6 OPERATING REQUIREMENTS AND PROCEDURES

The objective of the following requirements is to prevent releases of PCBs and associated contaminants to the site of the thermal destruction process and surrounding environment. These requirements apply to both demonstration testing and subsequent operations unless specifically noted.

6.1 Facility Startup

6.1.1 Approvals. The startup of **any** PCB destruction facility should require prior formal approval from the lead regulatory agency. It is recommended that the procedures and controls for the preparation and operation of such facilities as outlined in this report be adopted as minimum requirements. These minimum requirements include the prior approval of all plans submitted in technology and site applications.

6.1.2 Inspection and Startup Procedures. Prior to startup, the lead regulatory agency should inspect the facility to verify its ability to operate in compliance with all regulatory requirements.

The proponent should be required to follow a written startup procedure which has been reviewed and approved by the lead regulatory agency. Startup procedures should include:

1. **A Monitoring System Check:** Prior to startup and/or the introduction of waste feed to the process, the proponent should demonstrate the proper functioning and calibration of all monitoring instruments. This should be carried out in accordance with the Data Quality Assurance (DQA) Plan.

2. **An Operating Systems Check:** The maintenance of operating parameters, within the allowable ranges specified as conditions of approval, should be demonstrated by operating the destruction system on clean, supplementary fuel for a specified test period prior to feeding wastes.

3. **An Automatic Shutdown System Check:** The proper function of automatic shutdown systems should be demonstrated during the operating systems check with clean supplementary fuel.

4. **Waste Transport:** The transport of PCB wastes to a site must comply with federal and provincial requirements. It is recommended that approval to transport PCB wastes to the site, where applicable, be contingent upon demonstration that the PCB destruction system can comply with the conditions and system checks described in this report. Furthermore, it is recommended that PCB waste transported to the site should be limited to that needed to complete the startup procedure.

6.2 Nature and Quantity of Waste to be Destroyed

6.2.1 Documentation. The specific source, identity, and nature of all PCB wastes intended for disposal at the site should be clearly documented in accordance with procedures defined in the proponent's submission for approval. This documentation must be consistent with the Environment Canada and provincial PCB waste inventories as well as complying with federal and provincial marking and transportation requirements.

Documentation should also verify compliance with any constraints on the quantity, type and concentration of PCB waste brought to, stored, or destroyed at the site. Such constraints should be specified in advance by provincial regulatory agencies in consultation with local municipalities.

6.2.2 Waste Type. Wastes transported to the site should be compatible with the type and concentration of wastes within the storage, handling, and destruction capabilities of the facility. It is recommended that the waste characteristics (e.g., solid/liquid, PCB concentration) used for demonstration testing, should be as representative as possible to the types of wastes that require destruction.

6.2.3 Waste Quantity. In the case of a demonstration test, the total quantity of waste brought to the site should not exceed the quantity required for the demonstration. In the case of approved commercial operation at a site, the total quantity of waste transported to and destroyed at the site will normally be stipulated as a condition of approval. Limitations may also be placed on the total quantity of waste stored at the site. Storage capabilities at the site should be such as to minimize transport of waste to the site.

6.3 Supplementary Fuel

6.3.1 Limitations. Clean supplementary fuel should be required for demonstration tests. The use of waste solvents or oils as supplementary fuel during approved operation of destruction facilities should require the specific approval of the permitting agency. The destruction of solvent rinses from approved PCB container decontamination should be allowed with prior approval.

6.3.2 Analysis. If appropriate, chemical analysis of supplementary fuels should be required to identify fuel contaminants which may result in emissions regulated by the permitting agency. Any contaminants identified should be subsequently monitored during demonstration tests.

6.4 On-site PCB Waste Storage

6.4.1 Objective. On-site PCB waste storage should be confined to a designated and clearly defined area as recommended by Environment Canada[2][18] and/or stipulated within each jurisdiction. The designated area should be used exclusively for PCB waste storage and should be designated and operated to minimize all PCB releases to air, ground, and water including releases resulting from floods, storms or fire-fighting activities. The operator must provide secure, controlled storage which prevents direct contact of persons with wastes. The storage area should be designed to prevent spills or releases of PCBs to the surroundings, including direct or indirect releases to a watercourse or groundwater. Effective provision must be made for quick containment and cleanup of any PCB releases which may occur accidentally.

