercially. The operating permit will contain certain conditions, including matrices to be treated, maximum PCB concentrations to be treated, waste disposal, site security, recordkeeping, reporting, and closure requirements. A permit will normally be issued for up to 3 years' operation. A copy of this approval should be on site and adhered to during all operations.

8.0 REFERENCES

Neulicht, R. M., R. V. Shah, G. Kelso, B. L. Carson, and M. D. Erickson, "Guidelines for Permit Applications and Demonstration Test Plans for PCB Incinerators," Draft Interim Report No. 1, Revision No. 3, MRI Project No. 8501-A(06), EPA Contract No. 68-02-3938 (May 28, 1986).

U.S. Environmental Protection Agency, "Polychlorinated Biphenyls (PCBs) Manufacturing, Processing, Distribution in Commerce, and Use Prohibitions," Federal Register, 44, 31514-31568 (May 31, 1979).

U.S. Environmental Protection Agency, "Guidelines and Specifications for Preparing Quality Assurance Project Plans," Office of Monitoring Systems and Quality Assurance, QAMS-005/80, December 27, 1980.

U.S. Environmental Protection Agency, 40 CFR Part 761, "Procedural Amendment of the Approval Authority for PCB Disposal Facilities and Guidance for Obtaining Approval," Federal Register, 48, 13181-13186 (1983a).

U.S. Environmental Protection Agency, "Quality Assurance Program Plan for the Office of Toxic Substance," Office of Pesticides and Toxic Substances, Washington, D.C., September 30, 1983b.

U.S. Environmental Protection Agency, 1985, Code of Federal Regulations, Title 40, Part 761 (40 CFR 761), "Polychlorinated Biphenyls (PCBs) Manufacturing, Processing, Distribution in Commerce, and Use Prohibitions," Revised as of July 1, 1985.

Weller, P. J., J. Andis, and S. Baig, "Preliminary Study Regarding Alternative Definitions of PCB Solid/Liquid Wastes," dated October 1981, Appendix H in R. G. McInnes and R. J. Johnson, "Provision of Technical Assistance to Support Regional Office Implementation of the PCB Regulations--East and West," Draft Project Summary Report by GCA Corporation, New Bedford, MA, and TRW, Inc., Redondo Beach, CA, on EPA Contract No. 68-02-3168, Work Assignment No. 45, and Contract No. 68-02-3174, Work Assignment No. 68, for David C. Sanchez, USEPA, Office of Research and Development, IERL, Research Triangle Park, NC, 1982, 186 pp.

APPENDIX A

CHECKLISTS FOR COMPLETENESS OF SUBMITTAL

APPENDIX A-1

PERMIT APPLICATION CHECKLIST FOR NONTHERMAL DESTRUCTION SYSTEMS

	Submitted	To Be Submitted At Later Date[1]	Not Applicable
1. Permit Cover			
2. Summary (Section I)			
3. Project Organization (Section II)			
A. Chart			
B. Text			
4. Waste Description (Section III)			
A. Type			
B. Total Amount/Feed Rate			
C. Physical/Chemical Description			
5. Process Engineering (Section IV)			
A. General Overview			
• Description			
• Flow Diagram			
• Location			
• Site Maps			
B. Waste Feed System			
C. Waste Feed Cut Off System			
D. Destruction System			
E. Pollution Control System			
F. Process Operating Parameters			
6. Sampling and Monitoring Plan (Section V)			
A. Sampling/Monitoring Parameter List (see attached supplemental checklist)			
B. Sampling/Monitoring Frequency			
C. Frequency/Number of Samples (Sample Design)			
D. Methods			
• Sampling			
• Monitoring			
• Analytical			
E. Equipment			
• Sampling			
• Monitoring			
• Analytical			

	Submitted	To Be Submitted At Later Date[1]	Not Applicable
7. Sampling Procedures (Section VI)			
A. Appropriate Methods	_____	_____	_____
B. Written Protocols	_____	_____	_____
C. Apparatus	_____	_____	_____
D. Calibration	_____	_____	_____
E. Maintenance	_____	_____	_____
8. Sample Analysis Procedures (Section VII)	_____	_____	_____
A. Appropriate Methods	_____	_____	_____
B. Written Protocols	_____	_____	_____
C. Apparatus	_____	_____	_____
D. Calibration	_____	_____	_____
E. Data Reduction	_____	_____	_____
F. Data Storage	_____	_____	_____
G. Maintenance	_____	_____	_____
9. Monitoring Procedures (Section VIII)	_____	_____	_____
A. Appropriate Methods	_____	_____	_____
B. Written Protocols	_____	_____	_____
C. Apparatus	_____	_____	_____
D. Calibration	_____	_____	_____
E. Data Reduction	_____	_____	_____
F. Data Storage	_____	_____	_____
G. Maintenance	_____	_____	_____
10. Waste Handling and Disposal			
A. List of All Wastes (type and amounts)	_____	_____	_____
B. Disposal Methods	_____	_____	_____
11. Data Reporting/Recordkeeping (Section IX)			
A. Format	_____	_____	_____
B. Example Calculations	_____	_____	_____
C. Units	_____	_____	_____
12. Inspection Procedures (Section X)			
A. Waste Feed System	_____	_____	_____
B. Destruction Feed System	_____	_____	_____
C. Waste Feed Cut-Off System	_____	_____	_____
D. Pollution Control System	_____	_____	_____
E. Alarms	_____	_____	_____
F. Fire Extinguisher Systems	_____	_____	_____

	Submitted	To Be Submitted At Later Date[1]	Not Applicable
13. Spill Prevention Control and Countermeasures Plan (Section XII)			
14. Safety Plan (Section XIII)			
15. Training Plan (Section XIV)			
16. Demonstration Test Plan (Section XV)			
A. Tentative Date			
B. Tentative Location			
C. Parameters to be Tested			
D. Type Waste			
17. Test Data or Engineering Performance Calculations (Section XVI)			
A. Previous Test Results			
B. Engineering Calculations			
18. Other Permits or Approvals (Section XVII)			
A. Regional R&D			
B. Regional Full-Scale			
C. RCRA			
D. State or Local			
E. DOT			
F. Other			
19. Schedule (Section XVIII)			
20. Quality Assurance Plan (Section XIX)			
A. Format			
B. Organization and Responsibility			
C. QA Objectives			
1. Precision			
2. Accuracy			
3. Completeness			
4. Representativeness			
5. Comparability			
D. Monitoring Procedures			
E. Sampling Procedures			

	Submitted	To Be Submitted At Later Date[1]	Not Applicable
F. Analytical Procedures			
G. Sample Custody			
H. Calibration Procedures and Frequency			
I. Data Reduction, Validation and Reporting			
J. Internal Quality Control Checks			
K. Audits			
1. Performance			
2. System			
L. Preventive Maintenance			
M. Specific Routine Procedures Used to Assess Data Precision Accuracy and Completeness			
N. Corrective Action			
O. Quality Assurance Reports to Management			
21. Operational Plan (Section XX)			
22. Closure Plan (Section XXI)			
A. Site-to-Site			
B. Permanent			
C. Routine Waste Disposal			

[1] Section of the permit should be reserved for revised submittal and the deficiency should be noted in the application.

