Management Plan for Polychlorinated Biphenyls (PCBs) in Ireland

Including a Code of Practice for the in-use management of PCBs and PCB containing equipment

August 2008

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DEFINITIONS

PCB	Polychlorinated biphenyls (see section 1 for legal definition)
PCT	Polychlorinated terphenyls (see section 1 for legal definition)
Large PCB Holding	A facility, company or individual with ownership of an aggregate quantity of PCBs of greater than 5 litres.
Small PCB Holding	A facility, company or individual with ownership of an aggregate quantity of PCBs of less than 5 litres
Suspect PCB holding	An equipment holding which due to lack of information and/or analytical results is suspected of containing PCBs
Confirmed PCB Holding	An equipment holding which due to the presence of a PCB label, trade name and/or analytical results is known to contain PCBs
Capacitor	A device for accumulating and holding an electric charge. A capacitor comprises two conducting surfaces separated by a dielectric fluid, which may contain PCBs. Also referred to as a condensor
Circuit breaker	A protective device that opens a circuit upon sensing a current overload. Oil filled circuit breakers can be filled with a dielectric fluid, which may contain PCBs.
Lighting ballast	A device contained within a light fitting designed to maintain the electric current.
Power factor correction unit	A specific form of large capacitor, generally located in close proximity to a site's transformer or power board
Transformer	A device that transfers an alternating current from one circuit to one or more other circuits, usually with a change of voltage. The unit is generally filled with a dielectric fluid, which may contain PCBs.
Contaminated equipment	Any item of equipment (e.g. transformer, capacitor, etc.) which contains PCBs at a concentration greater than 0.005% by weight (of liquid) and which has not been decontaminated.
EPA	Environmental Protection Agency

Acknowledgements and sources

The EPA would like to acknowledge the assistance and information provided by a number of different organisations and stakeholders in updating the PCB inventory. These include;

- Bord Na Móna
- The Defence Forces
- Eircom
- Electricity Supply Board
- The Health and Safety Authority
- The Health Services Executive
- Iarnród Éireann
- The Irish Prison Service
- and all organisations that responded to the PCB survey

The EPA would like to acknowledge the assistance provided by URS Ireland Ltd, in particular Ms. Caroline Donnelly in updating the PCB Management Plan, inventory and code of practice.

The publication entitled 'Safe Management of PCBs Code of Practice' produced by the Ministry of the Health for New Zealand has been used for inspiration and guidance in the preparation of the code of practice.

SUMMARY

Council Directive 96/59/EC on polychlorinated biphenyls and polychlorinated terphenyls (PCBs/PCTs) requires the preparation of an inventory of PCB holdings and also requires the making of plans and actions for the decontamination and disposal of PCBs and PCB-contaminated equipment. Certain provisions of this Directive were transposed into Irish law by the Waste Management (Hazardous Waste) Regulations, 1998. This *Management Plan for Polychlorinated Biphenyls (PCBs)* addresses the principal requirements of the Directive and the Regulations.

This document presents progress on developing a national inventory of PCB holdings and also presents an outline of the strategy to be adopted in managing the disposal of PCBs and PCB-contaminated equipment in the Republic of Ireland. Table 1 summarises the required and recommended actions to be taken by holders of PCBs. This Management Plan explains how these actions should be carried out.

Section 1 presents an introduction to PCBs and their definition.

Section 2 outlines the legislation that underpins the preparation of this Management Plan.

Section 3 presents the results of the survey of PCB holdings carried out in 2007. This survey was conducted to update the findings of the 2001 survey. Over 1,000 survey questionnaires were distributed to respondents and non-respondents to the 2001 PCB survey. The targeted facilities that received questionnaires included IPPC licenced facilities, high voltage electrical users, local authorities, hospitals and schools. Approximately 400 responses were received of which over 157 involved suspect PCB holdings and 4 involved confirmed PCB holdings. Those holdings determined to be confirmed large PCB holdings will be presented on a national inventory of PCB holdings. In volume terms, large holdings represent a significant proportion of all PCBs in use. Smaller suspect PCB holdings will be recorded separately and the information will be used to establish the full extent of PCB use.

Section 4 provides outline information on how to identify whether items of electrical equipment contain PCBs. In case of doubt, or in the absence of contrary information (such as analytical testing results or a 'PCB-free' label), items of equipment manufactured prior to:

- 1986 for transformers and large capacitors; and
- 1989 for small capacitors and lighting ballasts

should be assumed to contain PCBs.

Section 5 provides guidance to holders of PCBs, both large and small holdings, on how to manage these holdings including advice on how to meet legal obligations and practical information such as disposal options.

Section 6 outlines the actions that will be taken to ensure that the 2010 deadline for removal of large PCB holdings is achieved and how to encourage early disposal and removal of small PCB holdings.

Section 7 outlines the steps to be taken to make building managers, electrical contractors, demolition contractors, waste contractors and other groups aware of the obligations and opportunities that exist in terms of managing PCBs.

Appendix **A** of this report contains a code of practice entitled '*The In-use Management of Polychlorinated Biphenyls (PCBs) & PCB Containing Equipment'*. This code of practice has been developed to provide practical information to holders of PCBs on how to properly store PCBs and PCB contaminated equipment, how to label PCB holdings and when and how to notify the EPA. It also provides information on the waste disposal process for PCBs. The code of practice also contains information on health effects, accident prevention and emergency response with respect to PCBs.

Appendix **B** presents a list of contacts relevant to this document.

Appendix **C** contains a blank PCB notification form. This notification form should be completed annually by the 1st of September by those in possession of PCB holdings and submitted to the EPA.

Appendix **D** contains background information on PCB uses and possible environmental pollution pathways.

Appendix **E** contains relevant text from the Waste Management (Hazardous Waste) Regulations 1998.

Appendix **F** to **H** provide a list of PCB trade names, and transformers and capacitors trade names that are known to have contained PCBs.

Appendix **I** contains a list of hazardous waste contractors known to have dealt with PCB waste in the Republic of Ireland.

Appendix **J** provides contacts for laboratories that can analyse for PCBs in oils.

Table 1 Summary of actions to be taken in accordance with the Waste Management (Hazardous Waste) Regulations 1998

Action	Category of PCB holding			
	PCBs, used PCBs, waste PCBs	Equipment containing >5 dm^3 PCB with a …		Equipment containing <5 dm^3 PCB
		Concentration >0.05%	Concentration 0.005-0.05%	
Report to EPA by 1 September each year (see Appendix A: code of practice)	✓	✓	✓	X
Label equipment and premises (see Appendix A: code of practice)	✓	✓	✓	X
Dispose of PCBs and PCB-contaminated equipment: (see Appendix A: code of practice)				
(a) as soon as possible	✓	X	X	X
(b) by 2010		✓		
(c) at end of useful life			✓	✓

✓ = obligatory action

X = recommended action

Note: 1 dm^3 = 1 litre

S1. INTRODUCTION TO PCBs

PCB is the common name attributed to polychlorinated biphenyls, a group of aromatic chlorinated compounds. There are 209 possible PCB compounds, with one to ten chlorine atoms per molecule. Individual PCBs range from colourless oily liquids to viscous dark oils and yellow and black resins, depending on the chlorine content. Polychlorinated terphenyls (PCTs) are a similar group of compounds. For the purpose of this Management Plan, PCTs may be considered as a subset of PCBs.

PCBs are defined[1] as:

- polychlorinated biphenyls
- polychlorinated terphenyls
- monomethyl-tetrachloro-diphenyl methane
- monomethyl-dichloro-diphenyl methane
- monomethyl-dibromo-diphenyl methane, or
- any mixture of substances containing any one or more of the aforementioned substances in an aggregate amount which by weight exceeds 0.005% (or 50ppm) by weight of the mixture.

PCBs were first synthesised in 1864[2] but are known to have been commercially produced and sold as pure oil or in equivalent form from around 1929. It is estimated that approximately one million tonnes of PCBs have been produced world wide.

PCBs are extremely stable compounds with excellent electrical and heat transfer properties. These characteristics have led to their widespread use in a variety of industrial, commercial and domestic applications. PCB applications are commonly categorised as *open* (or dispersive) or *closed* (or non-dispersive) applications, as follows:

Open applications: use as heat exchange fluids, hydraulic oils, lubricating oils and as additives in paints, plastics, solvents, adhesives and cements.

Closed applications: use as insulating fluid in electrical transformers, capacitors, power factor correction units, lighting ballasts, vacuum pumps and submersible pumps.

Soils or other materials (that are intentionally or inadvertently contaminated with PCBs - for example, as a result of a spillage) that contain PCBs at a concentration greater than 0.005% by weight will be classified as PCBs in accordance with the definition given above.

Concern over the toxicity and persistence of PCBs led to restrictions on the marketing and use of PCBs, particularly for open applications, in Europe and America in the early 1970s. However, the use of PCBs in closed systems was permitted up until the late 1970s in the USA and the 1980s in Europe.

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[1] Waste Management (Hazardous Waste) Regulations 1998, S.I. No. 163 of 1998.

[2] Neumeier, G., 2001, The Technical Life Cycle of PCBs, A Case Study for Germany.

A review of available PCB inventories across Europe, America and Australasia reveals that approximately 70% of all PCBs manufactured have been used in closed applications.