6.4.2 Site-specific Requirements. The term of operation, stored waste quantity, and local conditions will influence the specific design of on-site PCB waste storage facilities. In addition to the following recommended requirements, PCB waste storage facilities must comply with all applicable federal, provincial and local regulations, requirements, and guidelines.

6.4.3 On-site Location. The primary on-site waste storage facility should have safe and controlled access to the destruction system, separation from combustible and/or explosive materials, including solvents and fuels, and separation from any other activities which may endanger safe storage.

The on-site storage facility should be located at last 100 metres from the nearest watercourse and site features should generally comply with the siting requirements specified by the lead regulatory agency.

6.4.4 Containment. A leakproof containment system must be provided for liquid PCB storage areas. Liquid PCB wastes must be stored in sealed containers or tanks within the containment area. The storage area should provide effective containment for the worst-case spill event. Provisions should be made for effectively removing spilled liquids from the containment area.

Solid PCB wastes should be stored in appropriate closed containers on solid surfaces which are durable, dry, and readily cleanable.

6.4.5 Enclosure. An indoor, covered and enclosed, storage area is preferred. If this is impractical, effective measures should be provided to completely prevent the

infiltration of precipitation to all storage areas. Precipitation which contacts waste containers and/or enters the waste storage area must be retained and, if necessary, disposed of as contaminated wastewater.

Where applicable, appropriate precautions should be taken to prevent PCB releases resulting from container or equipment rupture due to mechanical shock or exposure to extreme ambient temperatures.

6.4.6 Ventilation. Good ventilation should be provided for enclosed areas where PCB liquids are stored, especially where temperatures may exceed 25°C. Vapours from bulk liquid PCB tanks should be vented to the atmosphere through activated carbon filters.

6.4.7 Security. The storage area should be fenced or enclosed with controlled access through lockable gates or doors. Access to the area should be limited to authorized personnel. Effective protection should be provided to prevent entry by vandals or unauthorized personnel.

6.4.8 Signing and Container Marking. The storage area should be clearly identified as a PCB waste storage area. Waste containers should be identified in accordance with Environment Canada labelling requirements and any other provincial, federal or user-equivalent marking requirements.

6.4.9 Housekeeping. The storage area should be kept clean and orderly. Waste containers should be placed in an orderly and systematic arrangement giving attention to conventional rules of safety concerning stacking and impact protection of containers where vehicular access to the area is allowed.

6.5 Controlling and Monitoring Operational Parameters

The maintenance of key operating parameters within ranges which will ensure the required destruction of PCB wastes (99.9999% DRE) is the primary control mechanism for PCB destruction processes. **Prior to approvals** for any demonstration testing or operation, these key parameters will be determined from a review of detailed process and monitoring data that have been submitted to the regulator.

6.5.1 Allowable Ranges of Key Parameters. The allowable operating ranges of key parameters, as indicated by existing test data or prior operational results in other jurisdictions, will be confirmed during the performance of demonstration tests. The

allowable ranges will pertain only to the specific waste-feed conditions for which approval is sought.

All operations of the PCB destruction system (subsequent to the completion of the demonstration tests) will require the key parameters to fall within the allowable ranges which have been either demonstrated or stipulated as a condition of the approval to operate.

6.5.2 Monitoring and Automatic Shutdown. Key operating parameters should be monitored continuously during all operations including demonstration tests and subsequent approved operation. The monitoring equipment, procedures, and record keeping will be in accordance with the detailed Data Quality Assurance Plan.

The PCB waste feed to the system should be automatically interrupted if the monitored values of key parameters fall outside allowable ranges. The system should also automatically initiate any other appropriate shutdown actions.

6.6 General Operational Controls

The operators of mobile PCB destruction facilities should comply with the minimum requirements for PCB waste storage, handling, transportation, occupational health and safety, and contingency planning as presented in this document. Equipment and practices must also comply with provincial and local regulatory requirements or codes and should comply with Environment Canada recommendations as set out in the "Handbook on PCBs in Electrical Equipment"[15].

