10 PROCESS WASTE TREATMENT AND DISPOSAL

As indicated in Section 6.8, all liquid and solid wastes and residues (or any other potentially contaminated equipment or materials) resulting from the operation of the PCB destruction system should be retained on-site until analyzed for PCBs, PCDDs, and PCDFs and disposal is authorized by the lead regulatory agency.

Disposal of process residues and other waste materials should comply with the requirements of the following sections and all additional requirements of federal, provincial, and local regulatory agencies.

10.1 Solid Waste Disposal

The requirements of this section refer to the conditions of disposal for solid residues of the PCB destruction facility such as incinerator ash, collected flue gas particulate matter or control device sludge. These recommendations are based primarily on contaminant limitations in the "Federal Mobile PCB Treatment and Destructions Regulations".

- It is recommended that process solid wastes with a PCB content less than or equal to 0.50 mg of PCB/kg of waste (0.5 ppm) be defined as non-hazardous solid industrial wastes and disposed of in land disposal sites or any facilities that are certified to accept such waste or in accordance with any other applicable regulations of the province.

- Solid wastes discharged from the incinerator with PCB contents greater than 0.50 mg/kg of waste require further on-site treatment by the mobile PCB destruction system. This standard is for the treatment of solids containing greater than 50 ppm PCBs and represents best available control technology for the destruction of the PCBs contained in these wastes when treated.

- It is recommended that disposal of solid process residues should not be allowed if the concentration of 2,3,7,8-TCDD toxic equivalents exceeds 1 µg/kg of the waste (1 ppb). When concentrations in treatment residues exceed this limit, it is recommended that residues be reprocessed in the PCB destruction system.

10.2 Container Disposal

Polychlorinated biphenyl waste containers of all forms and types should be subject to the general disposal requirements listed in the previous section. The following specific requirements should apply:

- The decontamination of any equipment or containers which contact PCB wastes should require the specific formal approval of the lead regulatory agency.

- The re-use of dedicated drums or waste containers should be allowed, subject to careful inspection to ensure that they are in good condition and meet the general requirements of PCB waste containers.

Alternatively,

- Drums for disposal should be triple rinsed with solvent which can be disposed of in the test facility. It is suggested that the volume of each rinse be at least 10% of the container volume. Specific procedures for decontamination activities should be stipulated as a part of the approvals submission and approved as a condition to test or operate the facility.

- It is recommended that drums rinsed in such a manner be disposed of as non-hazardous waste in landfills or other facilities that are certified for such disposal, or, properly rinsed drums can be recovered as scrap metal in a facility properly certified to accept such materials.

- Re-use of rinsed drums (except as containers for non-hazardous waste to be deposited in a certified landfill) should not be allowed.

10.3 Bulk Transport Vehicle Decontamination

The use and subsequent decontamination of tank trucks for transporting **bulk** PCB liquids or vehicles used for the transport of **bulk** PCB solids should be specifically addressed in the approvals application. If decontamination of vehicles is required, specific approval for procedures should be a condition of approvals to test or operate the facility.

10.4 Liquid Effluent

10.4.1 Disposal of Wastewaters. Formal approval should be required for discharge of **all** aqueous wastes from the disposal facility following verification that these discharges contain contaminants below regulated levels.

The recommended maximum concentration of PCBs in aqueous wastes is 5 µg/L. Acceptable disposal methods[6] for wastewaters which have a PCB content less than or equal to 5 µg of PCB/L of wastewater (as determined by approved analytical methods) include discharge to:

- a municipal sewage treatment plant,
- a receiving water body,
- deep-well injection, or
- to soil.

It is recommended that these wastes be retained at the site until analyses are complete and disposal approval has been received. Wastewaters that have a PCB content greater than 5 µg/L must be treated to a PCB content of less than 5 µg/L before discharge.

Dilution of such wastes as a means to achieve allowable discharge levels should not be permitted.

It is recommended that the maximum concentration of 2,3,7,8-TCDD toxic equivalents in aqueous wastes should not exceed 0.6 ng/L. Aqueous wastes that exceed this limit should not be discharged but should be treated until levels are reduced to or below the allowable limit.

10.4.2 Contaminated Precipitation. The generation of contaminated runoff should be avoided by preventing the infiltration of precipitation to impoundments or containment areas.

Where precipitation or runoff becomes contaminated, this liquid should be retained and treated as wastewater according to the requirements listed in the previous section.

11 EMERGENCY RESPONSE AND CONTINGENCY PLANNING

11.1 Responsibilities of the Proponent

The proponent of a PCB destruction facility should have (at a minimum) the following obligations and responsibilities regarding emergency response and contingency planning:

- A detailed emergency response and contingency plan should be submitted as a part of the application for regulatory approvals. This plan should be site-specific and should address each component of an emergency plan as defined in Section 11.3.
- Before PCB destruction activities take place at a site, the facility operator should demonstrate that the required emergency response equipment is on-site, readily accessible and in proper working order.
- Before PCB destruction activities occur, the facility operator should demonstrate that on-site personnel are properly trained in the effective use of equipment and are ready and able to implement all parts of the emergency response plans.