Appendix D provides additional information on PCB sources and use, including a PCB use tree, a summary of common industrial uses, and information on likely disposal routes for PCBs or potential causes of environmental pollution.

2. LEGISLATION & LEGAL REQUIREMENTS

PCBs are covered principally by an EU Directive and two sets of national Regulations.

Council Directive 96/59/EC on PCBs and PCTs

The PCB Directive sets out broadly the requirements for the quantification of PCB holdings and the requirement to plan for the decontamination and disposal of all PCB holdings. The text of the Directive is available at http://europa.eu.int/eur-lex/lex/en/index.htm

Waste Management (Hazardous Waste) Regulations, 1998, S.I. No. 163 of 1998

These Regulations implement provisions of the PCB Directive and set out the requirements in terms of disposing of PCBs and registering holdings of PCBs. The provisions are summarised in Table 2. The relevant text of the Regulations is reproduced in full in Appendix E. Additional requirements of these regulations such as labelling of PCB containing equipment are detailed in the code of practice in Appendix A of this document.

Table 2 Summary of certain provisions of the Waste Management (Hazardous Waste) Regulations 1998 in relation to polychlorinated biphenyls (PCBs)

<table>
<tr><th>Category of PCB holding</th><th colspan="2">Action required</th></tr>
<tr><td>PCBs</td><td rowspan="3">Subject to inventory and notification to the Agency of holdings
(Article 15(1))

Subject to labelling requirements
(Article 14(1)(c))</td><td>To be disposed of as soon as possible (Article 14(1)(b))</td></tr>
<tr><td>Used or waste PCBs</td><td>To be disposed of as soon as possible (Article 14(1)(a))</td></tr>
<tr><td>Equipment containing >5dm^3 PCB</td><td>Equipment containing a concentration >0.05% by weight of PCBs shall be decontaminated or disposed of by end 2010
(Article 14(3)(a)).

Equipment containing a concentration between 0.005% and 0.05% by weight of PCBs may be decontaminated
or alternatively
disposed of at the end of its useful life
(Article 14(3)(b)).</td></tr>
<tr><td>Equipment containing <5dm^3 PCB</td><td colspan="2">Removal and separate collection of equipment upon taking it out of use, recycling or disposal
(Article 14(1)(e)).</td></tr>
</table>

Note: Decontamination and disposal are defined in Article 13(1) of the Regulations.

European Communities (Dangerous Substances and Preparations)(Marketing and Use) Regulations, 2003, S.I. No. 220 of 2003

These regulations implement Council Directives 85/467/EEC and 89/677/EEC in relation to PCBs (except mono and dichlorinated biphenyls); polychlorinated terphenyls (PCTs), and preparations, including waste oils, with a PCB or PCT weight content higher than 0.005%. These substances may not be used, except in designated applications which were in service prior to 30 June 1986. Equipment and plant containing PCBs or PCTs are required to display instructions concerning disposal and maintenance and use of equipment and plant containing them.

3. QUANTITIES ARISING AND LIKELY SOURCES

3.1 Inventory of PCB holdings

During 2007, the EPA commissioned a revision of the national inventory of PCB holdings. The inventory was originally compiled from a survey undertaken in 2001. The inventory has been updated based on surveying respondents and non-respondents to the 2001 survey. The results of the 2007 survey are presented in this section. Holdings of PCBs have been classified according to the scale of the holding and the obligation to notify that holding.

Large Holdings

"Large holdings" represent those individual holdings which are subject to notification in accordance with the Regulations. PCBs could be in use in large holdings at any facility using equipment which draws or holds a significant electrical current or any facility which receives power via high voltage lines. Typical examples include:

- electrical utilities;
- industrial and manufacturing premises;
- railway utilities;
- underground mining operations;
- military installations;
- electronics manufacturing plants;
- water and wastewater treatment plants;
- research laboratories; and
- large buildings such as those used as educational, health or commercial premises.

Many sites surveyed in 2007 contained large electrical units manufactured prior to 1986 which have not been tested for PCBs. In accordance with Article 13(2) of the Regulations, in the absence of contrary information (such as analytical data or a confirmed age for the equipment), such units have been assumed to contain PCBs and have been included in the inventory as suspected large holdings.

To date, details of 3 confirmed large holdings and 90 suspected large holdings have been collated through the 2007 survey and site visits, comprising a total volume of 174,368 litres of PCBs. This is a significant increase of inventoried large holdings compared to 2001 and an increase of over 100,000 litres of suspect PCBs. The reason for this may be due to the fact that the 2007 survey was a more focused survey concentrating largely on suspected large PCB holdings and non respondents to the 2001 survey. Additionally in the 2007 survey, oil filled circuit breakers were included as a potential PCB source. The 2007 survey also included 114 site visits, which resulted in more accurate survey returns.

Three large suspected holdings[3] identified in the 2001 PCB survey have since ceased operation and could not be contacted during the 2007 survey. At the time of the 2001 survey, these holdings comprised 3,493 litres of suspect PCBs. This estimate has been retained in the 2007 survey results owing to the lack of further information on these holdings. Further efforts will continue to be made to track these suspected holdings in the future.

Small holdings

"Small holdings" represent those individual pieces of equipment with aggregated PCB volumes of less than 5 litres. These holdings are not subject to notification but information is sought on small holdings so as to attempt to quantify the total quantity of PCBs in use, and not just the large holdings. For the purposes of the national inventory, small holdings also include holdings made up exclusively of lighting ballasts contained in fluorescent light units. Details of one confirmed small holding and 67 suspect holdings have been collated through the 2007 survey and site visits, with a corresponding estimated volume of 87 litres of suspect PCBs. This is a reduction of 101 suspect small holdings and a reduction of 3,119 litres of suspect PCBs since the 2001 PCB Inventory.

The reason for this reduction may be due to the fact that in 2007 companies were more knowledgeable on how to complete the survey and therefore identified a greater number of suspect PCB holdings which would result in that company being classified as a large holding. Also, the 2007 PCB survey was a more focussed survey including a larger number of site visits to survey respondents and included some key non respondents of the 2001 survey. Since 2001, it is expected that a large number of older fluorescent lighting units with potentially PCB containing ballasts have been replaced and disposed of.

Some suspected small holdings identified in 2001 could not be contacted during the 2007 survey either due to site closures or unavailability of personnel to complete the survey. These 74 suspected small holdings accounted for an additional 834 litres of suspected PCBs. See Table 4 for a summary of the inventoried estimate of small holdings.

Tables 3 and 4 summarise the estimate of large and small holdings, respectively, that were identified during the 2007 survey. Some of the holdings identified in Tables 3 and 4 are based on estimates of potential PCB holdings likely to be present in items of electrical equipment, which have been made in the absence of more accurate information.

[3] These suspected holdings comprised 4 transformers with a combined total of 3,433 litres of oil and 4000 fluorescent light ballasts with approximately 60 litres of oil.

Table 3 Summary of inventoried estimate of large holdings[4]

2007 Suspect Individual Holdings >5 litres PCBs										
Transformers		Capacitors		Power factor correction units		Oil filled circuit breakers		Fluorescent Light ballasts		Total Volume (litres)
No. of units	Volume (litres)	No. of units	Volume (litres)	No. of units	Volume (litres)	No. of units	Volume (litres)	No. of units	Volume (litres)	
265	157,784	335	1,020	163	906	329	14,551	10,100	107	174,368[5]
2001 Suspect Individual Holdings >5 litres PCBs not confirmed in 2007										
4	3,433							4,000	60	3,493
Total estimated volume of suspect PCB holdings >5 litres										**177,861**

[4] Please note that tables 3 and 4 include confirmed and suspected PCB holdings

[5] 1,033 litres of this total has been confirmed as PCB holdings

Table 4 Summary of inventoried estimate of small holdings

2007 Suspect Individual Holdings <5 litres PCBs								
Capacitors		Power factor correction units		Oil filled circuit breakers		Fluorescent Light ballasts		Total Volume (litres)
No. of units	Volume (litres)	No. of units	Volume (litres)	No. of units	Volume (litres)	No. of units	Volume (litres)	
6	12	9	16	1	3	6223	56	87[6]
2001 Suspect Individual Holdings < 5 litres PCBs not confirmed in 2007[7]								
						48,255	834	834
Total estimated volume of suspect PCB holdings <5 litres								**921**

[6] 4 litres of this total has been confirmed as PCB holdings.

[7] Suspect large and small PCB holdings from the 2001 PCB survey that could not be confirmed in 2007 have been included in these updated estimates. Efforts will be made by the EPA to track these holdings in the future.

3.2 Estimate of non-inventoried holdings

Many items of household or commercial electrical equipment manufactured prior to 1989 have the potential to contain small amounts of PCBs in the capacitors[8]. Common items that may contain oil-filled capacitors include:

refrigerators;	air conditioners;
microwave ovens;	dehumidifiers;
cookers;	radios;
washing machines and dryers;	photocopying machines;
dishwashers;	oil burners;
milking equipment;	submersible pumps; and
shearing equipment;	fluorescent light ballasts or starters

Each capacitor may contain 20-30 ml of PCBs and some equipment items may contain more than one capacitor. The oil used in capacitors was typically undiluted PCBs and would exceed the 0.05% and 0.005% concentration thresholds. Therefore, almost any industrial, commercial or residential property with electrical equipment manufactured prior to 1989 (see Appendix A) has the potential to be considered a small PCB holding.