APPENDIX A-2

CHECKLIST FOR NONTHERMAL DESTRUCTION SYSTEM DEMONSTRATION TEST PLAN

	Submitted	To Be Submitted At Later Date[1]	Not Applicable
1. Test Plan Cover			
2. Summary (Section I)			
3. Project Organization (Section II)			
A. Key Personnel Identified			
B. Organization Chart			
4. Process Engineering Information (Section III; new information from Permit Applications)			
5. Process Operation Test Parameters (Section IV)			
A. Operational Plan			
B. Process Operating Parameters			
C. Anticipated Emission Levels			
D. Waste Feed Description/ Quantity			
6. Sampling and Monitoring Plan Design (Section V)			
A. Number of Tests			
B. Parameters to be Monitored[2]			
C. Parameters to be Sampled[2]			
D. Sampling/Monitoring Locations			
E. Number/Frequency of Samples			
F. Sampling Methods			
G. Monitoring Methods			
H. Analysis Method			
7. Sampling/Analysis Procedures[2] (Section VI)			
A. Methods			
B. Written Protocol			
C. Equipment			
D. Calibration			

	Submitted	To Be Submitted At Later Date[1]	Not Applicable
8. Monitoring Procedures[2] (Section VII)			
A. Written Protocol	_____	_____	_____
B. Equipment	_____	_____	_____
C. Calibration	_____	_____	_____
9. Data Reporting (Section VIII)			
A. Data to be Reported, Units	_____	_____	_____
B. Example Calculations	_____	_____	_____
10. Miscellaneous Tests (Section IX)			
A. Waste Feed Cut-Off	_____	_____	_____
B. Alarm Systems	_____	_____	_____
C. Fire System	_____	_____	_____
11. Waste Handling and Disposal (Section X)	_____	_____	_____
12. Test Schedule (Section XI)	_____	_____	_____
13. Addenda to QA Plan (Section XII)	_____	_____	_____
14. Addenda to Standard Operating Procedures (Section XIII)	_____	_____	_____

[1] Section of the permit should be reserved for revised submittal and the deficiency should be noted in the application.

[2] See supplemental checklist.

SAMPLING AND MONITORING PARAMETER SUPPLEMENT FOR NONTHERMAL PCB DESTRUCTION PROCESSES

	To Be Monitored (Y/N)	Monitoring Frequency	To Be Sampled	Sampling Frequency	Monitoring/Sampling Design	Method	Apparatus	Analytical Method	Data Reduction/Storage	Calibration	Maintenance	Written Protocol
a. PCBs in Waste Feed	___	___	___	___	___	___	___	___	___	___	___	___
b. Feed Composition	___	___	___	___	___	___	___	___	___	___	___	___
c. Waste Feed Rate	___	___	___	___	___	___	___	___	___	___	___	___
d. Reagent Feed Rate	___	___	___	___	___	___	___	___	___	___	___	___
e. Reaction Temperature	___	___	___	___	___	___	___	___	___	___	___	___
f. Reaction Pressure	___	___	___	___	___	___	___	___	___	___	___	___
g. pH of Product	___	___	___	___	___	___	___	___	___	___	___	___
h. Residual Reagent in Product	___	___	___	___	___	___	___	___	___	___	___	___
i. PCB Concentration in Product	___	___	___	___	___	___	___	___	___	___	___	___
j. PCBs in Aqueous Effluents	___	___	___	___	___	___	___	___	___	___	___	___
k. PCBs in Other Wastes	___	___	___	___	___	___	___	___	___	___	___	___
l. PCBs in Air Emissions	___	___	___	___	___	___	___	___	___	___	___	___
m. Pollution Control System Operation	___	___	___	___	___	___	___	___	___	___	___	___
n. Other _____												

APPENDIX B

SAMPLING AND ANALYSIS PROCEDURES

This appendix reviews methods of sampling and analysis of PCBs in feed materials and final products or effluents. Analytical methods for PCBs have been reviewed (Erickson and Stanley 1982; Erickson et al. 1985b; Erickson 1986).

1.0 SAMPLING PLANS

Sampling plans are often slighted in the rush to get a test underway. Poor planning of the sampling can ruin an otherwise acceptable test and is often the weakest portion of an application. The applicant and permit reviewer must work together to develop a detailed sampling plan which will produce the desired information. In some cases, a "typical" sample may be desired, while in others a "worst case" sample may be desired. The objective must be clearly spelled out.

PCB destruction facilities are, unfortunately, not ideal sampling sites. Events do not always occur according to plan, especially during the shake-down periods in which the destruction test is generally held. The sampling plan must reflect the realities of the destruction unit and make every attempt to meet the stated objectives. The plan should propose alternatives to the optimum samples. In cases where a sampling plan is compromised, the demonstration test report should present an explanation.

Several examples of approaches (not full sampling plans) to sampling situations are presented below.

1. A chemical dechlorination system is to be demonstrated. The batch process vessel is to be filled from numerous drams. The process vessel is filled and the mixer activated. Thirty minutes after mixing, a sample is drawn from the vessel tap; a second sample is drawn 10 min later.

2. A field of waste drums is to be sampled. The drums could be randomly sampled. If the drums are known to be from several sources and are identifiable, the sampling design should include stratification of the subsets.