11.2 Potential Emergency Events

As a minimum, the emergency response plan should address the following:

- spills of PCB liquid (e.g., bulk PCB waste fluids stored on-site);
- release of PCB-contaminated fluids, including runoff from storm events, aqueous wastes generated by the treatment process (e.g., scrubber fluids), and aqueous runoff from fire-fighting activities;
- fires involving PCB liquids or wastes (with attention to minimizing dispersal of soot and other residues of fire-fighting activities);
- failure of key process monitoring and shutdown controls; and
- catastrophic process failure (e.g., explosion and/or fire involving process equipment or key process controls).

11.3 Elements of Emergency Action Plans

The specific form and content of an emergency response plan will be dictated by the lead regulatory agency. As a minimum, the plan should include:

- identification of site-specific, high-risk situations;
- advanced notification of local fire officials of site activities;
- advanced consideration and definition of specific actions and equipment for responding to the types of emergency events identified in Section 11.2 under the full range of local weather conditions;
- clear assignment of staff duties, responsibilities and accountability for implementing all aspects of the plan;

- designation of a contact person to notify appropriate officials of an emergency;
- identification and utilization of local emergency response resources; and
- consideration of the following aspects of the action plan:
  - event discovery,
  - notification of on-site response personnel,
  - first-action response (e.g., immediate containment of spills, immediate actions to protect or evacuate personnel, alerting off-site resources),
  - notification of appropriate regulatory agencies,
  - definition of response action options,
  - action implementation,
  - documentation,
  - assessment of response effectiveness, and
  - reporting.

11.4 Considerations for Specific Emergency Events

The potential severity of the emergency events listed in Section 11.2 varies significantly. Spills of PCB solids are of relatively low hazard and are relatively easy to contain and clean up. Large spills of PCB liquids are of greater immediate concern to the environment and require a higher degree of protection for cleanup personnel. Events involving the partial combustion of PCBs in fires may pose a severe hazard because of the generation of highly toxic polychlorinated dibenzofurans and dibenzodioxins[17]. Polychlorinated biphenyls, PCDFs, and PCDDs can be widely dispersed in soot and fire-fighting residues. Widespread dispersal of these residues can pose a serious health and/or environmental threat as well as causing severe difficulties and high costs in carrying out a thorough cleanup.

11.4.1 Spills. Compliance with the general design and operating requirements of this report and with the emergency planning considerations outlined in Sections 11.1 and 11.3 should provide sound protection against PCB releases resulting from spills.

11.4.2 Fires. In addition to the general design and operating requirements of this report and the emergency planning considerations outlined in Sections 11.1 to 11.3, **particular care should be taken to prevent fires involving PCB materials.** Special precautions should include the following:

- Isolate PCB wastes from all flammable materials including supplementary fuels.
- Provide rapid and effective fire extinguishers in all potential fire areas. Chemical foam or carbon dioxide extinguishers are recommended. The use of water to control fires involving PCBs will generate contaminated wastewaters which may be difficult to contain and/or dispose of.
- Give special attention to measures which will facilitate the rapid detection of fires.
- Provide effective protective gear for fire-fighting personnel. Self-contained breathing apparatus should be mandatory and personnel should be informed and trained about health and environmental concerns regarding exposure to PCDFs and PCDDs.
- Consider design and response measures which will minimize the dispersal of fire residues via all routes.
- Consult the lead regulatory agency (in consultation with Environment Canada) for guidance on site cleanup.

11.4.3 Failure of Key Process Monitoring and Shutdown Controls. Operating controls include the continuous monitoring of key process parameters with interruption of the waste feed and/or automatic shutdown of the process if allowable operating ranges of the parameters are exceeded. Since failure of the shutdown system under upset conditions potentially could result in excessive release of PCBs and/or PCDFs and PCDDs in the stack gases, the contingency plan should address the detection of such failures and the description of manual procedures for interrupting waste feed and/or shutting down the waste destruction system.

11.4.4 Catastrophic Failure. Although a major fire or explosion involving the process or key controls is highly unlikely, the emergency response plan should consider these potential situations. As a minimum, off-site resources for dealing with a major emergency should be identified and integrated with the emergency response plan. The area of impact for catastrophic failure should be defined with appropriate actions stipulated in the response plan (e.g., evacuation of affected off-site areas).

12 SITE CLEANUP AND CLOSURE

Upon termination of operations at each site, prior to or concurrent with movement to a new location, the proponent will be required to restore the site to a condition satisfactory to the regulator. Site decommissioning should be done according to the closure plan of the application and any stipulations of approvals. This will normally involve removal of equipment, temporary structures, containers, berms, process wastes, and possibly may involve site cleanup and disposal of additional cleanup materials. Recommended guidelines pertaining to decontamination activities and waste disposal have been addressed in Section 10.

Although the sequence of decommissioning activities may vary, the general activities and recommended requirements after process termination are:

- container or other equipment decontamination as per approval;
- submission of process waste samples for analysis by an independent laboratory approved by the regulatory agency and procurement of results and regulator approval prior to waste disposal;
- disposal of all operational wastes in an approved manner;
- the conduct of post-test environmental monitoring in the vicinity of waste handling/processing areas;
- submission of operational reports to the regulator;
- inspection of the site; and
- transportation of the mobile destruction process to a new location in accordance with new site application/approval requirements.