The identification of PCB sources in New Zealand shows that the most significant sources of small holdings are:

- fluorescent lighting ballasts in commercial and public buildings (hospitals, schools, etc.);
- capacitors contained in dairy and shearing equipment; and
- street lights.

A small holding may, on closer inspection, contain more than 5 litres of PCBs located in various small items of equipment. For example, a small to medium sized older building, with a floor space of 800m^2 and an average light spacing of one fluorescent fixture per 5m^2, could conceivably contain over 5 litres cumulatively of PCBs in the lighting ballasts and starter capacitors alone.

Table 5 contains a preliminary estimate of the extent of non-inventoried large and small holdings in Ireland. The calculations presented are a best estimate based on existing data and are presented with a degree of uncertainty due to a number of assumptions that have been made such as the rate of replacement of old electrical equipment with new equipment. They do however provide an illustration of the possible scale of use and distribution of PCBs. Some of the calculations are based on

[8] A USEPA survey estimated that 25% of all household white goods have PCB-containing capacitors (Management of Polychlorinated Biphenyls in the United States, USEPA, 1997).

observations made during site visits carried out as part of this project during 2007 and 2008 to a number of schools and farms.

Table 5 does not include an estimate of PCB-containing capacitors that may be contained in household white goods as it is expected that the majority of household white goods older than 19 years will have been disposed of by now. In discussion with professional bodies such as WEEE Ireland and the European Recycling Platform (ERP) relating to waste electronic and electrical equipment (WEEE) in Ireland, the average age of WEEE being disposed of is approximately 9 years. These discussions also revealed that since the implementation of the WEEE regulations in Ireland, no PCB material has been found associated with WEEE. A site visit was also undertaken in March 2008 to Techrec Ireland Ltd in Dublin. Techrec are one of the largest WEEE recyclers in Ireland. Capacitors are removed from WEEE as part of their dismantling process and are separated based on size. These capacitors are exported for disposal abroad. Any capacitor removed from old WEEE in the future that may contain PCBs will be treated in this manner.

Table 5 Summary of non-inventoried holdings

Facility Type	**Total No. of premises older than 1989**	**Estimated volume of PCBs (litres)**
Schools and colleges	3,067	3,022
Commercial Premises	78,571	102,142
Street Lighting	54,877	1,646
Farms	122,040	18,306
Total	**258,735**	**125,116**

*Table 5 does not include an estimate of all large holdings yet to be notified.

3.3 Summary of inventoried and non-inventoried holdings

Table 6 contains an overview of the reported volumes of inventoried and non-inventoried suspected PCB holdings identified in 2001 and 2007. Overall there appears to be a reduction of 30,157 litres of suspected PCB oils since the 2001 survey. However it is anticipated that the confirmed volume of PCB oils identified as a result of the 2007 survey will in fact be much lower. This is based on laboratory results received during the 2007 survey which indicate that only a fraction of suspect PCB holdings that were tested were actually confirmed as PCB holdings on the basis of laboratory analysis which indicated a PCB concentration of greater than 0.005% (50 ppm).

The national PCB inventory will be updated on a regular basis by the EPA as information is received from PCB holders. Examples of such information include;

- removal or decommissioning of PCB containing equipment,
- receipt of laboratory results confirming PCB or PCB-free status.

Table 6 – Summary of inventoried and non-inventoried holdings

Year	**Summary volume of inventoried large and small holdings (litres)**	**Summary volume of estimated non-inventoried holdings (litres)**	**Total Volume of Suspected PCB oil (litres)**
2001	70,256	263,787	334,043
2007	178,782	125,116	303,898
Estimated reduction in suspect PCB volume from 2001 to 2007			**30,145**

4 IDENTIFICATION OF PCBs AND CONTAMINATED EQUIPMENT

Article 13(2), Waste Management (Hazardous Waste) Regulations, 1998

"Any equipment of a type which is likely to contain PCBs shall … be considered as containing PCBs unless it is reasonable to assume the contrary."

4.1 Identification of Equipment

Historical production of PCBs is known to have been undertaken by manufacturing facilities in the USA, UK, France, Italy, USSR, Germany, Spain, Czechoslovakia, Austria, China and Japan. PCBs were commercially manufactured for over 60 years by dozens of manufacturers using over 100 different trade names. The large variety of equipment and oil names and a general inadequacy of equipment labelling complicates the identification of PCB-containing equipment.

The following information is provided to assist with the identification of PCB oils and associated equipment:

- **Appendix F** – a list of common trade names for the various mixtures of PCB oils. Where possible, the country of origin and/or manufacturer has also been identified.
- **Appendix G** – a list of transformer manufacturers reported to have used PCB oils in their equipment; and
- **Appendix H** – a list of capacitor manufacturers reported to have used PCB oils in their equipment

The lists in the Appendices should not be assumed to be exhaustive or all-inclusive. If there is any doubt about whether an item of equipment contains PCBs, it should be assumed that it does. Additional information under any one of the above categories, or additional information that might assist in the identification of PCBs and contaminated equipment, should be forwarded to the EPA at the address given on the title page of this document.

The following should be used as a guide in the identification of PCB-containing equipment. Analytical testing is always recommended prior to disposal of equipment suspected of containing PCBs.

Transformers: Review the manufacturer's name plate and compare against Appendix F and Appendix G. If a match is found it may be assumed that it contains 600,000-700,000 ppm PCBs[9]. Where such data is not available, an estimate of the unit's age should be made. Units manufactured in the USA after 1977 should contain a 'PCB-free' label. In the EU, the sale of certain items of PCB-containing equipment was banned from 1986. On the other hand, some transformer manufacturers in the USSR were still using PCBs up until 1993. Therefore, in the absence of contrary information, any transformer which was manufactured in 1986 or earlier (or if from the USSR or former USSR

[9] Polychlorinated Biphenyls, USEPA Region III Waste and Chemicals Management Division, 2001.

countries, 1993 or earlier) should be considered to potentially contain PCB oils until such time as analytical testing or other evidence may prove otherwise.

The volume of oil will vary greatly from unit to unit and may range from 0.2 to 4,000 litres. Where the volume is not specified on the equipment, an initial estimate may be made by measuring the outer dimensions of the transformer. Wet cell transformers typically contain 50-80% fluid by volume.

Capacitors: Review the manufacturer's name plate and compare against Appendix D and Appendix H. PCBs are known to have been used in capacitors up until 1989 and in the absence of contrary information, any capacitor manufactured during or prior to 1989 should be assumed to contain PCBs.

Typically a capacitor containing PCBs will be a completely sealed unit with two electric contacts. Over 70% of all capacitors are used as power capacitors and will contain 10 to 20 litres of oil. Small capacitors, such as those associated with household appliances, generally contain 0.05 to 1.8 litres of oil.

Power factor correction (PFC) units: Review the manufacturer's name plate and compare against Appendix F and Appendix H. Power factor correction units are typically comprised of several smaller capacitors and therefore the PCB-free date is the same as capacitors, i.e. post-1989. Power factor correction units are generally of uniform size (approximately 60x30x15 cm) and contain approximately 1.8 litres of oil.

Oil filled circuit breakers: Review the manufacturer's name plate and compare against Appendix F and Appendix H. PCBs are known to have been used in oil filled circuit breakers up until 1989 and in the absence of contrary information, any oil filled circuit breaker manufactured during or prior to 1989 should be assumed to contain PCBs.

The volume of oil in an oil filled circuit breaker will vary greatly from unit to unit and may range from 1 litre to 500 litres. Where the volume is not specified on the equipment, an initial estimate may be made by measuring the outer dimensions of the unit in which the breakers are submerged. Many modern circuit breakers will be air or gas insulated and may have the letters 'ACB' on the equipment (Air Circuit Breaker).

Lighting ballasts: Lighting ballasts rarely display sufficient technical details to determine their PCB-status. Ballasts manufactured in the USA after 1979 will have 'PCB-free' labels attached. No such equivalent requirement in the EU is known to exist. As a general rule, all lighting ballasts manufactured before 1989 that do not contain a 'PCB-free' label should be considered to contain PCBs. Each lighting ballast typically contains 0.01 to 0.03 litres of PCB fluid and there is generally one ballast for every two fluorescent lighting tubes.

All holders of electrical equipment should systematically determine whether their equipment contains or potentially contains PCBs. Any PCB-containing equipment or suspect PCB-containing equipment should be notified to the EPA in accordance with the Code of Practice in Appendix A.

The EPA will continue to update the available information on the identification of PCB holdings as it becomes available. Any such information should be submitted to the EPA.

4.2 Testing and analysis

Oil filled electrical transformers, capacitors and oil filled circuit breakers older than 1986 and 1989 (inclusive) respectively should be assumed to contain PCBs unless analytical testing or appropriate labelling indicates that the units are PCB-free (i.e. contain less than 0.005% by weight PCBs).

It is often not possible to access the oil in a sealed electrical unit. In such cases, it is not reasonable to test the unit before it is taken out of service for disposal. Such units should be assumed to contain PCBs as described above (section 4.1).