6.6.1 Documentation of Specific Controls. The specific controls and procedures to be applied at a given site should be detailed as a part of the proponent's approvals application. Compliance with these requirements should be a condition of approval to operate the destruction system under all circumstances.

6.6.2 Prevention of PCB Releases. The facility should be designed and operated to minimize fugitive emissions and PCB spills, and the equipment should incorporate PCB compatible materials. The number of connections used in piping for transferring PCB liquids should be minimized. All vapours containing PCBs should be vented through adsorbent (e.g., activated carbon) cartridges or returned to the destruction process.

6.6.3 Containment. Effective containment should be provided at all potential points of PCB leakage or spillage. Precautions should be taken to prevent the infiltration of precipitation to impoundments, spill trays, or containment systems. Where such infiltration occurs, the liquid must be retained and treated as an aqueous waste.

6.7 Emission and Compliance Monitoring

6.7.1 Demonstration Tests. Detailed process, emissions, and environmental monitoring will be required during demonstration tests. The object of this monitoring is to verify the allowable operating ranges of key process parameters (Section 7) which will ensure the required destruction efficiency and compliance with emission regulations. Environmental monitoring may also be required to verify that site contamination does not occur and/or that site restoration activities are satisfactory.

Pre-test, test, and post-test monitoring will generally be required for demonstration tests. The specific procedures and controls for the tests, including a Data Quality Assurance Plan, should be detailed in writing as a part of the approvals application.

As a minimum, the monitoring should provide sufficient reliable data, assembled, presented, and assessed in accordance with the approved Data Quality Assurance Plan, to verify that the process meets the recommended performance standard of 99.9999% DRE. This determination should be based on accurate analysis of all process inputs and outputs. In addition, it must be shown (using approved methods) that any emissions of PCBs, PCDDs and PCDFs comply with emission regulations. Conventional air contaminants should also be regulated at source.

In addition to these requirements, any applicable provincial ambient air criteria for PCBs, PCDDs and PCDFs must be met. Similarly, Interim Environmental Quality Objectives for PCBs in ambient air, that have been accepted by CCME, should not be exceeded. The Canadian Council of Ministers of the Environment has recently accepted Ontario ambient air quality criteria for PCBs.

Waste destruction during demonstration tests should be immediately terminated if: key parameters undergo excursions from allowable operating ranges; air pollution guidelines or standards are found to be exceeded; or any other unsafe conditions are identified.

6.7.2 Approved Operation. The operations of facilities approved for the destruction of PCB wastes will be controlled by continuous monitoring of key process parameters, with automatic shutdown if excursions occur outside allowable ranges of parameters. In addition, periodic compliance monitoring of source emission levels for PCBs, PCDDs and PCDFs is required by some provincial regulations and is recommended here. The minimum recommended requirement is for continuous monitoring of process parameters

and for at least one source compliance test for PCB, PCDD and PCDF emissions during routine operations at each site.

All monitoring and data reduction and assessment during approved operation should be in accordance with the Data Quality Assurance Plan.

6.8 Material Discharges

6.8.1 Wastes and Residues. All liquid and solid wastes and residues and any other potentially PCB-contaminated equipment or material resulting from the operation of the PCB destruction system should be retained on-site until analyzed for PCB, PCDD, and PCDF content and disposal is authorized by the lead regulatory agency.

Disposal of process residues and other waste materials should comply with the minimum requirements of Section 10 and additional requirements of provincial and local regulatory agencies.

6.8.2 Decontamination Activities. The on-site decontamination of equipment and/or waste containers should require the specific approval of the lead regulatory agency. It is recommended that tank trucks for transporting PCB bulk fluids be dedicated vehicles. Decontamination and subsequent alternative use of such vehicles should be stringently regulated by certificates of approval issued by the permitting agency. The re-use and/or disposal of waste drums or containers for PCB wastes should be in accordance with the requirements.

6.8.3 Storm Runoff. Precipitation should be prevented from contacting equipment and materials which could result in PCB contamination. Where such contact inadvertently occurs, the contaminated rainwaters should be retained and treated as aqueous waste.

Surface runoff from the site should be periodically monitored in accordance with the requirements of the lead regulatory agency. The need for and frequency of such monitoring should be determined from site-specific conditions and stipulated as a condition of approval for operation on the facility.