In the event that residues of PCBs or other compounds in soils or other post-operational environmental samples are found to exceed levels measured before operations, the proponent will be required to take remedial site restoration measures. That is, the site areas should be cleaned and restored to a condition acceptable to the regulatory agency as defined by jurisdictional guidelines.

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APPENDIX I

SUMMARY OF AVAILABLE TECHNOLOGY

APPENDIX I SUMMARY OF AVAILABLE TECHNOLOGY

The recommendations in this manual apply to any mobile thermal destruction technology which is intended for PCB wastes. This includes proven, conventional liquid injection and rotary kiln incinerators and also developing thermal technologies such as pyrolysis, thermal radiation, or plasma arc systems.

A detailed description and assessment of commercial, near-commercial and developing PCB destruction technologies is presented in a recent Environment Canada report entitled "Evaluation of Mobile and Fixed Facilities for the Destruction of PCBs"(1), and only a brief discussion is presented here. Using incineration as an example of a proven thermal destruction technique, Figure 3 depicts an overview of the waste types accepted and the nature of process emissions that require control.

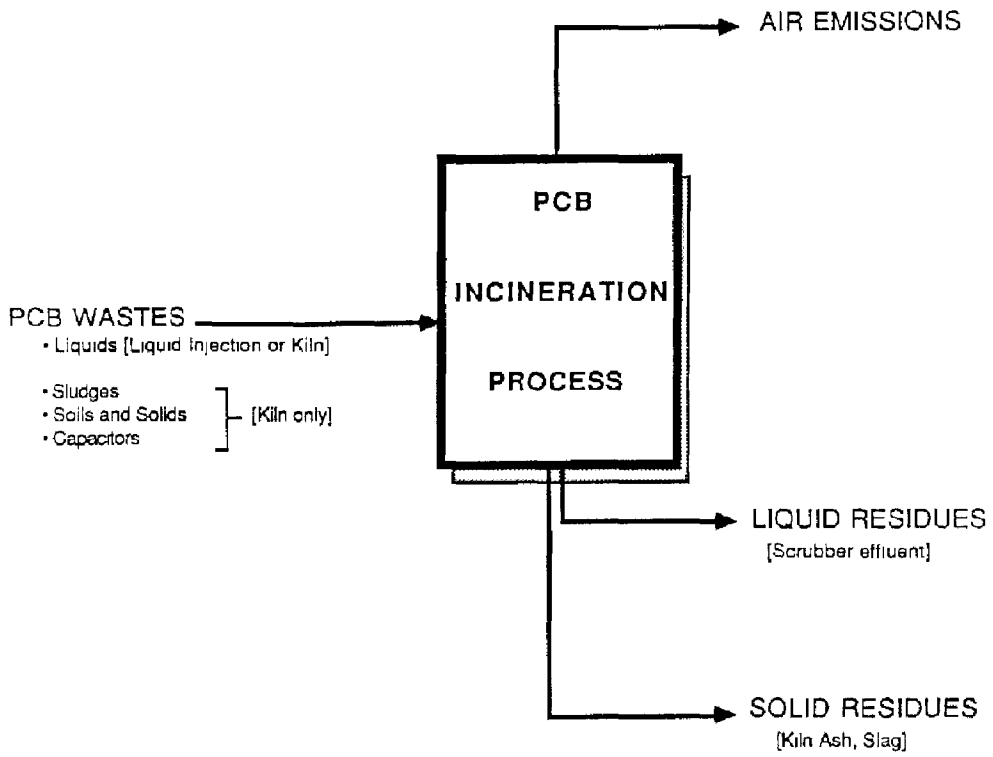

FIGURE 3 OVERVIEW OF PCB INCINERATION PROCESSES

The technology used in rotary kilns and liquid injection incinerators consists of size-reduction (solids) and/or atomization (liquids) of the waste feed and introduction into a refractory-lined chamber where the waste is oxidized by controlled flame combustion. Where PCB materials are the sole waste feed, an auxilliary fuel is required for combustion. Several years of experience have been gained with stationary facilities in

some countries. Commercial operations of these stationary systems have demonstrated the capability for obtaining 99.9999% destruction and removal efficiencies (DRE) with PCB wastes while producing acceptably low or non-detectable levels of toxic combustion by-products including PCDDs or PCDFs.

The demand for transportable or mobile waste destruction systems has increased during the last five years, and numerous mobile thermal systems have been or are being developed for commercial use in North America(1). The design of the mobile equipment is largely based on the design of the stationary PCB destruction systems.

One mobile liquid injection system has been approved by the U.S. EPA for the commercial destruction of liquid PCB wastes in six EPA regions; however, for economic reasons it has not operated in a mobile mode. A number of transportable systems have also been licensed by EPA for the commercial destruction of PCB solid wastes. The capability and flexibility of these systems could lead to their eventual application for the destruction of PCB liquid and solid wastes in Canada.