For sampling, ASTM Standard D-923 (Sampling) is the recommended reference method for obtaining liquid samples for analysis.

For analysis, Commission Decision 2001/68/EC established two reference methods of measurement for PCBs pursuant to Article 10(a) of the PCB Directive. European standards EN 12766-1 and prEN 12766-2 and subsequently upgraded versions shall be applied as the reference method for the determination of PCBs in petroleum products and used oils. European standard IEC 61619 and subsequently revisions shall be applied as the reference method for the determination of PCBs in insulating liquids.

Analysis for total organic chlorine or chloride is not an acceptable test method for quantifying PCB concentration.

One company in Ireland who acts as an agent for a laboratory in the UK has been identified by the EPA as providing PCB analysis services to the European standards identified. At the time of preparing this report, another laboratory based in Ireland is in the process of setting up a PCB analysis procedure. Further information on testing laboratories should be submitted to the EPA at the address given in the title page of this document. See Appendix J for laboratory contact details.

There are a number of commercial PCB test kits available which can be used by ‘non-chemists’ as an initial screen for PCBs. Common trade names include Clor-N-Oil and Clor-D-Tech. Additional details (including USEPA assessments) of these and other tests are provided on the websites of the following organisations:

- **Dexsil** corporation [10] - Dexsil manufacture portable test kits and instruments for the detection and quantification of contaminants in soil, water and oil. http://www.dexsil.com/
- **United States Environmental Protection Agency [11] – (USEPA)** http://www.epa.gov/

[10] http://www.dexsil.com/uploads/docs/dtr_0501.pdf

[11] http://nlquery.epa.gov/epasearch/epasearch?querytext=PCB+test+kits&submit=Go&typeofsearch=epa&areasidebar=epahome_sidebar&fld=epapages&areaname=&areacontacts=http%3A%2F%2Fwww.epa.gov%2Fcomments.htm&areasearchurl=&result_template=epafiles_default.xsl&filter=samplefilt.hts

The kits may be used as screening tools in the field but cannot be relied upon to provide accurate results. Hence any indication of potential PCB content as a result of the use of a test kit should be verified by formal laboratory tests.

All appropriate health and safety measures must be taken when accessing electrical equipment for sampling. Advice should be sought from an appropriately qualified person or from the Health and Safety Authority.

Original laboratory reports for PCB analysis may be requested during an audit of PCB holdings and should be retained.

5 MANAGEMENT OF PCBs

5.1 In Use Management of PCBs.

Appendix A contains a code of practice entitled '*The In-use Management of Polychlorinated Biphenyls (PCBs) & PCB containing equipment*'.

The code of practice has been developed so that holders of PCBs and PCB contaminated equipment can minimise the risk to the environment from PCB holdings and avoid potential liabilities associated with holding and managing PCBs. The code of practice contains practical information for holders of PCBs on the appropriate storage of PCBs, labelling of PCB holdings, notifying the EPA of PCB holdings, and disposing of PCBs. The code of practice also contains information on the potential health effects associated with PCBs and how to react to emergency situations associated with PCBs.

5.2 Disposal of Large PCB Holdings

Large holdings of PCBs are to be disposed of:

- as soon as possible in the case of PCBs or used PCBs; or
- by 2010 in the case of equipment contaminated by or containing more than 5 litres of PCBs.

Large holdings are most likely to be in the possession of large organisations who should have little difficulty in arranging for a waste contractor to collect and dispose of PCBs. From an economic point of view, holders of PCBs should endeavour to take the opportunity, where possible, to investigate and dispose of all PCBs as part of the same exercise. As the size of a job increases, the unit charge for disposal is likely to be less.

The 2010 deadline is considered adequate for PCB holders to investigate their requirements in terms of equipment replacement and PCB disposal. However, earlier disposal will ensure that a holder is removed from the national PCB inventory and that ongoing annual registration fees are not incurred.

5.3 Disposal of Small PCB Holdings

Small holdings are not always so attractive commercially for waste contractors to collect and consequently proportionately larger charges are likely to apply. In addition, small holders may be unable or unwilling to pay the costs associated with hazardous waste disposal. Special arrangements for the collection and disposal of small holdings may be required as outlined in Section 6 of the management plan.

As mentioned above, the small holdings are most likely to be capacitors contained in everyday electrical equipment. Each capacitor may contain 20-30 ml of PCBs and some items of equipment may contain more than one capacitor. Some of the most significant sources are relatively easily identified and are may include fluorescent lighting ballasts, including street lights, and capacitors contained in farm dairy equipment. Such items are often likely to come to light only upon replacement or during building refurbishment. Electricians, electrical and demolition engineers, building managers,

waste contractors and other target groups will be provided with relevant information for awareness purposes so that:

- they can identify known or suspected PCB containing equipment; and
- they can safely organise the removal and management of that equipment.

There is currently no prescribed timetable for the disposal of small PCB holdings. This means that PCBs may continue to arise as waste for the next decade or more. The generation of small holdings will be kept under review by the EPA. Where progress on the disposal of small holdings is not deemed to be adequate further instruments or incentives may be required. Such instruments might include;

- a national contract for the disposal of small PCB holdings
- an absolute deadline for the removal of small PCB holdings. This would require legislative amendments incorporating specific legal requirements and timelines for PCB disposal by the Department of Environment, Heritage and Local Government (DoEHLG).
- consideration of drop off facilities at civic amenity sites and other suitable locations for small businesses who may possess small PCB holdings.

The following factors, combined with effective information and awareness raising, may contribute towards accelerating the removal and disposal of PCBs and ensuring that PCBs do not cause environmental pollution.

Small holdings are now at least 19 years old and many (if not most) will be coming to the end of their useful lives by 2010. In addition, existing regulation requires that:

- all PCB waste is to be kept separate from all other waste types; and
- no PCB waste may be disposed of at landfill sites in Ireland.

If existing legislation is effectively enforced, particularly in terms of electrical and demolition contractors and at landfill sites, then the risk of environmental pollution resulting from PCB removal and disposal will be minimised.

Progress in disposing of small holdings will be monitored and the recommendations made here may be amended where considered necessary.

6 ACTIONS

The co-operation of industry and commercial representative organisations is essential in ensuring that PCBs are removed and disposed of in accordance with legislative requirements. The EPA would prefer to see accelerated removal and disposal of PCBs, not only of large holdings but also of low volume and dispersed small holdings, particularly where these may be located in areas such as food production, healthcare and educational facilities. The following actions[12] will be taken by the EPA to assist in the removal and disposal of PCBs;

- The EPA will periodically review the list of PCB holdings through correspondence, inspection and other appropriate measures. All holders will be contacted individually with a request to demonstrate the PCB status of suspect equipment. This measure will increase the pace at which suspect holdings are either removed from the inventory because they are nil holdings or at which they become confirmed PCB holdings.

- A national inventory of suspected and confirmed PCB holdings will be published on the EPA website in 2008. This will be updated by the EPA as new information is received from holdings regarding their PCB status.

- A PCB holding notification fee of € 125 will be maintained to cover administrative costs in updating and managing the inventory. PCB holdings should be notified annually to the EPA by the 1st of September. See Notification Form in Appendix C.

- The EPA will investigate and may initiate enforcement actions regarding any failure or alleged failure to comply with the 2010 deadline for the removal of large holdings of PCBs.

- A poor level of awareness still exists in terms of the risks associated with PCBs and the associated legislative requirements. The EPA will provide appropriate information and liaise with public and industry to improve the awareness on PCB issues. Examples of awareness measures include the following;

    - For local authorities each environmental awareness officer and green business officer will be provided with a copy of the PCB Management Plan. Copies will also be provided to Directors of Service for water in relation to waste water treatment plants and drinking water treatment plants.

    - An Taisce will be asked to promote awareness of PCBs through the Green Schools and Green Homes programmes. Incentives to remove fluorescent lighting units older than 1989 could be incorporated into the schools green code.

[12] It should be noted however that until suspect PCB holdings have been established as PCB free OR confirmed PCB holdings there exists a great deal of uncertainty as to the amount of PCBs remaining in Ireland. During the 2007 survey numerous companies provided analytical results of suspected PCB holdings at the request of the EPA. Only 3 results returned a PCB concentration of >0.005%. Therefore the actions outlined may be revised once the quantity of confirmed PCB holdings has been established.

- Recommendations regarding the management of PCBs and PCB waste will be considered in the context of broader recommendations proposed under the National Hazardous Waste Management Plan[13]. For example, the collection of small items of equipment that may contain PCBs will be included in the scope of works for the preparation of a code of practice for the acceptance and management of small scale hazardous waste at civic amenity sites.

[13] The Plan can be downloaded at www.epa.ie/whatwedo/resource/hazardous/.

7 INFORMATION AND AWARENESS

During the survey and site visits carried out in 2007, it was evident that many organisations were unaware of their obligations to report holdings of PCBs. There was also a general lack of awareness of the fact the PCBs were contained in certain items of equipment. In order to increase the level of awareness of PCBs and to improve the rate of notifications, the following tasks will be undertaken by the EPA:

Publication of this Management Plan and circulation to stakeholders including:

- Relevant government departments;
- Business and employers representative bodies;
- Farming associations;
- Demolition and construction representative bodies;
- Electrical contractors associations;
- Hazardous waste contractors and waste management industry;
- Local authorities.