6.9 Operator Training

All operators at the facility should receive comprehensive training appropriate to the safe performance of their duties as well as for the safe handling of PCB materials. The training program should be described in detail in the approvals application. The program should provide appropriate training in the following specific areas:

- features and function of the destruction facility;
- knowledge of physical/chemical properties, and workplace and environmental hazards of PCB wastes and other dangerous materials used at the facility;
- occupational health and safety regulations, environmental regulations and handling guidelines for PCB wastes and any other dangerous materials used at the facility;
- knowledge of the function and effective use of safety and emergency response equipment; and
- implementation of the emergency contingency plan for the facility, including emergency response measures for spills and fires and reporting procedures for emergencies.

6.10 Data Reporting, Record Keeping

Detailed procedures for all aspects of record keeping and data reporting should be addressed in the Data Quality Assurance Plan which is submitted as a part of the approvals application.

Operator records for each disposal site should contain: descriptions of PCB wastes processed, owner/operator names, pertinent activity dates/times, monitoring and analytical data, descriptions of spills or other accidental occurrences, inspection records, facility waste data and disposal methods, and other relevant information. It is recommended that records of treatment activities be retained for five years.

It is also recommended that a written report of activities at each site be provided by the operator or owner to the designated regulatory agency. This will assist in the overall PCB waste management strategy by providing a mechanism for the regulator to review all destruction activities and maintain accurate PCB waste inventories.

6.11 Duration of Operation

If the requirements of this report are observed, then there are no technical concerns which justify limiting the term or frequency of operation at a given site. Federal, provincial, or local agencies, however, may wish to stipulate a maximum period of operation for demonstration tests and/or subsequent approved operation. In such cases, the operational period should be determined by site-specific conditions including waste quantity, cost constraints and allowances for facility setup, shakedown, and decommissioning. It is emphasized that the imposition of short operating periods may make the application of such mobile processes prohibitively expensive because of the high mobilization costs associated with these facilities.

6.12 Site Security

The site should be securely fenced with access controlled by a locked gate. When an attendant is not present, appropriate measures should be taken to prevent unauthorized entry and vandalism. The 24-hour presence by an attendant is recommended. When the facility is in operation, all activities should be adequately and continuously supervised.

7 MONITORING AND INSPECTION PARAMETERS

All permit applications for demonstration testing and subsequent operations should require a plan that addresses the monitoring of operational, emission, and environmental parameters. The purpose of monitoring is to verify the destruction performance of the facility and to document operational compliance with all pertinent regulations. More extensive monitoring will be required during demonstration tests than during commercial operation. In general, the recommended minimum monitoring requirements are:

- **continuous monitoring of key process parameters** during demonstration tests and during routine operation;
- **waste feed sampling and analysis** during both demonstration tests and operation;
- **extensive emission sampling and analysis** during demonstration tests and periodic confirmatory tests during operation;
- **sampling and analysis of liquid and solid wastes from the process** during demonstration tests and/or routine operations, to ensure that they can be properly disposed of; and
- **environmental sampling and analysis** before, during, and after demonstration tests and routine operation.

The primary monitoring considerations which should be reviewed and approved by the lead regulatory agency, are: the monitoring locations, parameters, procedures to be used, and monitoring frequency.

7.1 Process Monitoring

Key operating parameters of the process should be monitored continuously in order to ensure proper process control. The minimum key parameters to be continuously monitored in an incineration process are indicated in Table 5. Although specific monitoring locations and parameters depend on the process type, configuration and type of emission control device, the primary parameters to be monitored include:

- rates of waste feed, burner fuel, and air;
- temperature and combustion conditions; and
- inlet/outlet flows of scrubber liquid.

Key process monitoring data that will be used to verify proper operation of the process include:

- temperature
- excess oxygen,
- residence time, and
- combustion efficiency.