Full-scale, mobile rotary kiln destruction systems are transportable on a number of tractor-trailer units comprising a waste feed handling system, a rotary kiln unit, a secondary combustion chamber, a water quench or waste heat recovery boiler, a flue-gas scrubbing system, a scrubber effluent treatment system, and a control room and laboratory. These systems are self-contained and sophisticated in design with full micro-processor control.

Rotary kiln-based technology will accept a wide range of waste feeds for destruction including liquids, sludges, and solids including soil and shredded capacitors. Although the systems are generally classed as mobile, a 6 to 8 week on-site set-up and shakedown period can be required and a minimum job-size of the order of 5000 tonnes of waste could be required for the system to be cost-effective.

As described in Reference 1, several promising thermal destruction technologies are under development for commercial application. These technologies include pyrolysis by near-infrared radiation or in a plasma arc, and combustion in a bed of molten salt. These technologies have been demonstrated at pilot or full-scale levels, but are not yet proven with PCB wastes under commercial conditions.

APPENDIX II

OVERVIEW OF APPROVAL REQUIREMENTS AND PROTOCOL USED IN ONTARIO

APPENDIX II OVERVIEW OF APPROVAL REQUIREMENTS AND PROTOCOL USED IN ONTARIO

Figure 4 represents an overview of application protocols, authorization stages and general components and time constraints involved in conducting demonstration tests and operating a mobile PCB destruction facility in Ontario.