3. The plan stipulates that if a bung on a drum is frozen, the sampler is to move to the nearest drum to the north. If more than half of the bungs are frozen or if the bungs on an apparent set of drums (in one area or with similar markings) are all frozen, the representativeness of the sampling may be compromised (these may all contain a corrosive liquid which has frozen the drums shut) and additional efforts at opening the drums should be employed. These would include freeing the frozen bungs or cutting a new hole in the drum.

2.0 EXAMPLES OF SAMPLE COLLECTION TECHNIQUES

Additional guidance on sample collection techniques is available in "Samplers and Sampling Procedures for Hazardous Waste Streams" (USEPA 1980) and in "Sampling and Analysis Methods for Hazardous Waste Combustion" (USEPA 1983).

2.1 Liquids

Liquids may be collected by grab or integrative techniques. Grab sampling may include filling a jar from a spigot or dipper collection of water from a lagoon. Frequency of sampling and amount to be collected during each test must be stated in the sampling plan and recorded when the samples are collected. Integrative sampling requires a pump on an interval timer, a slow flow from a valve, manually timed interval sampling, or other device. Additional guidance is available (Berg 1982).

2.2 Solids

Solid sampling techniques vary with the nature of the solid. Free-flowing powders may behave like a liquid, while other solids may require special equipment to remove a portion. The equipment to be used (trowel, auger, grain thief, etc.) and procedures for its use must be adequately described.

2.3 Mixed Phase Samples

Mixed phase samples represent a challenge to the sample collector. In tanks and other static systems, a phase separation during sampling is preferable, provided that the total volume or weight of each phase is measured. Phases collected separately must be analyzed separately. Proportions of each phase in the system (e.g., a holding tank) shall be measured volumetrically. Examples including skimming solids off liquids and drawing off oil and water layers from a tank. Where phase separation is impractical, such as a suspended solid, the whole must be mixed to assure that the sample is representative. In a flowing pipe, collecting a representative sample of a solid/oil/water mixture may be impossible, since the valve position is fixed. In this situation the oil phase would probably contain more PCBs than the water and would represent a maximum (worst case for waste, best case for feed). The representativeness or lack thereof should be noted.

3.0 SAMPLE ANALYSIS

For many alternative technologies, the PCB content of the feed, product, and waste samples must be determined. This section addresses the analysis of these matrices for PCBs. As discussed elsewhere in this document, EPA may require additional analyses to demonstrate that an alternative technology is equivalent to incineration. The applicant is responsible for presenting detailed methods for these matrices, other matrices, or non-PCB analyses, as required.

OTS does not specify analytical methods for PCBs; however, this section presents certain guidelines on methods which OTS has reason to believe will provide acceptable data. Methods for feed materials, stack gas, ash, and scrubber water are presented. Methods other than those presented here may be proposed by permit applicants, provided that the proposed methods meet the OTS data quality objectives (e.g., analysis for all PCBs in samples with detection limits adequate to meet permit requirements). Applicants should review these guidelines and propose complete, specific methods in their test

plan. Many methods, including some of those discussed in this section, present one or more options to the analyst. The applicant must state which option is to be used. If selection of options is dependent on samples, or on other factors which cannot be predicted, the selection criteria must be presented in the test plan.

PCBs are a complex set of 209 individual chemical compounds. The commercial mixtures for commonly found in the feed material generally contain from 20 to 80 of these 209 PCB congeners. In most cases for final product or effluent samples, however, it can be anticipated that the PCB pattern will be qualitatively different from that in the feed, unless the PCBs were transmitted through the system without any chemical alteration by the destruction process. For final product or effluent samples, the analytical method must identify and quantitate all of the PCBs present in each sample, not just the Aroclor present in the feed.

3.1 Feed Materials

As long as the feed material contains PCBs which qualitatively resemble one of the commercial mixtures, such as the Aroclors, the traditional analytical methods which use Aroclor mixtures for GC calibration are acceptable. These methods are discussed below.

If the PCB composition in the feed material does not resemble a commercial mixture, the samples should be analyzed using the methods recommended for the final product and effluent samples, as discussed below.

3.1.1 Oils

The EPA procedure for analysis of PCBs in transformer oils and waste oils (USEPA 1981, Bellar and Lichtenberg 1981) provides a generalized approach with respect to sample preparation and instrumental analysis. Several cleanup techniques are provided as optional approaches in this procedure. For the instrumental analysis, GC with halogen specific, electron capture, or mass spectrometry detectors are all allowed, provided appropriate limits of detection can be achieved. A strong quality control program including control samples, daily quality control check samples, blanks, standard additions, accuracy and precision records, and instrumental and chromatographic performance criteria is required to support all data generated by the method.

The ASTM (1983) D4059-83 procedure for mineral insulating oils utilizes solvent dilution and a Florisil slurry cleanup prior to PGC/ECD determination. The procedure assumes that the composition of the PCBs present in transformer or capacitor oils closely resembles that of the Aroclor standards. It notes that the sensitivity of the ECD is reduced by mineral oil and instructs the analyst to make the amount of oil in the standard and sample equivalent to minimize the effects of the oil interference on the quantitative results.

3.1.2 Soils, Sludges, and Solid Wastes

A variety of standard methods are available for these matrices.

Several EPA methods utilize dichloromethane extraction, followed by cleanup and GC determination with different detectors. Soil and other solid wastes may be analyzed by EPA's SW-846 methods (USEPA 1984a). Method 8080 is the packed column GC/ECD method; 8250 is the packed column GC/EIMS method; and 8270 is the capillary column GC/EIMS method. All three methods have a stated limit of detection of 1 µg/g. Some options are presented in these methods and the quantitation procedure is not well-defined for PCBs; therefore, applicants must supply additional details on the planned analysis.

The sludge method EPA 625-S (Haile and Lopez-Avila 1984) gives optional Florisil, silica gel, and GPC cleanups and stipulates electron impact mass spectrometry as the GC detector. Quantitation is by total areas compared to total areas of Aroclor standards.

ASTM Method D3304-74 (ASTM 1981b) utilizes a hexane/water/acetonitrile extraction for soil samples. Several optional cleanups are presented. Samples are analyzed by packed column GC/ECD and quantitated using the total areas of Aroclor standards.

3.1.3 Capacitors and Other Solids

No standard methods exist specifically for these matrices. The sample should be physically prepared by shredding or grinding and then extracted with an appropriate solvent (e.g., benzene or hexane), preferably with a Soxhlet apparatus over multiple cycles. Cleanup and analysis can then follow one of the methods given above.