TABLE 5 RECOMMENDED CONTINUOUS MONITORING REQUIREMENTS OF OPERATING PARAMETERS FOR AN INCINERATION PROCESS

Monitoring Parameter	Unit	Possible Monitor Location[a]
Waste Feed Rate	kg/h	transfer line from bulk storage or other feed
Auxillary Fuel Feed Rate	kg/h	fuel supply
Combustion Air Flow	am^3/min.*	combustion air supply
Incinerator Pressure	kPa	primary and afterburner chambers
Combustion Temperature	°C	primary and afterburner chambers
Oxygen	%	afterburner chamber (b)
Carbon Monoxide	ppm	afterburner chamber (b)
Carbon Dioxide	%	afterburner chamber (b)
Scrubber Liquid Flow	m^3/min.	scrubber inlet
Scrubber Pressure Drop	kPa	scrubber chamber
Scrubber Liquid Makeup Flow	m^3/min.	water supply
Scrubber Liquid Discharge Flow	m^3/min.	scrubber outlet
Quench Water Makeup Flow	m^3/min.	water supply
Quench Water Discharge Flow	m^3/min.	quench chamber outlet
Calculated Parameter		
Total Thermal Load	Megawatts	
Residence Time	seconds	
Combustion Efficiency	%	

Notes: (a) - for an incinerator configuration comprising a primary and afterburner chamber with a quench chamber, liquid scrubber, and spray tower

(b) - these parameters may be alternatively monitored after the gas scrubber

* am^3/min. - actual cubic metres per minute - referring to actual temperature and pressure

Monitoring elements for these key parameters should be linked to an automatic waste feed cut-off or process shutdown system that will be triggered if the predetermined range of operating parameters is exceeded. For incineration, the minimum parameters that should be linked to an automatic feed-shutdown system are temperature and excess oxygen. Automatic feed stoppage also should occur in case of failure of monitors for temperature, oxygen (O_2), carbon monoxide (CO) and carbon dioxide (CO_2). Specific monitoring equipment and procedures, including mechanisms used to compensate for momentary abnormal excursions of key parameters, should be specified in the proponent's applications and approved by the lead regulatory agency.

7.2 Emission Monitoring

Detailed monitoring of process input streams and all discharges to air, water, and soil will be required during demonstration testing, especially with respect to facilities operating for the first time. Recommended minimum sampling and analytical requirements, based primarily on Ontario regulations[6], are provided in Table 6. Sampling and analytical methodologies, monitoring locations, monitoring frequency and parameters to be monitored should be approved within each jurisdiction. As a minimun, PCBs, chlorobenzenes, PCDDs, PCDFs, and chlorophenols should be determined in all waste streams. Other components such as trace metals, total chlorine and sulphur also may require analysis depending on the type of feed. Replicate measurements should be performed for each type of waste feed (e.g., triplicate measurements using wastes containing PCBs at concentrations up to the maximum for which approval is sought). Air emissions should be characterized by monitoring at a point downstream of air pollution abatement equipment and prior to release to the atmosphere. An automated weather station should be operated in conjunction with these tests.

During subsequent operation at destruction sites, confirmatory emission monitoring for at least PCBs, PCDDs, and PCDFs should be performed, at a frequency stipulated by the permitting agency (e.g., at least once during operations at each site). Solid and liquid process wastes should be analyzed on a routine basis for PCBs, PCDDs, and PCDFs and retained at the site until authorization is received for disposal. During confirmatory emission monitoring tests, the waste feed should be analyzed for PCBs. Results of incoming and outgoing stream monitoring should demonstrate that PCBs are destroyed by the process without the creation of other pollutants that exceed environmental standards, criteria, and guidelines.

TABLE 6 RECOMMENDED MINIMUM EMISSION MONITORING REQUIREMENTS FOR MOBILE PCB THERMAL DESTRUCTION PROCESSES

Sample Types	Recommended Frequency[a]	Minimum Analysis	Other Specific Analysis[b]
PCB Feed[c]	composite samples taken at specified intervals during emission sampling period(s) for each PCB waste concentration	PCBs, chlorobenzenes	chlorophenols
Scrubber Water Influent	same as PCB Feed	PCBs, chlorobenzenes	
Supplementary Fuel	same as PCB Feed	PCBs, chlorobenzenes	
Stack Emissions[c][d]	three six-hour tests for each PCB waste	PCBs, chlorobenzenes, PCDDs and PCDFs, chlorophenols, O_2, CO, CO_2, HCl, Cl_2, THC, PAHs particulate matter	trace metals
Liquid Effluent[c][d]	same as PCB Feed	PCBs, chlorobenzenes, PCDDs and PCDFs, chlorophenols, PAHs	trace metals, chlorine
Ash/Other Solids[c]	same as PCB Feed	PCBs, chlorobenzenes, PCDDs and PCDFs, chlorophenols, PAHs	

Notes:

(a) The number of samples per test and sampling intervals depend on expected test durations, specific jurisdictional requirements and the types of parameters being monitored.