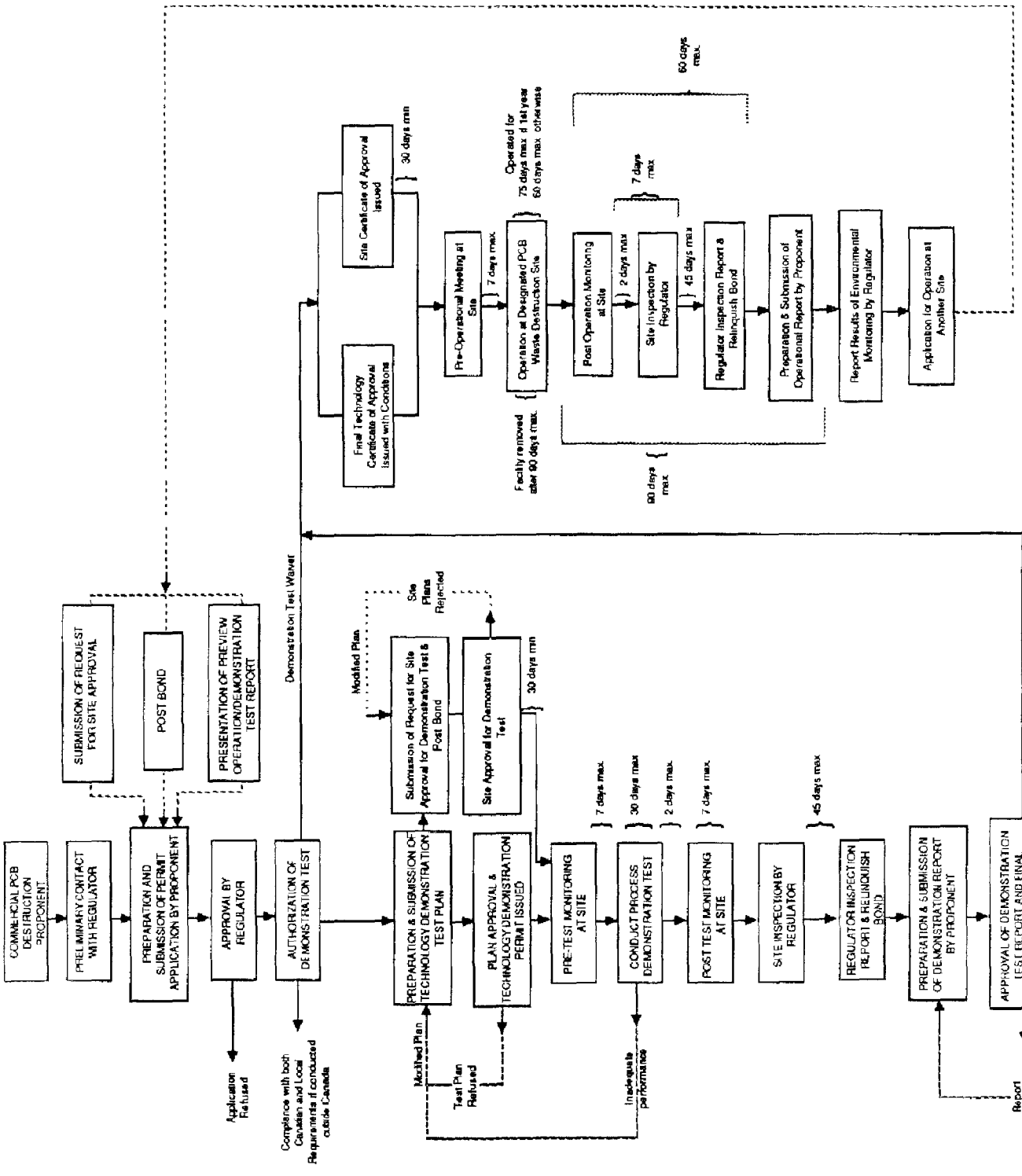

FIGURE 4 GENERAL APPROVAL REQUIREMENTS AND PROTOCOL USED IN ONTARIO

APPENDIX III

RECOMMENDED CONTENT OF A TECHNOLOGY PERMIT APPLICATION FOR MOBILE PCB DESTRUCTION SYSTEMS

APPENDIX III RECOMMENDED CONTENT OF A TECHNOLOGY PERMIT APPLICATION FOR MOBILE PCB DESTRUCTION SYSTEMS

Specific approvals and formal written permits should be required prior to operating any commercial mobile PCB destruction facility in Canada. Accordingly, a proponent of any technology should satisfy the regulator that the facility can be operated in an environmentally safe manner and that all pertinent operational and environmental standards/criteria, defined within a given jurisdiction, can be consistently met. The types of activities that typically require permits are:

Full-scale Operation: A formal regulatory approval should be required for each PCB destruction facility before operation and a separate approval also is recommended for every new location at which the facility is temporarily located. Specific operational time limits may be imposed by the regulator so that operations are minimized in a given locale.

Demonstration Tests: Prior to issuing an operating permit, regulators may request a process demonstration test for new technologies or those which may have been approved or tested in another jurisdiction. Both technology and site approvals should be obtained before testing/operating any commercial facility. A demonstration test permit should include operational conditions and specify a limited time and quantity of waste to be treated at one location for purposes of defining process performance.

Research Tests: The testing of any laboratory/pilot-scale facility being developed to destroy PCBs should have prior approval by regulators. This may be obtained on an individual and less formalized basis than required for commercial facilities. Although primarily applicable to commercial processes, recommended procedures addressed in this report may become the ultimate, longer-term requirement for research-type facilities. Generally, much smaller waste quantities would be involved in such tests than in demonstration tests or commercial operation. In any case, the emission or discharge regulations of a given jurisdiction must be complied with for the destruction of any PCB waste and information on potential emissions and verification procedures should be supplied to regulators.

The following general information is provided to proponents of commercial and developing technologies that intend to submit an application to operate a commercial PCB destruction facility in Canada.

1. **Application Procedures.** In applying for permits, it is recommended that preliminary contact be made with the appropriate government agency for the jurisdiction in which the planned facility is to be located in order to obtain information on specific jurisdictional requirements. Depending on the previous operating experience of the applicant, applications may be submitted for one of the permit types together with supporting documentation on the facility. In the event that a demonstration test is required or considered likely, a separate demonstration test plan would be submitted at a later date.
2. **Recommended Application Information.** An application to be submitted for technology approval should include (as a minimum) the information found in the following table.

RECOMMENDED CONTENT FOR A TECHNOLOGY PERMIT APPLICATION FOR MOBILE PCB DESTRUCTION SYSTEMS
(modified from Reference 8)

1. PERMIT COVER
   - Technology Identification (standardized terminology)
   - Company identification (name, address, contact)

2. SUMMARY
   - Process
   - Approval Status
   - Location of Facility

3. PROJECT ORGANIZATION
   - Chart
   - Text
   - Contractual Arrangements
   - Staff Functions/Responsibilities

4. WASTE DESCRIPTION
   - Type/Concentration Range
   - Total Amount/Feed Rate
   - Physical/Chemical Description
   - Heating Value

5. PROCESS ENGINEERING DESCRIPTION (Facility Description)
   - General Overview
     - description of key components and configuration
     - flow diagram
     - mobility features and transportation requirements
     - size of facility and components
   - Waste Feed and Handling System
     - storage handling and distribution system (waste and other process inputs)
     - design and actual maximum/minimum feed rates
   - Waste Feed Shutdown System
   - Destruction System
     - safety features
     - principle and mode of operation
     - temperature/residence time (primary/secondary combustion)
     - feed/operational restrictions (temperature)
   - Pollution Control System
     - air, water, waste descriptions (control equipment, stack height)
     - expected emission (types, concentrations)
     - fugitive emission control
   - Process Operating Parameters
     - run duration (minimum, maximum if applicable)
     - temperature/pressure control
     - auxiliary fuel requirements
   - Facility Service and Support
     - power, water, other service requirements
     - laboratory and other support requirements
   - Liquid/Solid Residue Handling Systems and Disposal
     - storage capability and handling systems
     - pollution control device effluent and ash quantities, rates and handling systems
     - disposal requirements and procedures

6. OPERATIONAL PLAN
   - Startup, Shutdown Procedures
   - Operating Conditions
   - Proposed Activity Schedule

7. MONITORING PLAN
   - Scope and Extent of Monitoring (process, emission, environmental)
   - Monitoring Parameter List
   - Input/Output Monitoring and Material Balance Calculations
   - Monitoring Frequency
   - Monitoring Design (frequency, locations)

8. PERFORMANCE MONITORING PROCEDURES
   - Appropriate Methods and Degree of Automation
   - Written Protocols
   - Apparatus/Equipment
   - Calibration and Maintenance
   - Data Reduction and Storage
   - Data Reporting