3.2 Final Product or Effluent Samples

3.2.1 Processes Which Do Not Change Aroclor Pattern

For processes which do not alter the PCB composition, such as solvent cleaning/distillation processes, the methods listed above for feed samples can be adapted to the final product or effluent samples. With the lower required detection limits, additional blanks and other QC measures may be appropriate.

3.2.2 Processes Which Alter the Aroclor Pattern

If the Aroclor pattern is significantly altered by the destruction process, or if other PCBs (e.g., partially dechlorinated homologs) are observed in the samples, then the traditional methods described above are not appropriate. For these samples, the analytical method must identify and quantitate all of the PCBs present in the sample, not just the Aroclor present in the feed.

3.2.2.1 Oils and Other Nonvolatile Organic Liquids

The sample preparation procedures may follow those listed for the feed samples, above. Samples may then be analyzed by an appropriate instrumental technique.

If the applicant chooses to use GC/ECD as the instrumental method, a mixture of 10 PCB congeners (one each for the various degrees of chlorination) may be used for the calibration. This mixture was determined by the Dry Color Manufacturers Association (DCMA) to give an average ECD response for each homolog (DCMA 1982). Instrumental analysis can be done according to EPA Method 608 (USEPA 1984b) or ASTM (1983) D4059-83. To quantitate the samples, the following protocol (Midwest Research Institute 1985) may be used:

a. Determine the retention windows. Note: This is an arbitrary demarcation and results in misidentification of some congeners as either a higher or lower homolog. However, since the ECD cannot discriminate by homologs, this is the best approach to partitioning the peaks.

(1) Record the retention time for each congener in the standard on a data sheet.

(2) For the mono-, the window extends from the retention time of the standard, which is the first eluting PCB, to the midpoint between the mono- and di- standards. Start the window sufficiently ahead of the standard elution time (e.g., 0.1 min) to allow for retention time drift.

(3) The windows for di- through nona- are the midpoints between the retention times of the standards.

(4) For the deca-, which has only one isomer, the window is the retention time of the standard, allowing appropriate time (e.g., ± 0.1 min) for retention time drift.

b. Calculate a linear regression curve for each homolog. The minimum correlation coefficient (e.g., 0.99) should be specified in the QA Plan. If this required correlation is not obtained, either rerun the standard curve or perform corrective action as given in the QA Plan.

c. Quantitate the samples. Obtain the concentration in micrograms per milliliter of each peak in the sample (as injected on the gas chromatograph) from the regression equations calculated above. For most samples, only peaks equal to or greater than 1 µg/g need be reported. Those peaks much less than this value do not need to be calculated. Where it appears that the peaks will be below the cutoff, calculate the area counts necessary for 2 µg/g and then visually compare these with the sample data. This shortcut can speed up the data reduction process by eliminating unnecessary calculations.

d. Multiply the concentration obtained by the dilution factor and divide by the original sample weight (or volume) to obtain the concentration in µg/g (or µg/mL) of the original sample. Record this value on the data sheet for each peak greater than or equal to 2 µg/g.

e. Automated quantitation routines, incorporating the above principles may be substituted.

An EPA method for by-product PCBs in commercial products and product wastes (Erickson et al. 1982; Erickson 1984b) may be used with GC/MS as the instrumental method. This method presents several options, so permit applicants must stipulate which options are to be used.

3.2.2.2 Volatile Organic Liquids

No specific standard procedures are recommended for these matrices. If the matrix is compatible with the analytical method (e.g., a hydrocarbon and GC/ECD), direct injection or evaporative concentration may be sufficient. If the matrix is not compatible with the analytical method (e.g., a chlorofluorocarbon and GC/ECD), then a solvent-exchange must be conducted (MRI 1985). A higher boiling hydrocarbon "keeper" should be added, so that the sample is not evaporated to dryness. The sample analysis by GC/ECD or GC/MS can follow that given in Section 3.2.2.1, above.

3.2.2.3 Dissolvable Solids (Process Waste, Sludge, etc.)

For samples which readily dissolve in organic solvents such as hexane, benzene, or methanol/hexane, a weighed aliquot can be dissolved to a known concentration, mixed thoroughly (MRI 1985), and then either analyzed directly, or cleaned up as an oil sample (see Section 3.2.2.1). The sample analysis by GC/ECD or GC/MS can follow that given in Section 3.2.2.1, above.

3.2.2.4 Insoluble Granular Solids (Soils, Ash, and Non-Bulk Solid Wastes, etc.)

The sample preparation for soils, sludges, and solid wastes can follow that in Section 3.1.2 above. No specific published method is available for analysis of ash samples using the DCMA quantitation mixture. Sample preparation (extraction, cleanup, etc.) can be done according to EPA's SW-846 (USEPA 1984a) or the EPA by-product method (Erickson 1984b; Erickson et al. 1985a). The sample analysis by GC/ECD or GC/MS can follow that given in Section 3.2.2.1 above.

3.2.2.5 Insoluble Bulk Solids

No standard methods exist specifically for filter media and other bulk solids. The entire sample should be extracted with an appropriate solvent, preferably with a Soxhlet apparatus over multiple cycles. It is important that the entire sample be extracted since the PCB content is most likely not homogeneous and, thus, a subsample would probably not be representative. The choice of extraction solvent depends on the nature of the sample. If the sample is heavily water-laden or hydrophilic, the solvent should wet the surface (e.g., mixed hexane/acetone or hexane/water/acetonitrile). If the sample is hydrophobic, then extraction with a nonpolar solvent such as hexane or benzene may be appropriate. The sample analysis by GC/ECD or GC/MS can follow that given in Section 3.2.2.1 above.

3.2.2.6 Aqueous Samples

Scrubber water and other aqueous samples can be analyzed by EPA Method 608 (USEPA 1984b) or 625 (USEPA 1984c) or ASTM method D3534-80 (ASTM 1981a) only if the Aroclor pattern remains intact after the incineration.

If the Aroclor pattern is significantly altered by the destruction process, or if other PCBs (e.g., partially dechlorinated homologs) are observed in the samples, then the above methods are not appropriate for the analysis. An EPA method for by-product PCBs in water (Erickson 1984a) may be used with GC/MS as the instrumental method. This method presents several options, so permit applicants must stipulate which options are to be used.