To increase awareness of PCB issues, the EPA will also consider the publication of information on PCBs in relevant publications and locations. Liaison with appropriate stakeholders and media outlets will be required for these awareness activities to be successful. Information developed to increase awareness of PCB issues will be published on the EPA's PCB webpage (http://www.epa.ie/whatwedo/resource/hazardous/pcb/) and will also be disseminated to relevant target groups.

Appendix A: Code of Practice for the in-use management of Polychlorinated Biphenyls (PCBs) and PCB-containing equipment.

CONTENTS

Section **Page No**

1. IN-USE & MANAGEMENT OF PCBS & PCB CONTAINING EQUIPMENT

PCBs[14] and PCB-contaminated equipment[15] that are still in use (i.e. awaiting replacement/decommissioning) or in storage (i.e. awaiting disposal) should be appropriately managed to minimise the risk to the surrounding environment. This code of practice describes best practice methods for the safe storage and management of PCBs.

Holders of PCBs should put in place a formal written procedure entitled '***Management of PCB Holdings***' which will aim to minimise the safety and environmental risks associated with PCBs. The procedure should refer to this code of practice and the Management Plan for PCBs.

1.1 Storage of PCBs

PCBs can include any or all of the following categories of material:

- PCB-contaminated equipment such as capacitors and transformers (in-use equipment);
- PCB liquid wastes drained from equipment and collected from drip trays;
- PCB contaminated materials such as soil, absorbent material, clothing, rags and handling equipment.

The following sections provide guidance on safe storage options for the above categories.

1.1.1 In-Use Equipment

In-use PCB-contaminated equipment such as transformers should be stored in a bund made from a material impervious to PCBs such as steel.

The bunding used for in-use PCB-contaminated equipment should, as a minimum, be bunded locally or remotely to a volume not less than the greater of the following:-

(i) 110% of the capacity of the largest tank or drum within the bunded area; or

(ii) 25% of the total volume of substances which could be stored within the bunded area.

The PCB contaminated equipment should be listed on an inspection schedule so that any potential leaks can be prevented through appropriate maintenance.

[14] Throughout this code of practice PCBs are defined as polychlorinated biphenyls, polychlorinated terphenyls, monomethyl-tetrachloro-diphenyl methane, monomethyl-dichloro-diphenyl methane, monomethyl-dibromo-diphenyl methane and any mixture of substances containing any one or more of the aforementioned substances in an aggregate amount which by weight exceeds 0.005% (or 50ppm) by weight of the mixture.

[15] For the purpose of this code of practice any item of equipment (e.g. transformer, capacitor, etc), which contains, or contained, PCBs at concentrations above 0.005% (or 50ppm) by weight of PCBs, and has not been subject to decontamination, is defined as PCB-contaminated equipment.

To prevent leaks or spills from in use equipment the following additional measures should be adopted:

- A **monthly inspection schedule** should be devised to ensure that PCB-contaminated equipment is inspected regularly and maintained so that any potential leaks are prevented. A suggested checklist format is provided in **Table 1**;

- **Drain valves** on PCB-contaminated equipment should be securely closed in a way that will prevent inadvertent or unauthorised opening. Valves should be labelled 'Risk of PCB spillage – do not open';

- In addition to bund provision, **spill containment measures** such as metal drip trays or absorbent mats should be fitted to installations where possible. Spill kits should be provided near installations and procedures should be in place for the management of used spill abatement materials that may contain PCBs;

- **PCB spillages** should not be able to reach floor drains. Where there is a risk of this occurring, and the risk cannot be avoided, drains should be capable of diversion to suitable containment or temporarily sealed by using appropriate drain seals or drain protectors;

- As part of the recommended written procedure *'Management of PCB Holdings'*, an **Accident Prevention and Emergency Response Plan** should be prepared and should incorporate the steps to be taken in the event of a spill of PCBs. This plan should be known and available to all staff (refer to **Section 3** of this code of practice).

Any leakage or spillage of PCBs should be cleaned up and stored prior to disposal as outlined in **Sections 1.1.2** and **3**.

1.1.2 Storage of Decommissioned / Waste PCBs

Decommissioned PCB-contaminated equipment or PCB waste should be transferred to a secure, and well labelled store as it is removed from service or as waste is generated. Between the time of generation of the waste and its placement in storage, all due care should be taken to prevent accidental release of PCBs.

Waste PCBs and small items of decommissioned PCB-contaminated equipment should be moved and stored in appropriate sealed containers (e.g. UN approved hazardous waste containers) made of steel or other metals that provide sufficient durability and strength to resist any chemical action by liquid PCBs. Containers should have close fitting lids, which can be hermetically sealed.

Waste PCBs and decommissioned PCB-contaminated equipment should be stored on a floor or surface that is PCB resistant and that is appropriately bunded as outlined in **Section 1.1.1** above.

1.1.2.1 Design of Storage Areas

Storage areas for decommissioned PCB-contaminated equipment and PCB wastes should have the following characteristics:

- Security – The PCB storage area should be securely locked and access should be restricted to authorised personnel;
- Fire protection – PCBs and PCB-contaminated equipment must be kept separate from flammable materials and holders should take all necessary precautions to avoid any risk of fire involving PCBs. The storage of combustibles should not be allowed within 10 metres of the PCB store. Appropriate fire fighting equipment should be available for use in the immediate vicinity of the store area;
- Spill containment - All floor drains, sumps or other openings in the floor of the storage facility should be closed and sealed to prevent the release of liquids. Drains should be capable of diversion to suitable containment or temporarily sealed by using appropriate drain seals or drain protectors. Spill containment equipment should be readily available inside the store;
- Segregation of PCBs - No other waste should be stored within the area and no manufacturing or other activity should be undertaken. Solids and liquids should be stored in separate drums;
- Weatherproofing – Where possible, it is recommended that the PCB store be located indoors. If this is not possible an outside storage area should be covered with a waterproof barrier that protects the PCB containing equipment or containers and prevents moisture from entering the bunded storage area;
- Adequate ventilation – The store should have a fresh air inlet and an air exhaust to the outside.

A copy of the Accident Prevention and Emergency Response Plan should be posted in the store. A first aid kit should also be located inside the store.

Large capacity PCB storage facilities should have a central receiving area where PCB equipment and wastes are loaded and unloaded from transport vehicles. This area should have an impervious floor and a containment system to control any spills during loading and unloading of PCBs. Further guidance on the design of storage areas and general storage requirements can be obtained in the EPA's IPPC guidance note on the *Storage and Transfer of Material for Scheduled Activities*. (http://www.epa.ie/downloads/advice/general/)

1.1.2.2 Maintenance and Inspection of Storage Facilities

Personnel working at the storage facility should be made aware of safety and environmental risks associated with PCBs and should be trained in the use of personal protective equipment (PPE) and cleanup techniques (refer to **Section 2**).

A register of all waste PCB movements should be maintained. This register should record the type, nature and quantity for all incoming and outgoing wastes. The register should specifically record the following information on outgoing wastes:

- the weight and a detailed description of the waste PCB waste including European Waste Code (EWC);
- the name of the carrier of the waste and their waste collection permit details;
- details of the ultimate disposal destination of the waste and its permit/licence details;
- copies of all C1 and / or TFS documentation;
- written confirmation of the disposal of the waste PCBs.

The storage facility should be inspected at least monthly to ensure that PCB-contaminated equipment and PCB waste materials are appropriately stored so that any potential leaks are prevented. An example of an Equipment and Storage Facility Inspection Checklist is provided in Table 1 below. This checklist could also be used for in-use PCB contaminated equipment and PCB waste materials. A signed and dated checklist should be kept on file.

Table 1 – Monthly PCB In Use Equipment and Storage Facility Inspection Checklist

Monthly PCB Storage Facility Inspection Checklist				
Item for inspection	**Compliant* (please tick)**		**Observation**	**Corrective Action**
	Yes	**No**		
PCB equipment	√			
PCB containers		√	**Corrosion was observed on a 205L drum containing waste PCBs**	**Appropriate PPE was worn and wastes were transferred to a suitable UN approved 205L drum.**
Floors	√			
Drains	√			
Drainage systems	√			
Bund capacity	√			
Fire prevention apparatus	√			
PPE	√			
Security	√			
Date		**Signature**		

*Compliant means that the piece of equipment, waste material or storage area does not, in its present condition pose a threat to the environment or a health and safety risk.

Any equipment or container found to be leaking PCBs should be repaired or replaced and any contaminated area cleaned up as outlined in **Section 3.**

1.2 Labelling of PCB Holdings

The purpose of labelling is to:

- provide immediate identification of PCB equipment and PCB wastes;
- alert personnel that the labelled equipment or waste requires special handling and disposal considerations;
- alert personnel to the presence of PCBs in the event of a spill, leakage or emergency;
- assist holders of PCBs in reporting on their PCB inventories and;
- assist with record keeping.

1.2.1 Labelling of In-Service Equipment

PCB identification labels[16] are a requirement of the Waste Management (Hazardous Waste) Regulations, 1998. Labels shall be affixed to;

- Any equipment containing more than 5 litres of PCBs (large PCB holdings);
  - equipment where it is reasonable to assume that the equipment contains PCBs at a concentration between 500 ppm and 50 ppm (and where the equipment contains more than 5 litres of PCBs) then that item of equipment may be labelled as "PCBs contaminated < 500ppm".
- To the door of the premises where the equipment is located,
- To decontaminated transformers.