9. INSPECTION PROCEDURES
   - Waste Feed System
   - Destruction Feed System
   - Waste Feed Cut-off System
   - Pollution Control System
   - Alarms
   - Fire Extinguisher Systems

10. SPILL AND ACCIDENT PREVENTION CONTROL AND COUNTERMEASURES PLAN
    - Appropriate Preventative Measures and Contingencies (spills, fire, explosions)
    - Containment and Cleanup Procedures/Equipment
    - Pollution Control and Operational Upset
    - Feedback/Shutdown Systems
    - Vandalism Prevention

11. OCCUPATIONAL HEALTH AND SAFETY PLAN
    - Operation Protection (impervious clothing, respirators, wash facilities, housekeeping)
    - Medical Surveillance Programs

12. TRAINING PLAN
    - Knowledge of Facility and Emergency Response Procedures
    - Knowledge of Waste Handling and Occupational Health Guidelines

13. INSURANCE COVERAGE
    - Liability Coverage
    - Other Monetary Assurance

14. QUALITY ASSURANCE PLAN
    - Format
    - Organization and Responsibility
    - QA Objectives (precision, accuracy, completeness, representativeness)
    - Monitoring, Sampling, Analysis Procedures
    - Calibration Procedures and Frequency
    - Data Reduction, Validation and Reporting
    - Internal/External Quality Control Checks
    - Preventative Maintenance
    - Specific Procedures to Assess Data
    - Corrective Action
    - QA Report

15. CLOSURE PLAN
    - Facility Decommissioning and Waste Removal
    - Site Cleanup (as required)
    - Activity Report

16. TEST DATA OR ENGINEERING PERFORMANCE CALCULATIONS
    - Previous Test Descriptions and Results
    - Engineering Calculations (destruction efficiency, material balance, combustion efficiency)
    - Emission Compliance Information
      - air (PCBs, PCDDs, PCDFs, acid gases)
      - Liquid/solid waste

With reference to the foregoing table, specific explanatory notes on some sections of the application follow.

a) **Process Engineering Description (Facility Description)**

A description of the facility should include information such as: process equipment and design details, process mobility and waste handling features, services required, facility enclosure/containment capabilities, emission controls and waste discharge information. In addition, pertinent information regarding company organization and project staffing should be provided. These descriptions should contain sufficient detail to allow the regulator to evaluate the capabilities of the destruction equipment and staff qualifications of the proponent and/or operator.

b) **Waste Description**

The nature and quantity of PCB wastes to be destroyed should be indicated, including the applicable PCB concentration range and composition. The proponent should specify intended feed rates for each type of PCB waste (e.g., maximum and minimum rates as a function of PCB concentration), feed pre-treatment requirements and feed handling/storage equipment and procedures. As feed analysis generally will be a requirement during operation and the PCB concentration limit to be allowed will be set at the approvals stage, descriptions of feed capabilities and analytical methods should be given in sufficient detail to meet the requirements of the approval agency(ies).

c) **Process Operating Conditions**

The applicant should define an operational plan related to the specific types of PCB wastes to be destroyed. This should include conditions and parameters under which the facility will operate such as: facility start-up procedures, control of PCB waste feed-rates within specified ranges, process parameters and emission controls, record keeping and other staff functions, proposed methods to dispose of solid wastes/liquid effluents, shutdown and equipment decontamination strategies where applicable. The operating conditions indicated in the plan must be technically sound and based on previous demonstration and/or commercial operation of the facility with types of PCB wastes similar to those requiring destruction. The proposed operating conditions, and other information supplied, will assist in defining the need for a demonstration test upon review by the regulator.

d) **Monitoring and Inspection**

Information in the application should address all monitoring aspects and should identify all types of expected air and water emissions in conjunction with points of discharge and associated control techniques. For example, the proponent should provide: methods that have been and/or will be used to continuously monitor critical process operating parameters; procedures to monitor emission streams as required; and details of any environmental measurements that may be required. The extent of monitoring, especially performance and environmental monitoring requirements, may vary between jurisdictions and procedures identified in the submission will need to comply with those of the given jurisdiction. Routine inspection procedures of all facility components also should be indicated as should a quality assurance plan. This information supplied in the application, in conjunction with previous performance monitoring of the facility, can also be expected to form the basis in determining the need for a demonstration test.

e) **Staff Training, Safety and Emergency Contingency Plans**

Applications should contain information relating to procedures, safety measures, preventative measures and contingency plans to prevent/control spills, fires, vandalism or other emergency situations. Additional information should be provided regarding safe work practices and available protective equipment to minimize operator exposure to PCBs and other chemicals in conjunction with occupational health requirements of the jurisdiction. The proponent also should indicate operator qualifications and training that is required, or currently exists, in operating the facility, especially with regard to knowledge of the facility and emergency response protocols.

f) **Facility Performance Data**

All data regarding facility performance should be provided, including previous operating data, demonstration test data and/or reports, which can be used to demonstrate successful PCB destruction by the specified facility and adherence to existing provincial environmental regulations. Recommended performance requirements for mobile thermal destruction systems are discussed in Section 3. Alternatively, results of pilot or bench-scale tests which have established successful destruction of PCBs without generation of undesirable products or other pollutants should be submitted as the basis for the proposed commercial-scale facility. This documentation, or a part of it, may be required as a separate report to be submitted with the application.

g) **Application for Facility Siting and Activity Scheduling**

A separate application for siting facilities will normally be required after receiving technology approval. Proponent applications for siting facilities should include the following types of information: other approvals (e.g., technology, other sites), the location of the proposed site and information to indicate how it satisfies available jurisdictional site selection criteria and a description of the proposed site characteristics. In some jurisdictions, calculation of ground level point-of-impingement concentrations will be required with the application to ensure that certain air pollutants emitted from the facility comply with jurisdictional ambient air quality criteria at the specific site.