If the applicant chooses to use GC/ECD as the instrumental method, the DCMA (1982) quantitation discussed above may be used. No specific published method is available for analysis of ash samples using the DCMA quantitation mixture. Sample preparation (extraction, cleanup, etc.) can be done according to EPA Method 608 (USEPA 1984b) or 625 (USEPA 1984c) or the EPA by-product method (Erickson 1984b). Instrumental analysis can be done according to EPA Method 608 (USEPA 1984b). To quantitate the samples, the protocol presented in Section 3.2.2.1 may be used.

4.0 REFERENCES

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APPENDIX C

OTS GUIDANCE ON FREQUENTLY ASKED QUESTIONS
June 1986

PREFACE

This Appendix presents answers to frequently asked questions related to permitting of incinerator facilities. The answers represent OTS guidance, as of June 1986.

Types of Processes Permitted

Question 1: How does OTS approve extraction and distillation type processes?

Answer: OTS will issue a permit for the overall system and not for individual unit operations. The system must be closed. All working fluids must be labeled in accordance with the original concentration of the treated material, unless shown to be of a lower concentration. All fluids, filters, wastes, and the system itself must be appropriately marked before leaving the site, unless shown to be less than 2 ppm per resolvable chromatographic peak in the PCB retention window.

All fluids and PCB-containing materials should be tested before leaving the site so that a formal accounting or mass balance of PCBs is maintained. Records must be kept for any effluent streams. The PCB-containing product materials (fluids, filters, etc.) must be disposed of according to regulations (i.e., incinerated).

Specific examples include:

a. Processes which are authorized (as defined in Glossary of Terms) according to 40 CFR 761.30 are:

   * Closed filtration units to remove PCBs from transformer dielectric fluids; and

   * Extraction/distillation processes which remove PCBs from transformer dielectric fluids if the dielectric is reused in PCB-controlled equipment and the concentrated waste is disposed according to the regulations.

b. An extraction/distillation process which uses a solvent working fluid to remove PCBs from transformers must incinerate all the resulting material, or must label all the material as PCB-containing in accordance with the original concentration of the fluid being treated, or must obtain a PCB destruction permit requiring the PCBs to be destroyed to below 2 ppm per resolvable chromatographic peak.

c. Destruction systems with an ancillary extraction/distillation process will be permitted as an entire unit and must treat the PCB material to below 2 ppm per resolvable chromatographic peak.

Question 2: How should companies apply for disposal of more than one kind of material by a single process?

Answer: Applicants must justify the applicability of the process to the different types of PCB materials. The justification must include a documentation of the effectiveness of the process with the different matrices. This may be limited to calculations showing the lack of

matrix effect on PCB destruction efficiency or, preferably, would include R&D results demonstrating the process effectiveness. EPA normally will require that a field demonstration may be adequate for each matrix.

Conditions Which May Be Included in Permits

Question 3: What physical/chemical parameters for matrices to be tested will be specified for PCB fluids in PCB disposal permits issued to chemical destruction and other alternate methods of destruction facilities.

Answer: In general, permits are issued only for the matrices demonstrated. Permits will be issued according to the following scheme:

a. Mineral oil dielectric fluid (MODEF) - the qualifier "dielectric fluid" identifies a specific type of mineral oil. Therefore, additional description within the permit is unnecessary.

b. Heat transfer fluid - the wide range of fluid types used in heat transfer applications makes it necessary to specify, within the permit, either the particular brand name authorized (i.e., Therminol 55) on a specific set of chemical and physical characteristics.

c. Hydraulic fluid - the material used in this capacity is sufficiently similar that it will not be permitted by brand name. Rather, the allowable bottom solids, water content (e.g., 10%) or other physical or chemical properties will be specified.

d. Other - in this category are waste oils, kerosene, etc. Authorizations to dispose of these fluids will be written on an individual basis. Chemical analysis and category of application will be the description criteria used for the permits.

Question 4: Can less rigorous or less stringent analytical techniques be used during commercial operation of chemical processes than were used during the process demonstration(s)?

Answer: No. For chemical treatment processes, the analytical technique which will be used during commercial site operation is considered integral to the process and therefore must be demonstrated on-site. Quality assurance information for that technique must be provided to support the application/demonstration plan. Confirmatory testing (i.e., by another laboratory) should be conducted to verify the results of field units. OTS reserves the right to spotcheck the analytical methodology and results. In order to meet the equivalency requirement to incineration, the additional burden of analyzing the final concentration of each batch is deemed appropriate and necessary by OTS.

Question 5: Is "blend-down" of PCB fluids authorized?

Answer: Blending and/or spiking is allowed only for the purpose of achieving a particular treatment concentration during process demonstrations. However, during commercial operation no material which exceeds the concentration level demonstrated and authorized by the permit, may be diluted or blended.

Question 6: How should process filters be disposed?

Answer: For process filters which utilize activated charcoal or macroreticular resins (e.g., XAD-2), the used and contaminated material must be disposed of by EPA-approved incineration. Other filter media shall also be incinerated unless the PCB concentration of the filters, as determined by chemical analysis, is < 2 µg/g/resolvable chromatographic peak, in which case, the filters are not regulated. The applicant must obtain approval for alternate disposal from OTS.

Question 7: What are the requirements for handling by-product wastes from alternative technology processes?

Answer: Permits issued for alternative destruction processes generally will require that all treated materials and by-product waste streams must have PCB concentrations of less than 2 µg/g/resolvable chromatographic peak (ppm). If this condition is not met, the effluents containing 2 ppm or greater must be disposed as if they contained the PCB concentration of the original influent material.

Demonstration Test Protocol

Question 8: What are the testing requirements for dioxins and furans during process demonstrations?

Answer: Chemical reaction systems which use sodium reduction will not be required to perform dioxin and furan analyses if operated below approximately 500°C. Systems which operate in excess of 500°C will be evaluated on a case-by-case basis. Similarly, other alternate destruction systems will be evaluated individually.

Question 9: Should all process effluents be analyzed?

Answer: If the PCB feed material being treated by the process is over 500 ppm PCB, then the resulting effluents must be incinerated unless an analysis is conducted and indicates that the PCB concentration is below 2 ppm per PCB peak.