The labels should state that the equipment (or premises containing equipment) is "*Contaminated by PCBs*". The signage shall be visible, legible, indelible and a contrasting colour to the equipment they are affixed to.

Health and Safety Labelling

In order to comply with safety, health and welfare at work regulations[17] a label of the type shown in **Figure 1** should be used in conjunction with labels that contain text. The reason for this requirement is that signs are intended to be understood independently of the literacy or language ability of the

[16] As outlined in the Waste Management (Hazardous Waste) Regulations, 1998 http://www.irishstatutebook.ie/1998/en/si/0163.html

[17] Safety, Health and Welfare at Work (General Application) Regulations, 2007 http://www.hsa.ie/eng/Legislation/Acts/Safety_Health_and_Welfare_at_Work/General_Application_Regulations_2007/

worker viewing it. For more detailed information on these Regulations and PCB health and safety related issues, please contact the Workplace Contact Unit of the Health and Safety Authority whose contact details are provided in **Appendix B**.

Figure 1 Toxic Material

The safety, health and welfare at work regulations also require employers to provide information to employees regarding potential risks in the workplace.

PCB Labelling

There are specific labelling requirements for PCBs, used PCBs or contaminated equipment under Article 14(d) of the Waste Management (Hazardous Waste) Regulations, 1998. Suggested labels are presented in Figures 2 to 4 below. **Figures 2 and 3** are designed for use on in service equipment that contain large confirmed (**Figure 2)** and suspect (**Figure 3)** PCB holdings (i.e. greater than 5 L). Alternatively these labels can be placed on the door of the premises where the PCB contaminated equipment is contained.

Figure 2: Label for confirmed PCB contaminated equipment

WARNING PCBs
CONTAMINATED 0.05%

Internal PCB Oil Contamination Greater than 0.05% (500ppm). Awaiting Disposal. Wear Appropriate PPE.

For Proper Disposal Information contact

…….

Figure 3: Label for suspect PCB contaminated equipment

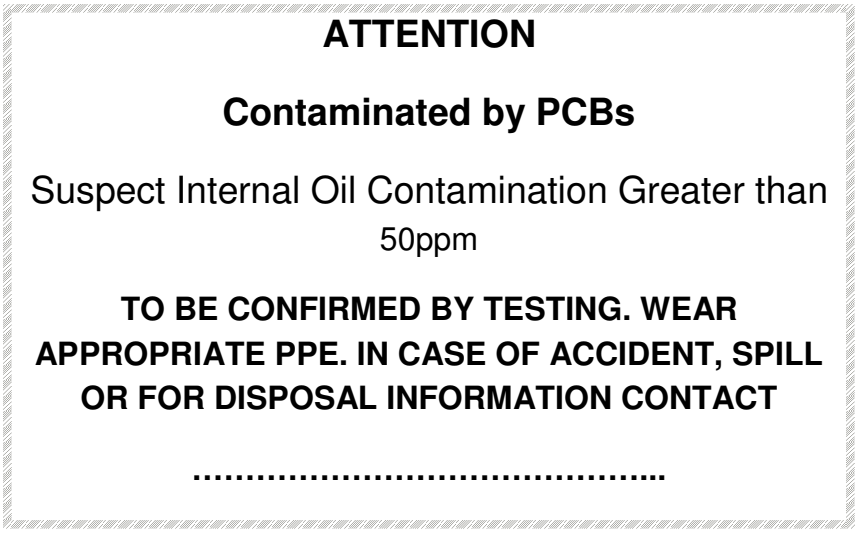
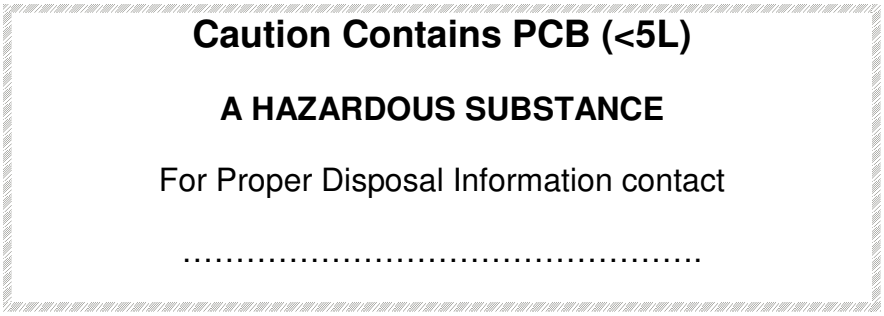


Figure 4 is a recommended label for small PCB holdings (i.e. less than 5 L).

Figure 4: Label for small PCB equipment



The proper labelling of in-service PCB equipment will ensure that it is correctly identified when it enters the waste stream. The PCB label also alerts people to the presence of PCBs in the equipment and assists in inventory control while in service, and later, during handling, storage, and disposal.

1.2.2 Labelling of PCB Waste or a PCB Decontaminated Transformer

All labels applied to in-service equipment, according to the requirements given in **Section 1.2.1**, should be left on that equipment when it becomes waste, unless liquids have been decontaminated to less than 0.005% of PCBs whereby the label in **Figure 5** should be used.

It is a legal requirement under Article 14(d) of the Waste Management (Hazardous Waste) Regulations, 1998 that a decontaminated transformer must be clearly marked with an indelible and embossed or engraved sign, which must include the following information:

Figure 5: Decontaminated Transformer

DECONTAMINATED Transformer

Fluid containing PCBs was replaced
_ with ……..(name of substitute)
_ on ……(date)
_ by …… (undertaking)

Concentration of PCBs in
_ old fluid ……(% by weight)
_ new fluid ……..(% by weight)

1.3 Notifying the EPA of a PCB Holding

Holders of PCBs, used PCBs or contaminated equipment containing more than 5 litres of PCBs are obliged to give notice in writing to the EPA by the 1st of September each year regarding such holdings. Specifically the following information must be provided:

1. The name and address of the holder;
2. The location and quantity of the PCBs or used PCBs;
3. The location and description of the equipment;
4. The quantity of PCBs contained in such equipment;
5. The measures taken or proposed to be taken (including a timescale) for the decontamination or disposal, as the case may be, of the said PCBs, used PCBs and equipment; and
6. The date of giving such notice.

A notification fee to cover the administration of PCB holding notifications is also required. This fee is **€ 125**. A blank PCB notification form is provided in **Appendix C** of this document.

It is recommended that holders of PCBs copy their PCB notification to their local authority and Fire Officer as, in the event of fire, the presence of PCBs may present a health and environmental pollution risk.

1.4 Disposal of PCBs

When oil-filled electrical transformers older than 1986 (inclusive) and capacitors, power factor correction units, lighting ballasts and oil filled circuit breakers older than 1989 (inclusive) are being decommissioned they should be assumed to contain PCBs unless analytical testing or appropriate labelling indicates that the units are PCB-free. Analytical tests may be an appropriate means of demonstrating the PCB-free status of equipment.

1.4.1 Analytical Testing

For sampling, ASTM Standard D-923 (Sampling) is the recommended reference method for obtaining liquid samples for analysis. Contact details for ASTM International Standards are provided in **Appendix B**.

For analysis, Commission Decision 2001/68/EC established two reference methods of measurement for PCBs pursuant to Article 10(a) of the PCB Directive. European standards EN 12766-1 and prEN 12766-2 and subsequent revisions shall be applied as the reference method for the determination of PCBs in petroleum products and used oils. European standard IEC 61619 and subsequent revisions shall be applied as the reference method for the determination of PCBs in insulating liquids. European Standards are available from the European Committee for Standardisation whose contact details can be found in **Appendix B**.

Please note that analysis for total organic chlorine or chloride is not an acceptable test method for quantifying PCB concentration.

1.4.2 Decontamination of PCB contaminated equipment

Transformers containing more than 0.05% (500ppm) by weight of PCBs should be decontaminated so as to reduce the level of PCBs, if possible, to less than 0.005% (50ppm) by weight. The replacement fluid, not containing PCBs, must entail markedly lesser risks. The replacement of the fluid must not compromise the subsequent disposal of the PCBs.

Decontamination of PCB-contaminated equipment is probably not economical except in the case of large, valuable pieces of equipment. This practice has declined in popularity as it becomes more economical to dispose of and replace aging equipment. Furthermore the replacement dielectric fluid is likely to become contaminated with PCBs which may leach from porous components of the transformer into the replacement dielectric fluid.