(b) Analysis of these components may be required depending on the nature of the feed and jurisdictional requirements.

(c) Sampling and analysis of these media are recommended during both demonstration tests and routine operation. The frequency and parameters to be monitored will depend on jurisdictional requirements.

(d) Separate sampling units may be needed for specific compounds classes. In some instances, (e.g., stack emissions, liquid effluents), separate analysis of particulate and vapour or filtered liquid components may be required.

7.3 Environmental Monitoring

The requirements for environmental monitoring should be predetermined by the lead regulatory agency. It should be the responsibility of the proponent to carry out the monitoring program. In some circumstances, environmental monitoring will also be undertaken by the regulatory agency.

Contaminants should be measured in environmental media as required to detect the presence of fugitive or unanticipated airborne emissions, the occurrence of spills, and any potential effect of PCB destruction activities on the local environment. The recommended minimum environmental monitoring requirements are shown in Table 7. Prior to demonstration tests, samples of soil, receiving water, vegetation and ambient air should be collected at the site and analyzed for background contaminant levels (e.g., PCBs and chlorobenzenes as a minimum). Similar monitoring, of soil and water, should be done after demonstration tests, as well as before and after subsequent operations at each site. These data should be used to document any significant differences from background concentrations that could result from destruction operations and to define the need for site restoration. In addition, some jurisdictions may require ambient air measurements during trial burns and periodically, on a less frequent basis, during subsequent operation of the facility. Ambient measurements can be used to confirm compliance with any air quality guidelines or point-of-impingement standards of the permitting agency and to determine the extent of any fugitive emissions.

7.4 Inspection

Facility inspection should be undertaken by the permitting agency in addition to routine inspection by operators of the destruction system.

Demonstration test activities should be thoroughly inspected both before and during testing to confirm that all operational controls, monitoring devices and associated procedures are properly functioning. Similarly, each destruction site should be inspected before and after operations to determine the condition of the site and any need for restoration. Inspection or surveillance during operations should be done on both a ramdom and scheduled basis in order to verify that systems comply with all regulations. It is recommended that at least one inspection be done by regulatory personnel per month of operation. Records of the operator should be available for regulatory review at any time. If any emission or waste disposal regulations are found to be violated, or if any other unsafe condition is identified, operations should be terminated until approved to resume.

TABLE 7 RECOMMENDED MINIMUM ENVIRONMENTAL MONITORING REQUIREMENTS FOR MOBILE PCB THERMAL DESTRUCTION PROCESSES

Sample Types[a]	Location	Minimum Analysis	Other Specific Analysis[b]
Soil	each of 4 compass point locations surrounding the facility [c]	PCBs, chlorobenzenes PCDDs and PCDFs	chlorophenols, trace metals, total chlorine, and sulphur
Vegetation	same as Soil, taken only if location warrants	PCBs, chlorobenzenes, PCDDs and PCDFs	trace metals, total chlorine, and sulphur
Water	same as Vegetation	PCBs, chlorobenzenes, PCDDs and PCDFs	chlorophenols, trace metals, total chlorine
Ambient Air[d]	Same as Soil	PCBs, chlorobenzenes PCDDs and PCDFs	chlorophenols, trace metals, SO_X, HCl, NO_X, THC

Notes:

(a) Sampling of these media should be done before and after demonstration tests and/or subsequent operations at each approved site. Sampling locations will depend on the characteristics of both the site and the facility and specific locations should be selected in consultation with the permitting agency and approved as part of the data quality assurance plan.

(b) Although samples should be collected, analysis of these components may be waived depending on other sample results.

(c) Soil sampling in the immediate vicinity of the facility also is recommended in order to detect the occurrence of spills and to define cleanup requirements.