Question 10: Does OTS require testing of air emissions (e.g., PCBs or benzene) during chemical process demonstration tests?

Answer: Any emissions (gaseous, liquid, or solid in nature) must comply with all other relevant Federal, state, and local regulations. For chemical treatment processes, OTS requires documentation verifying that no air emission regulations are violated. OTS reserves the right to require or conduct sampling of any gaseous effluent stream. Results of pre-demonstration testing for air emissions will be reviewed by OTS, but not necessarily accepted in lieu of data acquired during a demonstration test.

Question 11: How many batches must be treated during a chemical process demonstration?

Answer: For chemical treatment processes, a demonstration should include as a minimum, three full-scale batches treated on separate days, or on the same day following system shutdown(s). At least two concentration levels should be tested. A replicate run at the highest concentration should be conducted. The higher concentration should be approximately double the lower unless the applicant has reason to use different concentrations.

Question 12: What PCB standards are recommended for analytical testing?

Answer: The PCB standard chosen depends on the PCB composition in the samples and the purpose of the data.

a. If a waste feed sample is being assayed for initial PCB concentration, and if it consists of an identifiable Aroclor (or other commercial mixture) or combination of Aroclors, the instrument may be calibrated using the appropriate Aroclor or combination of Aroclors. The standard concentrations must be within the working range of the instrument and must bracket the concentration of the sample dilutions.

b. If the sample does not contain a PCB mixture similar to the Aroclors or other commercial mixtures, the applicant must demonstrate that all PCBs are being measured. The product oil from a chemical treatment process and similar samples are in this category. For chemical destruction processes, all peaks must be less than 2 ppm/resolvable chromatographic peak.

The PCB elution window is defined by the retention times on a gas chromatograph between 2-chlorobiphenyl and decachlorobiphenyl. The calibration mixture is generally a solution containing one each of the 10 PCB homologs (i.e., mono-, di-, tri-, ... decachlorobiphenyl; e.g., the "DCMA" solution available from chromatography supply companies).

As with the Aroclor calibration, the standard concentrations must be within the working range of the instrument and must bracket the concentration of the samples.

Any peaks within the PCB retention window must be calculated as PCBs unless the analyst can demonstrate through use of blanks, confirmatory techniques, or other methods that the peak(s) in question is not a PCB.

Preparations for a Demonstration

Question 13: Is an R&D program, or some other demonstration of the ability to operate, required prior to scheduling an official test demonstration?

Answer: For previously unpermitted facilities OTS recommends either a preliminary R&D program with PCBs or use of a PCB substitute for shakedown of the unit. An R&D permit will not be issued for more than three total batches. It should be stressed that once the applicant proceeds with a demonstration test, if the demonstration schedule is not adhered to, OTS will reserve the right to rescind the permit while on-site or leave the demonstration before it is completed. Another demonstration cannot be rescheduled for a minimum period of three months.

Question 14: Will applicant preparedness be screened prior to demonstration?

Answer: OTS will work with applicants to ensure that the process is ready prior to the demonstration. This may include evidence of successful operations under similar conditions. For facilities where immediate on-site analyses of product is required as part of the demonstration, successful analysis of QA samples may be required before the demonstration as a method of screening out unprepared applicants.

Test Demonstrations

Question 15: What criteria will be used to make an on-site determination to discontinue a demonstration?

Answer: For chemical treatment methods, an acceptable run must be completed on the first day or EPA representatives will have sufficient cause to leave. Two interruptions will be allowed during processing of any batch. Additional interruptions automatically invalidate the run's results.

If the demonstration schedule is not adhered to, OTS will reserve the right to rescind the permit while on-site or leave the demonstration before it is completed. Another demonstration cannot be rescheduled for a minimum period of three months.

APPENDIX D

ADDRESSES FOR HEADQUARTERS AND REGIONAL OFFICES

Addresses follow for U.S. EPA Headquarters and Regions. Headquarters will supply the names of Regional PCB Coordinators upon request.

Headquarters
Director of the Office of Toxic
Substances (TS-792)
Environmental Protection Agency
401 M Street, S.W.
Washington, D.C. 20460

Region 1
(Connecticut, Maine, Massachusetts,
New Hampshire, Rhode Island, Vermont)

Regional Administrator
Environmental Protection Agency
John F. Kennedy Federal Building
Boston, Massachusetts 02203

Region 2
(New Jersey, New York)

Regional Administrator
Environmental Protection Agency
26 Federal Plaza
New York, New York 10278

Region 3
(Delaware, District of Columbia,
Maryland, Pennsylvania, Virginia,
West Virginia)

Regional Administrator
Environmental Protection Agency
841 Chestnut Street
Philadelphia, Pennsylvania 19107

Region 4
(Alabama, Florida, Georgia, Kentucky,
Mississippi, North Carolina, South
Carolina, Tennessee)

Regional Administrator
Environmental Protection Agency
345 Courtland Street, N.E.
Atlanta, Georgia 30365

Region 5
(Illinois, Indiana, Michigan, Minnesota
Ohio, Wisconsin)

Regional Administrator
Environmental Protection Agency
230 South Dearborn Street
Chicago, Illinois 60604

Region 6
(Arkansas, Louisiana, New Mexico,
Oklahoma, Texas)

Regional Administrator
Environmental Protection Agency
First International Building
1201 Elm Street
Dallas, Texas 75270

Region 7
(Iowa, Kansas, Missouri, Nebraska)

Regional Administrator
Environmental Protection Agency
726 Minnesota Avenue
Kansas City, Kansas 66101

Region 8
(Colorado, Montana, North Dakota,
South Dakota, Utah, Wyoming)

Regional Administrator
Environmental Protection Agency
999 18th Street, Suite 1300
Denver, Colorado 80202-2413

Region 9
(Arizona, California, Hawaii, Nevada)

Regional Administrator
Environmental Protection Agency
215 Fremont Street
San Francisco, California 94105

Region 10
(Alaska, Idaho, Oregon, Washington)

Regional Administrator
Environmental Protection Agency
1200 6th Avenue
Seattle, Washington 98101

APPENDIX E

ANNOTATED BIBLIOGRAPHY

D. G. Ackerman, L. L. Scinto, P. S. Bakshi, R. G. Delumyea, R. J. Johnson, G. Richard, A. M. Takata, and E. M. Sworzyn, "Destruction and Disposal of PCBs by Thermal and Non-Thermal Methods," Noyes Data Corporation, Park Ridge, NJ, 1983, 417 pp.