Photograph 1 – Decontamination of a Transformer[18]

The choice and economic feasibility of decontamination versus transformer disposal should be carefully considered, given that the transformer which may need decontamination will now be 22 years or older and that a transformer generally has an effective life of about 30 years[19]. Decontamination will result in the generation of a significant volume of PCB-contaminated flushing solvent, which must be dealt with as a hazardous waste. If decontamination to less than 0.005% cannot be achieved, and the volume of fluid is greater than 5 litres, then a notifiable PCB holding still remains. Taking these considerations into account, it is recommended that old equipment containing PCBs be decommissioned and disposed of. Decontamination should only be considered where replacement is not an option for economic or operational reasons. Holders of PCBs will be asked to provide justification if they choose decontamination over equipment replacement. Where decontamination is a viable option then the following control measures should be implemented;

- Decontamination should only be carried out by experienced practitioners;
- Decontamination should be carried out in a suitably bunded area where there are no drains or floor valves leading to open areas;
- Appropriate spill control measures should be in place prior to decontamination;

[18] Photograph taken from United Nations Environment Programme Inventory of World-wide PCB Destruction Capacity First Issue December 1998

[19] PCB Transformers and Capacitors: From Management to Reclassification and Disposal, UNEP, 2002

- All hazardous wastes associated with the decontamination process including the PCB oil, washing solvent, contaminated clothing and used spill absorbent material should be dealt with as outlined in **Section 1.4.5** below.

- A thorough risk assessment should be carried out in advance to determine potential causes and sources of environmental pollution resulting from the decontamination activity. The risk assessment report should be provided to the local authority and emergency services and they should be notified in advance of the date of the decontamination.

1.4.3 Decommissioning of PCB Contaminated Equipment

Where PCB-contaminated equipment is to be decommissioned and replaced, PCBs should not be drained prior to decommissioning unless it is leaking. If the piece of equipment is leaking, immediate action must be taken to seal or plug the leak prior to decommissioning.

The equipment should first be checked to ensure it is suitable for transportation and to ensure that it is not leaking or contaminated externally with PCBs. The following measures should be adhered to when decommissioning PCB-contaminated equipment;

- Undertake an appropriate risk assessment of the activity, which will identify all potential risks and outline how these risks can be mitigated. The risk assessment should adhere to HSA guidelines[20];

- Ensure that all electrical equipment is safely and securely disconnected and isolated from all sources of energy. Electrical work should only be undertaken by a competent person;

- A PCB analysis should be conducted (**Section 1.4.1**). This will determine the PCB concentration in the contaminated equipment. Waste contractors will request this analysis or, in its absence, the piece of equipment will be assumed to contain >500ppm PCB;

- Transformer wheels if present, should be removed to prevent movement of the transformer during transportation;

- Capacitors should be externally short circuited by means of a fixed wire.

1.4.4 Disposal of fluorescent light fittings

If your fluorescent light fittings were fitted prior to 1989 there is a possibility that the ballast in the light fittings may contain PCBs. If your fittings and fluorescent lamps are being replaced with more modern fittings/lamps you must ensure that they are disposed of appropriately.

Under the WEEE Regulations[21], if your fittings/lamps are being replaced there is an obligation on your electrical supplier to take back old fittings/lamps on a one for one, like for like basis.

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[20] Guidelines on risk assessments and safety statements http://publications.hsa.ie/index.asp?docID=161

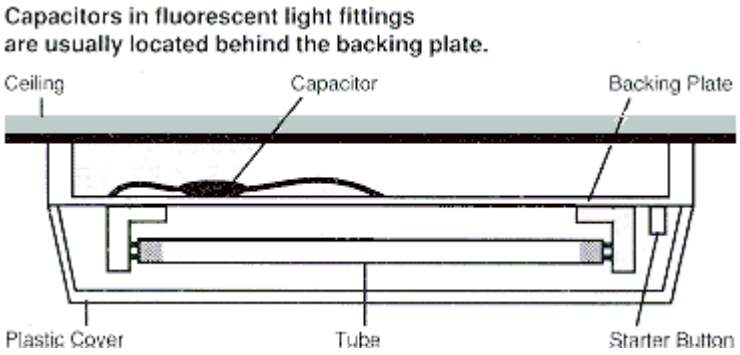
To ensure that you are dealing with a competent electrical contractor please ensure that they are members of a relevant trade organisation such as the Register of Electrical Contractors of Ireland (RECI) or the Electrical Contractors Safety & Standards Association (ECSSA). Also please ensure that your light fittings have been sourced from a registered producer. Producer registration status can be checked on the WEEE Register Society website, www.weeeregister.ie. Your electrical contractor will be able to confirm where they source their fittings from and should confirm for you that it is a registered producer.

The WEEE Register Society is the national registration body for producers of electrical and electronic equipment (EEE). The WEEE Register Society Category Listings (which can be downloaded from www.weeeregister.ie) outline the 10 categories of electrical and electronic equipment covered by the First Schedule of the WEEE Regulations. Light fittings and luminaries are detailed in Section 5.2 of the category listings.

Old light fittings or waste electrical equipment should never be disposed of along with general commercial waste.

If you have any complaints regarding a producer/contractor refusing to take back WEEE, or if you have any queries in relation to WEEE Regulations, please contact the Environmental Protection Agency's WEEE enforcement team on Lo Call 1890 33 55 99 or e-mail weee@epa.ie.

Figure 6: Diagram of fluorescent light fittings[22]



1.4.5 The Waste Disposal Process

PCBs and PCB contaminated equipment scheduled for disposal is classified as hazardous waste.

The European Waste Catalogue[23] and hazardous waste list is used for the classification of waste and hazardous waste and provides a consistent waste classification system across the EU. The relevant EWC codes for PCBs wastes are as follows:

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[21] Waste Management (Waste Electrical and Electronic Equipment) Regulations 2005 (S.I. No. 340 of 2005)

[22] http://www.docep.wa.gov.au/WorkSafe/Content/Safety_Topics/Hazardous_substances/Additional_resources/PCBSafeHandling.html

- 13 01 01* hydraulic oils, containing PCBs;
- 13 03 01* insulating or heat transmission oils containing PCBs;
- 16 01 09* components containing PCBs;
- 16 02 09* transformers and capacitors containing PCBs;
- 16 02 10* discarded equipment containing or contaminated by PCBs other than those mentioned in 16 02 09;
- 17 09 02* construction and demolition wastes containing PCB (for example PCB-containing sealants, PCB-containing resin-based floorings, PCB-containing sealed glazing units, PCB-containing capacitors).

(The '*' asterisk after the codes above signify a hazardous waste.)

In order to dispose of PCB waste the producer of such waste should engage a competent and appropriately authorised waste contractor who is familiar with all relevant waste and transportation regulations. There are currently no waste facilities in Ireland licensed to treat or dispose of PCB waste. Therefore all PCB waste must be exported for disposal. There is a network of licensed hazardous waste transfer stations where PCB waste can be stored in transit. See Appendix I for a list of hazardous waste contractors.

Any facility used for the transfer and storage of PCBs in Ireland should be authorised by the Environmental Protection Agency and be subject to a waste licence.

Private waste collectors must be permitted by local authorities in accordance with the Waste Management (Collection Permit) Regulations 2007[24], as amended. Under these Regulations, those involved in waste collection activities must apply to a nominated local authority for a Waste Collection Permit. The producer, or holder of the PCB waste, must ensure that the person/company physically transporting the waste from the producers site has a valid Waste Collection Permit.

The contractors listed in Appendix I will typically assist with the administrative procedures associated with PCB waste movement and disposal. Key tasks that should be completed when disposing of PCB waste include:

- Obtaining and completing of a **consignment note** (**C1 form**), for movement of waste within the State. Note that, if the waste is exported directly from the site where it was produced to the point of disposal, then a C1 form is not required;
- Obtaining and completing a **transfrontier shipment form** (**TFS**) from the National TFS Office for the export of waste out of the State; (see **Appendix B** for contact details).

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[23] European Waste Catalogue and Hazardous Waste List 2002
http://www.epa.ie/downloads/pubs/waste/stats/name,11733,en.html

[24] Irish Statute Book, Statutory Instruments, S.I. No. 820 of 2007 – Waste Management (Collection Permit) Regulations 2007 as amended by S.I. No. 87 of 2008

Competent and licensed waste contractors can generally assist in completing appropriate paperwork (C1 forms and TFS forms) and in ensuring that the producer of the PCB waste has adequately prepared the waste for transport (e.g. placed in a proper UN container, labelled, etc).

When PCB waste is received at its destination, the disposal facility should issue a certificate of receipt confirming that the waste has reached its authorised destination. Upon disposal of the waste, the disposal facility should issue a certificate of disposal confirming that the waste has actually been destroyed. The producer of the waste should keep a copy of these certificates for their records.

2 HEALTH EFFECTS

2.1 Health Effects

PCBs can enter the body in three ways, by:

- Direct contact with the skin. PCBs pass easily through intact skin, so this is likely to be the main way they get into the body;
- Breathing in fumes, spray or droplets of PCB-containing equipment that is being cut or heated;
- Ingestion of PCBs if you eat, drink or smoke in a workplace where PCBs are present.

PCBs can gradually build up in the body if a person is repeatedly exposed to them. PCBs can cause a skin condition called chloracne, which produces pustules, blackheads and cysts. In animals PCBs can cause damage to the liver, reduce the ability to fight infection, as well as other effects. Apart from chloracne, none of the range of effects seen in animals has been seen in people working with PCBs, although it is possible that they could occur if high exposures were to occur.[25].

A report referenced in the New Zealand Safe Management of PCBs Code of Practice indicated that there were a few cases where adverse effects from occupational exposures to PCBs were documented. Some studies have shown minor reversible changes in liver function in exposed workers but, generally, effects appear to be limited to burning of the eyes, face and skin when excessive exposure occurs[26].