The applicant should also define any site preparation requirements specific to the facility and procedures that will be used.

The proponent also should indicate the proposed operating duration at a given site, an operating schedule which specifies activities from initial site preparation including sufficient time for public notification (where required) to final closure of the facility and the time interval required after closure to submit a report on site operations. The activity schedule should not exceed any time limitations that are regulated for temporary site operations. The frequency of operations at any site within the same municipality should be outlined in the application as this also may be regulated for specific types of mobile destruction facilities. Specific liability insurance and other monetary assurances should be required for operations at each site.

APPENDIX IV

RECOMMENDED CONTENT OF A DEMONSTRATION TEST PLAN FOR THERMAL DESTRUCTION TECHNOLOGIES

APPENDIX IV RECOMMENDED CONTENT OF A DEMONSTRATION TEST PLAN FOR THERMAL DESTRUCTION TECHNOLOGIES

Types of Activities Requiring Permits

1. **Test Plan.** In the event that procedures, results, test durations, and other specific requirements provided in facility applications and other documentation comply with those being regulated or considered acceptable by the regulatory authority, a process demonstration could be waived. Alternatively, the regulator may request collection and analysis of additional data using approved methods or require a comprehensive demonstration test to be performed with conditions stipulated by the regulator.

   Should a process demonstration be required, the proponent will need to obtain written permission (e.g., test permit) that allows operation on a limited amount of PCB-containing waste. A demonstration test plan should then be submitted, preferably after the regulator's comments on the technology application have been received and it has been determined that a demonstration test is needed. If required, the test plan should present the test objectives and the manner in which the test will be conducted. Because the conditions defined for process demonstration will probably form the basis and scope of subsequent operations, the demonstration test plan should be as thorough and complete as possible.

   The following table is a summary of the basic recommended technical content of the demonstration test permit application. Documentation on each of the items should be provided in the plan. Unless there are test-specific changes, some of the information already provided in the application of technology approval need only to be referenced or briefly discussed in the plan (e.g., facility description and organization). Methodologies to monitor process parameters and all sampling and analytical techniques to measure total PCB content (and other parameters, where required) in each proposed type of feed, in the corresponding emission or effluent streams and in environmental samples should be clearly indicated. Emission monitoring should be designed to ensure that sufficient data will be available to determine the environmental significance of operations. Documentation should also be submitted to show an adequate level of operator training under both normal and emergency situations. Similarly, the test strategy, activity schedule and the proposed test location should be identified and sufficient time allowed for public comment.

2. **Test Conduct.** The demonstration test should be conducted for a limited term with a limited amount of PCB waste. Feed quantities, however, should be sufficient to allow normal operations to proceed so that adequate amounts of samples can be acquired for technology performance assessment/confirmation. Process testing activities must demonstrate compliance with operation controls, monitoring and record-keeping requirements that have been approved in the test plan.

   The range of process monitoring parameters, within which acceptable emissions are expected to be achieved, should be established and/or confirmed during testing. If excursions occur beyond the range, the facility should be immediately shut down. Additional information regarding demonstration test requirements (e.g., monitoring, operation, etc.) is provided in the appropriate sections of the manual.