Guidance - Thermal and Non-Thermal

This is a verbatim combination of two EPA reports:

1. Sworzyn and Ackerman (1982) [EPA-600/2-82-069], and
2. Ackerman et al., (1981) [EPA-600/2-81-022].

Department of Health, Education, and Welfare, Public Health Service, Center for Disease Control, National Institute for Occupational Safety and Health, "Criteria for a Recommended Standard...Occupational Exposure to Polychlorinated Biphenyls (PCBs)," September 1977, 224 pp. (available from U.S. Government Printing Office, Washington, DC).

Worker Safety and Health

The National Institute for Occupational Safety and Health (NIOSH) recommends that employee exposure to polychlorinated biphenyls (PCBs) in the workplace be controlled by adherence to the following sections. The standard is designed to protect the health and provide for the safety of employees for up to a 10-hour workday, 40-hour workweek, over a normal working lifetime. The standard is measurable by techniques that are valid, reproducible, and available to industry and governmental agencies. Compliance with the standard should substantially reduce any risk of reproductive or tumorigenic effects of PCBs and prevent other adverse effects of exposure in the workplace. Employees should regard the recommended workplace environmental limit as the upper boundary for exposure and make every effort to keep exposure as low as possible.

Evidence indicates adverse reproductive and tumorigenic effects in experimental animals exposed to certain commercial PCB preparations. Currently available information is not adequate to demonstrate that other commercial PCB preparations do not have these effects. Should sufficent information become available to indicate that the standard offers greater or lesser protection from some chlorobiphenyl isomers or commercial preparations than is needed, it will be considered for revision. [from Recommendations section of report]

R. L. Durfee, G. Contos, F. D. Whitmore, J. D. Barden, E. E. Hackman, III, and R. A. Westin, "PCBs in the United States - Industrial Use and Environmental Distributions," U.S. Environmental Protection Agency, Office of Toxic Substances, Washington, DC, Report No. EPA 560/676-005 [NTIS No. PB-252012], 1976, 488 pp.

Review of Disposal and Destruction Methods

This document presents the current state of knowledge about the production, usage, and distribution of polychlorinated biphenyls (PCBs) in the United States. The information presented is derived from detailed studies on the production and first tier user industries, the past and present generation and disposition of PCB-containing wastes, environmental transport and cumulative loads, potential alternatives to PCBs usage, inadvertent losses to and potential formation in the environment, and current regulatory authorities for PCBs control. These results indicated that, although PCBs content of industrial wastes can be reduced through various approaches (treatment, substitution, etc.), there exists a potentially severe future hazard in the form of large amounts of PCBs currently contained in land disposal sites. Further definition of this and other aspects of the PCBs problem, and determination of ways to minimize the hazard, are recommended. [author's abstract]

Environmental Protection Agency, "40 CFR Part 761, Polychlorinated Biphenyls (PCBs) Manufacturing, Processing, Distribution in Commerce, and Use Prohibitions," Federal Register, 44, 31514-31568, May 31, 1979.

TSCA Rules

This final rule implements provisions of the Toxic Substances Control Act (TSCA) prohibiting the manufacture, processing, distribution in commerce, and use of polychlorinated biphenyls (PCBs). Specifically, this rule:

(1) Prohibits all manufacturing of PCBs after July 2, 1979, unless specifically exempted by the Environmental Protection Agency (EPA);

(2) Prohibits the processing, distribution in commerce, and use of PCBs except in a totally enclosed manner after July 2, 1979;

(3) Authorizes certain processing, distribution in commerce, and use of PCBs in a non-totally enclosed manner (which would otherwise be subject to the prohibition described above);

(4) Prohibits all processing and distribution in commerce of PCBs after July 1, 1979, unless specifically exempted by EPA. [author's summary]

Environmental Protection Agency, "Region V Strategy for Permitting PCB Disposal Sites," Process Evaluation Unit, Technical, Permits and Compliance Section, Waste Management Branch, Waste Management Division, Region V, U.S. Environmental Protection Agency, Chicago, IL, undated, 68 pp.

Guidance

This document describes the permitting experiments by repeating the applicable CRF Sections and providing examples of approval and consent letters. Participant programs (public hearings) procedures and a checklist for evaluating applications are appended.

Environmental Protection Agency, "40 CFR Part 761, Polychlorinated Biphenyls (PCBs) Manufacturing, Processing, Distribution in Commerce and Use Prohibitions; Recodification," Federal Register, 47, 19526-19527, May 6, 1982.

TSCA Rules

This action recodifies 40 CFR Part 761 which deals with polychlorinated biphenyls (PCBs). The recodification provides for a more orderly organization of the material. No substantive changes are involved. [author's summary]

Environmental Protection Agency, "40 CFR Part 761--Polychlorinated Biphenyls (PCBs)--Procedural Amendment of the Approval Authority for PCB Disposal Facilities and Guidance for Obtaining Approval," Federal Register, 48, 13181-13186 (1983).

TSCA Rules

This procedural rule change gives the Assistant Administrator for Pesticides and Toxic Substances (Assistant Administrator) authority to approve certain PCB disposal facilities which have previously been subject to approval by each Regional Administrator. The Assistant Administrator will be the approval authority for facilities which are operated in more than one region. The Regional Administrators will continue to have the authority to approve all unique, site-specific facilities such as landfills, stationary incinerators, and research and development into PCB disposal methods. This amendment does not change any standards for approving PCB disposal activities and should provide better responsiveness to the needs of the public and industry. In addition, EPA is providing supplemental guidance to assist persons applying for approval of PCB disposal technologies that are alternatives to incinerators and high efficiency boilers. [author's summary]

M. D. Erickson and J. S. Stanley, "Methods of Analysis for By-Product PCBs--Literature Review and Preliminary Recommendations," Report by Midwest Research Institute, Kansas City, MO, to David P. Redford, U.S. Environmental Protection Agency, Office of Toxic Substances, Field Studies Branch, Washington, DC, EPA-560/5-82-005, 1982, 135 pp.