(d) Ambient air measurements are recommended to be done on an occasional basis in order to provide assurance that air quality is not adversely affected by unanticipated emissions.

8 OCCUPATIONAL HEALTH

8.1 Exposure Limit

The protection of workers and the environment are fundamental requirements of PCB destruction operations. Proponents will be required to ensure safe working practices, use precautionary measures that will limit the risk of exposure to PCBs and other contaminants, and adhere to occupational health regulations and guidelines.

Most provinces have adopted workplace air concentration limits set by the American Conference of Governmental Industrial Hygienists[16] that are associated with exposure to specific PCB mixtures (i.e., askarels). These air concentration limits, expressed as Threshold Limit Values (TLVs) and Short-term Exposure Limits (STELs), are:

42% Cl: 1 mg PCBs/m^3 air over 8 hours (TLV)
2 mg PCBs/m^3 air over 15 min. (STEL)

54% Cl: 0.5 mg PCBs/m^3 air over 8 hours (TLV)
1 mg PCBs/m^3 air over 15 min. (STEL)

Threshold Limit Values are limits defined as the maximum time-weighted average exposure level for an 8-hour working day and STELs are limits defined as the maximum exposure level for no longer than a 15-minute duration and no more than four times per day,

The current occupational health guideline used in Ontario for time-weighted average exposure to PCBs is 50 $\mu g/m^3$ of air for a 40-hour workweek. This guideline represents an airborne concentration to which it is believed that most workers may be repeatedly exposed on a daily basis within a 40-hour workweek, over a working lifetime, without adverse effects. An important provision of this guideline states that employees should be protected from skin contact with these compounds by the use of impervious materials.

8.2 Work Practices and Personal Protective Equipment

All persons handling, operating or maintaining PCB equipment should be adequately trained and familiar with occupational health and safety practices. Polychlorinated biphenyls are readily absorbed by inhalation, ingestion, and skin contact. As the volatility of PCBs increases with increasing temperature, it is important that all systems and especially processes involving elevated temperatures (i.e., 155°C, are completely enclosed and/or served by adequate exhaust control and ventilation. Periodic

air sampling (once per month) should be conducted to ensure that workers are not exposed to airborne concentrations higher than those previously specified. When such airborne concentrations are suspected or encountered, workers should be provided with air-supplied respirators, particularly if work is to be conducted in enclosed spaces. Polychlorinated biphenyl working areas should be clearly delineated, with restricted access policies in place. Similarly, containers and other equipment (e.g., transfer lines) should be labelled for inspection purposes and to ensure correct handling procedures. It is essential that good housekeeping practices be maintained at all times.

In working with PCBs, strict personal hygiene practices should be observed and skin contact avoided. To protect against dermal exposure, impervious protective clothing, such as gloves, boots, overshoes and overalls should be supplied to the workers.(2) Eye protection should be used to avoid injury by liquid splashes. In addition, eye wash fountains and deluge showers should be available, if practical, in the event of skin contact.

Disposal clothing is preferred, otherwise, work clothing should be regularly inspected to ensure that it remains clean, and in good condition. Work clothing should be retained on location and laundered regularly in a system reserved exclusively for contaminated clothing. Thorough personal washing should be done after removing protective equipment and before eating, drinking, or smoking. Eating and other such activities should not be permitted in PCB work areas. Similarly, all tools in contact with PCBs or PCB-contaminated materials should be washed at the end of each day or after use with an appropriate solvent (e.g., varsol, kerosene).

8.3 Medical Surveillance Programs

Polychlorinated biphenyl destruction facility operators potentially exposed to PCBs on a frequent or continuous basis should undergo pre-placement and periodic medical examinations and any clinical tests at intervals required by the examining physician. Employee exposure records (e.g., results of air sampling), medical histories, and clinical test results should be documented and retained for future reference.

9 TRANSPORTATION OF PCB WASTES AND MOBILE DESTRUCTION SYSTEMS

9.1 PCB Wastes

All PCB wastes must be transported to the treatment site in accordance with the requirements of current federal and provincial legislation. It is recommended that the proponent of the PCB destruction system should clearly indicate, in the approvals application, the specific plans for waste transportation. At minimum, all parties involved should be identified and the specific arrangements for waste receiving at the destruction site should be addressed. In addition, the contractual arrangements bearing on responsibility for transportation accidents and associated liability should be clearly indicated.