RECOMMENDED CONTENT OF A DEMONSTRATION TEST PERMIT APPLICATION

ACTIVITY PLAN	CONTENT DESCRIPTION
1. Operating Requirements during Demonstration	
Operational Plan and Test Parameters	- supply information on mobility features which may require demonstration and the mode of facility operation specific to planned test (e.g., batch/continuous) - define process operating parameters/conditions to be maintained at the start, during testing and upon shutdown with stated limitations to be demonstrated (e.g., temperature, combustion efficiency, etc.) - define operational controls to be tested and pollution control operating parameters - describe any shakedown requirements (e.g., pretest with non-PCB containing feed) - identify procedures to establish proper operating conditions before introduction of PCB feed - define test strategy (e.g., number of tests per type/concentration of PCB waste) - specify supplementary fuel requirements and availability for test
Waste Feed Plan	- define procedures for unloading/storing/transferring PCB feed to the process - identify bulk storage requirements and waste volumes expected to be handled during tests and means of transport to the site - define planned minimum/maximum feed rates and PCB concentrations by type of waste (e.g., solid/liquid) - indicate any waste preparation requirements (e.g., shredding)
Other Functional Plans	- describe plans to test waste feed or process cut-off systems when process conditions deviate beyond stated limits - define tests for alarms, fire extinguisher systems and other contingency plans during process demonstration - identify facilities for spill prevention/containment, retention of solid/liquid process waste streams or products until discharge is permitted (i.e., sufficient capacity for entire demonstration, test), means to prevent accumulation of PCBs or other pollutants in precipitation - demonstration of operator training under normal and emergency situations (e.g., knowledge of facility, environmental and safety concerns of PCBs, emergency response procedures)
2. Sampling and Monitoring Plan	
General Requirements and Monitoring Locations	- the designed plan should include both process and environmental monitoring to ensure that sufficient samples and data are available to characterize the environmental significance of operations (some samples may be required for historical purposes) - identify critical process parameters that require continuous monitoring during tests - describe all process/emission monitoring and environmental sampling locations - specify the number of samples per location and test
Monitoring Parameters a) Process and Emissions	- the design should indicate the monitoring parameters and a summary of data to be obtained - examples of parameters to be measured are: PCBs and other pollutants in both PCB waste feed and fuels introduced, operating parameters such as temperature and pressure, PCBs and other pollutants in the final product or liquid/solid/sludge effluents, PCBs and other pollutants in emissions to air including stacks or vents
b) Environmental	- the plan should incorporate environmental sampling that may be required associated with pre-and post-testing and during demonstration tests - examples are: PCBs and other pollutants in ambient air and nearby soils, water and vegetation - in some instances, this or a portion of the environmental monitoring may be undertaken by the regulatory body
Sampling and Monitoring Methods	- specify proposed sampling and monitoring methods for each measurement which, in most cases, will require approval by the regulator - indicate the frequency, replication and sample size (e.g., feed composition may require continuous collection) - define any sample transport or preservation requirements
a) Analysis Method	- specify proposed analytical methods for each type of sample indicating the procedures/instrumentation to be used for analysis with information on calibration standards/procedure, anticipated detection limit
b) Recording/ Record Keeping	- identify data reduction procedures - provide calculation methodology that will be used to demonstrate destruction efficiency or material balances using appropriate engineering units - identify record keeping and sample custody plans
3. Discharge Containment Plan	- define measures to contain any liquid effluent, solid wastes, material products, contaminated materials, etc. that result from demonstration testing until disposal approval is received
4. Quality Assurance Plan	- define quality assurance procedures with respect to test-specific information such as: system performance, inspections, preventative maintenance - define quality assurance procedures with respect to measurements and data validation such as: sampling/analytical methods, calibration, precision, accuracy, sample representativeness
5. Site-specific Plan	- define the test location and how it conforms to any required site selection criteria - specify the proposed operating schedule (e.g., planned daily activities and proposed dates) and test duration in conformance with any jurisdictional time-constraint requirements

Note: Data provided should be specific to the planned demonstration test and reference made to additional information supplied in the technology permit application unless different (e.g., project organization, technology description).

3. **Test Report.** After a demonstration test has been performed, a report of the results should be prepared and submitted to the regulator. The report should contain: a description of the test; all monitoring/operating parameters; any period of anomalous operation; tables of all pertinent results; demonstrated performance data (e.g., destruction efficiency) including calculation methods; quality assurance information; and inspections that were conducted. The regulator should review the report to determine if it contains all necessary elements and the degree to which the demonstration has met the objectives of the test. It can be expected that test results will be critically reviewed for:

   - completeness (i.e., if all test data have been taken);
   - representativeness and validity;
   - material balance calculations;
   - a determination whether or not test data meet destruction efficiency requirements; and
   - any potential environmental impact of the facility.

   The regulator should also approve disposal of any residual waste generated by the facility during testing in accordance with approved methods in the event that the PCB content (or other contaminants) meets disposal standards.

4. **Facility Approval.** Upon acceptance of the process demonstration test report and a determination that the process operates within all of the pertinent jurisdictional requirements and conditions of the demonstration test permit, the regulator should issue final approval to permit commercial operations of the technology. The proponent then requires site approval to conduct further operations.

APPENDIX V

TOXICITY FACTORS

APPENDIX V TOXICITY FACTORS

Congener	Toxicity Factor
PCDDs	
1. 2,3,7,8-T4CDD	1.0
2. 1,2,3,7,8-P5CDD	0.5
3. 1,2,3,4,7,8-H6CDD	0.1
4. 1,2,3,6,7,8-H6CDD	0.1
5. 1,2,3,7,8,9-H6CDD	0.1
6. 1,2,3,4,6,7,8-H7CDD	0.01
7. 08CDD	0.001
PCDFs	
8. 2,3,7,8-T4CDF	0.1
9. 1,2,3,7,8-P5CDF	0.01
10. 2,3,4,7,8-P5CDF	0.5
11. 1,2,3,4,7,8-H6CDF	0.1
12. 1,2,3,6,7,8-H6CDF	0.1
13. 1,2,3,7,8,9-H6CDF	0.1
14. 2,3,4,6,7,8-H6CDF	0.1
15. 1,2,3,4,6,7,8-H7CDF	0.01
16. 2,3,4,6,7,8,9-H7CDF	0.01
17. 08CDF	0.001