Sampling and Analytical Methods

A review of the literature on polychlorinated biphenyl (PCB) analysis and recommendations for methods to determine by-product PCBs in commercial products and other matrices are presented. This report was prepared to assist EPA in formulating a rule regulating by-product PCBs. The published literature on PCB analysis is critically reviewed. Several hundred references are cited in a bibliography. The review is subdivided into extraction, cleanup, determination, data reduction, confirmation, screening, quality assurance, and by-product analysis sections. The determination section includes TLC, HPLC, GC (PGC and CGC), GC detectors (ECD, FID, HECD, EIMS, and other MS), and non-chromatographic analytical methods (NMR, IR, electrochemistry, NAA, and RIA). Techniques applicable to analysis of commercial products, air, and water for by-product PCBs are discussed. The final section of this report presents a recommended overall primary analytical scheme. [authors' abstract]

M. D. Erickson, J. S. Stanley, G. Radolovich, K. Turman, K. Bauer, J. Onstot, D. Rose, and M. Wickham, "Analytical Methods for By-Product PCBs--Initial Validation and Interim Protocols," Report by Midwest Research Institute, Kansas City, MO, to David P. Redford, U.S. Environmental Protection Agency, Office of Toxic Substances, Field Studies Branch, Washington, DC, EPA-560/5-82-006, 1982, 243 pp.

Sampling and Analytical Methods

This document presents proposed analytical methods for analysis of by-product PCBs in commercial products, product waste streams, wastewaters, and air. The analytical method for commercial products and product waste streams consists of a flexible approach for extraction and cleanup of particular matrices. The ^{13}C-labeled PCB surrogates are added as part of a strong quality assurance program to determine levels of recovery. The wastewater method is based on EPA Methods 608 and 625 with revisions to include use of the ^{13}C-labeled PCB surrogates. The air method is a revision of a proposed EPA method for the collection and analysis of PCBs in air and flue gas emissions. Capillary or packed column gas chromatography/electron impact ionization mass spectrometry is proposed as the primary instrumental method. Response factors and retention times of 77 PCB congeners relative to tetrachlorobiphenyl-d_6 are presented in addition to statistical analysis to project validity of the data and extrapolation of relative response factors to all 209 possible congeners. Preliminary studies using the ^{13}C-labeled surrogates to validate specific cleanup procedures and to analyze several commercial products and product wastes indicate that the proposed analytical methods are both feasible and practical. [authors' abstract]

L. Fradkin and S. Barisas, "Technologies for Treatment, Reuse, and Disposal of Polychlorinated Biphenyl Wastes," Prepared for U.S. Department of Energy, ANL/EES-TM-168, 1982 (NTIS No. DE82013715).

Review of Disposal and Destruction Methods

Several technologies being developed by private industry and government to meet U.S. Environmental Protection Agency regulations for PCBs were assessed to assist in the selection of regulations for PCBs were assessed to assist in the selection of the best process for a particular application. Methods evaluated include a sodium naphthalide system, a sodium-amine method, the NaPEG TM process, plasma-arc technology, ultraviolet-ozone treatment, catalyzed wet oxidation, hydrothermal dechlorination, light-activated reduction, and EPAC filters as well as the approved methods of land disposal and incineration.

Navy, "PCB Compliance, Assessment, and Spill Control Guide," Naval Energy and Environmental Support Activity, Fort Hueneme, CA, Report No. NEESA-20.2-028A [NTIS No. AD-A121 329/7] August 1982, 105 pp.

Guidance

Polychlorinated biphenyls (PCB) are toxic belonging to the well-known chlorinated hydrocarbon family. Because of their low flammability and high stability, PCBs have been extensively used as coolants and insulators in electrical equipment. However, due to the known environmental and health problems occurring from improper use and handling, the Environmental Protection Agency has promulgated stringent regulatory controls concerning use, storage, transport and disposal of PCBs leading to a total ban on use of PCBs. This guide was designed to assist Navy activities in complying with these complex and intricate regulations. [author's abstract]

E. M. Sworzyn and D. G. Ackerman, "Interim Guidelines for the Disposal/ Destruction of PCBs and PCB Items by Non-thermal Methods," Report by TRW, Inc., Redondo Beach, CA 90278, to David Sanchez, EPA, Office of Research and Development, Research Triangle Park, NC, EPA-600/2-82-069, 1982, 177 pp. (NTIS No. PB82 217498).

Guidance - Non-Thermal

The report is an interim resource and guideline document to help EPA regional offices implement the polychlorinated biphenyl (PCB) regulations (40 CFR 761) for using non-thermal methods of destroying/disposing of PCBS. The report describes and evaluates various alternative chemical, physical, and biological PCB removal and/or destruction technologies, including: carbon adsorption; catalytic dehydrochlorination; chlorinolysis; sodium-based dechlorination; photolytic and microwave plasma destruction; catalyzed wet-air oxidation; and activated sludge, trickling filter, and other bacterial methods.

The alternative technologies were evaluated usin technical, regulatory, environmental impact, economic, and energy criteria. Because the technologies investigated are in various stages of development (only sodium-based dechlorination is available commercially), data deficiencies exist and good engineering judgment was used to supplement available quantitative information. Of the technologies evaluated, many show potential for > 90% PCB destruction with minimum environmental impact and low-to-moderate economic cost. These technologies are: catalytic dehydrochlorination, sodium-based dechlorination, and photolytic and microwave plasma processes. [author's abstract]

J. V. Zbozinek, T. J. Chang, J. R. Marsh, P. K. McCormick, and J. E. McCourt, "PCB Disposal Manual," Report by SCS Engineers, Inc., Long Beach, California for the Electric Power Research Institute, Palo Alto, California, CS-4098, 1985.

Guidance

The objective of this report is to present an update of the information presented in FP-1207, Volume 1, published in 1979. There have been significant changes both to the regulations and the technology in the intervening period. This report emphasizes the technology in the intervening period. This report emphasizes those areas which were subject to the greatest change, as well as new areas that were not considered when the previous volume was published. Among the various areas of PCB disposal which are addressed in this report are PCB materials and their distribution in the utility industry, regulations, thermal destruction technology, land disposal, treatment technologies, disposal capacity and demand, and a PCB management program. It is intended that this manual provide sufficient detail to be useful in utility decision processes, even with the realization that regulations are once again in a state of change, as are the available processes and disposal capacities [authors' abstract].