Regulations under the federal *Transportation of Dangerous Goods Act* (TDGA) and complimentary provincial legislation specify standards and requirements for the safe handling and transportation of dangerous goods and/or hazardous wastes by all modes of transportation within Canada. **Under federal TDGA Regulations,** wastes or articles containing PCBs are included in Division 1 and 2 of Class 9 and are to be identified by the Product Identification Number (PIN) 2315. These regulations stipulate the requirements for safety markings and documentation, packaging, safety precautions and training, and emergency training.

The TDGA Regulations and associated provincial regulations also require a completed manifest for each shipment of PCB waste. Copies of the manifest must be completed by each party involved (consignor, carrier and consignee). In addition, the regulators stipulate reporting requirements for spills of PCBs during transportation and related activities.

Amended regulations specific to the transportation of PCBs are now in force. The ammended regulations are summarized in the Dangerous Goods Special Bulletin, TP 2711E, ISSN 0710-0914. Information on the summary document is available from the offices presented in Table 8.

Provincial legislation complements the TDGA Regulations and may require all parties involved in transportation of PCB wastes to obtain provincial approvals or licenses. These approvals may stipulate additional contractual responsibilities for these parties. The specific agencies to contact for questions about requirements in each of the provinces are listed in Table 8.

TABLE 8 CONTACTS FOR INQUIRIES ABOUT TRANSPORTATION OF PCB WASTES

Jurisdiction	Responsible Agency	Telephone
Federal	Transport Canada Place de Ville (Tower C), 6th Floor Ottawa, Ontario K1A 0N5	(613) 992-4624
Yukon	Department of Community and Transportation Services P.O. Box 2703 Whitehorse, Yukon Y1A 2C6	(403) 667-5832
Northwest Territories	Pollution Control Division Department of Renewable Resources Yellowknife, N.W.T. X1A 2L9	(403) 873-7654
British Columbia	Solicitor General Motor Vehicle Branch 2631 Douglas St. Victoria, B.C. V8T 5A3	(604) 387-5585
Alberta	Dept. of Public Safety Services Dangerous Goods Control 10320-146 Street Edmonton, Alta. T5N 3A2	(403) 422-9600
Saskatchewan	Dept. of Highways and Transportation 1855 Victoria Ave. Regina, Sask. S4P 3V5	(306) 787-5527
Manitoba	Dept. of Environment, Workplace Safety and Health Box 7, 139 Tuxedo Ave. Winnipeg, Man. R3C 3Z1	(204) 945-7094
Ontario	Ministry of Transportation Compliance Branch West Tower, 1201 Wilson Ave. Downsview, Ont. M3M 1J8	(416) 235-3579
Quebec	Ministère des Transports 700, boul. Saint-Cyrille est Québec, P.Q. G1R 5H1	(418) 643-2990
New Brunswick	Dept. of Transportation Kings Place, York Street, Box 6000 Fredericton, N.B. E3B 5H1	(506) 453-2407
Nova Scotia	Dept. of Transportation 6061 Young Street, Box 156 Halifax, N.S. B3J 2M4	(902) 424-2727
P.E.I.	Transportation and Public Works Box 2000, 17 Havilland St. Charlottetown, P.E.I. C1A 7N8	(902) 368-5200
Newfoundland	Dept. of Transportation Box 8710 St. John's, Nfld. A1B 4J5	(709) 576-3454

9.2 Process Vehicles

Mobile PCB destruction facility transport vehicles must comply with all conventional requirements for transport vehicles. Since these vehicles are not expected to transport PCB waste materials, it is anticipated that the regulations governing waste transport would not directly apply. However, regulations are still under development and individual provinces may wish to stipulate specific precautions or conditions for the movement of mobile PCB destruction systems. It is recommended that the proponent's approval application to operate a mobile PCB destruction system contain a description of the equipment and procedures for transport. This will aid in identifying any appropriate conditions or precautions for equipment cleanup, decontamination or preparation prior to and during transport.