For more detailed information on PCB health and safety related issues, contact the Health and Safety Authority whose contact details are provided in **Appendix B**.

2.2 Occupational Exposure Limit Value

Table 2 below indicates the Occupational Exposure Limit Values (OELV) associated with PCBs. Where an employee is handling PCBs and there is a risk of exposure by inhalation the employer is required to ensure that they have not exceeded the OELV. An OELV provides a basis for ensuring that exposure to airborne contaminants in the workplace is controlled in such a way as to prevent adverse health effects. OELVs are defined '*as meaning, unless otherwise specified, the limit of the time-weighted average of the concentration of a chemical agent in the air within the breathing zone of a worker in relation to a specified reference period, as approved by the Authority'.* The Authority is the Health and Safety Authority.

[25] Health and Safety Executive UK webpage '*Do you know how to work safely with PCB's ?'* http://www.hse.gov.uk/pubns/msa19.htm

[26] Safe Management of PCBs Code of Practice, 1988. Department of Health, Wellington New Zealand

Table 2 - Occupational Exposure Limit Value PCBs

Substance [27]	EINECs No.	CAS No.	Occupational Exposure Limit Value (8hr reference period)	
			mg/m^3	Notes
Chlorinated biphenyls	215-648-1	1336-36-3	0.1	Skin
(42% chlorine)		53469-21-9	0.1	Skin
(54% chlorine)		11097-69-1	0.1	Skin

2.3 First Aid

2.3.1 Contact with clothes

If it is suspected that a person's clothes have come into contact with PCBs, contaminated clothing should be removed immediately. The contaminated clothing should be disposed of as PCB waste as outlined in **Section 1.4.**

2.3.2 Contact with skin

If it is suspected that a person's skin has come into contact with PCBs the following steps should be undertaken immediately:

- Wash thoroughly with a detergent and water or, if unavailable, use a waterless cleaner. Apply skin lotion to reduce the irritation, particularly if PCBs have contacted open cuts or abrasions;
- See a medical practitioner immediately.

2.3.3 Contact with eyes

If it is suspected that a person's eyes have come into contact with PCBs, the following steps should be undertaken immediately:

- Wash immediately with a gentle stream of lukewarm water for 15 minutes keeping the eyelids apart while flushing;
- See a medical practitioner immediately.

2.3.4 Ingestion

If PCBs were ingested, the following steps should be undertaken immediately:

- Do not cause vomiting;
- Do not drink anything;

[27] Schedule 1, 2007 Code of practice for the Safety, Health and Welfare at Work (Chemical Agents) Regulations 2001 (S.I. No.619 of 2001).

- Thoroughly rinse mouth with water;
- Proceed to a hospital emergency department or a medical practitioner immediately;
- Take information on the PCB, both brand name and PCB content if known, with the patient.

2.3.5 Inhalation

If PCBs were inhaled the following steps should be undertaken immediately:

- Get fresh air;
- See a medical practitioner immediately.

NOTE: Any person developing skin irritation or a respiratory tract irritation should be placed under the supervision of a medical practitioner.

2.4 Protective Clothing

Where workers may come in direct contact with PCB liquids, Personnel Protective Equipment (PPE) impervious to PCBs should be worn. If the PCBs are in closed containers such as capacitors, transformers or drums, and there is no direct contact, special clothing is not required. PPE should be available in all areas where there are significant amounts of PCB liquids, whether in service, in store, or whilst being transported. PPE should comprise the following items;

- gloves,
- overshoes,
- overalls and bib-type aprons
- Safety glasses with side shields,
- chemical safety goggles or face shields should also be worn.
- Impervious coveralls made of butyl rubber, neoprene, nitrile rubber, polyvinyl alcohol, viton, saranex or Teflon (NOT ordinary rubber) should be worn when handling PCB liquids.
- Respiratory protective devices with a full face mask and a cartridge or canister suitable for use with PCBs is required when handling PCBs liquids hotter than $55^{O}C$, where there is a significant amount of PCB liquid exposed to the air, or where adequate ventilation is not possible.

In a fire situation involving PCBs self-contained breathing apparatus must be used. No attempt should be made to wash PCB contaminated clothing for reuse. Hands should be washed thoroughly with warm water and soap, detergent or industrial hand cleansers before eating, drinking, smoking or using toilet facilities.

When working with PCBs, certain precautions should be taken to protect the health of personnel.

- PCB liquids should be pumped where possible and not poured, to minimise splashes and spills;
- Pumps and hoses used for PCB liquids should not be used for other purposes and should be routinely inspected and replaced if necessary. Old or damaged pumps and hoses used for PCB liquids should be disposed of as hazardous waste;
- Spill control measures should be in place during any movement of PCBs.

2.5 Safety Procedures

Before conducting any work on PCB contaminated equipment the Safety, Health and Welfare at Work Act 2005 requires that a **risk assessment** of the activity be undertaken using HSA guidelines as stated in **Section 1.4.3**.

Measures should be in place to ensure that anyone working with PCBs fully understand the safety procedures to be followed in handling PCBs and the emergency and first aid requirements described in **Section 3**. The Act further requires that the measures identified in the risk assessment are implemented. It is recommended that written safety procedures be developed for on site PCB holdings. This safety procedure should be integrated with the '*Management of PCB Holdings'* procedure recommended in **Section 1** of this code of practice.

The safety procedures should as a minimum contain:

- Background information on PCBs;
- The hazards and risks associated with PCBs;
- Precautions to be taken when handling PCBs including what PPE to use;
- What to do in the case of contact with PCBs;
- How to dispose of PPE.

All major PCB handling, emergency/first aid measures and dismantling projects should be planned in advance and a risk assessment of the activity completed. All information provided for employees should be provided in a form, manner and language likely to be understood by them.

One overall risk assessment, or individual risk assessments should, be carried out in compliance with sections 19 and 20 of the Safety, Health and Welfare at Work Act 2005 for the following activities:

- **Conducting any work on PCB contaminated equipment including decontamination and decommissioning of equipment;**
- **All major PCB handling, emergency/first aid measures and dismantling projects.**

3 ACCIDENT PREVENTION AND EMERGENCY RESPONSE

The Safety, Heath and Welfare at Work Act 2005 outlines measures to be taken for emergencies and in the case of serious and imminent danger. Accordingly the accident prevention and emergency response measures required for PCBs and PCB contaminated equipment must be appropriate to the place of work and nature and size of the PCB holding.

Emergencies involving PCBs can occur:

1. With in-service equipment;
2. During storage;
3. During transport;
4. At a disposal facility.

These emergencies may take the form of:

- A leak or spill of PCB liquid;
- The catastrophic failure of a piece of in-service equipment;
- The accidental breach of a container of PCBs; and
- Fire / explosion.

3.1 Emergency Preparedness

All companies operating storage or transfer facilities or transporting PCBs should develop and implement an ***Accident Prevention and Emergency Response Plan*** or amend their existing plan to include a section on PCBs. This plan should be developed in conjunction with the local fire officer and should provide information on:

- Emergency actions that should be taken in the event of a PCB spill or fire;
- PPE that should be used during an emergency response;
- Personnel who can be contacted on a 24-hour basis to supervise emergency actions; and
- Regulatory notification requirements detailing who must be notified in the event of an emergency.

3.2 Emergency Procedure Priorities

Holders of PCBs should copy their PCB notification to their local authority and fire officer in their areas as, in the event of fire, the presence of PCBs may present a significant health and environmental pollution risk. In the event of a serious PCB discharge the following steps should be undertaken:

- Utilise PPE;
- Stop the flow of PCBs;
- Contain PCBs;
- Report incident to the EPA, HSA, Local Authority and Fire Officer;
- Keep staff who are not involved in the emergency response away from the affected area;
- Recover all PCB contaminated material and dispose of as hazardous waste.

3.3 Handling PCB Spills and Leaks

Cleanup personnel should take care to avoid contact with PCBs and volatile cleaning solvents. PPE, appropriate to the degree of hazard of a specific spill, should be worn at all times and must comply with the site Risk Assessment, Accident Prevention and Emergency Response Plan and the requirements of the Safety, Health and Welfare at Work (General Application) Regulations 2007 (Part 2, chapter 3). It is recommended that the following PPE be available, all of which should be made of PCB-resistant materials.

- Disposable coveralls that completely cover arms and legs;
- Gloves with high gauntlets that completely cover hands and wrists;
- Boots and splash aprons;
- Tight-fitting chemical resistant goggles or full face shield; and
- Clothing of heat-resistant materials when working with hot liquids.

If a PCB leak or a spill occurs, the following steps should be taken:

- Shut off the source of the leak or prevent further spillage. Failing this, make arrangements to collect and contain the PCB spill;
- Equipment filled with PCBs that is found leaking should be removed from service as soon as possible to correct the leak. Where it is not possible to remove the equipment from service immediately, some means of collecting the PCB should be used. Polyethylene sheeting or metal trays can be used as temporary containment for leaking capacitors or transformers. Regular supervision of the containment is necessary.
- If applicable, the area of the leak or spill should be adequately ventilated to prevent the accumulation of any vapours.

- Liquid PCB should be collected or absorbed using dry sawdust, vermiculite, activated charcoal, rags or sand. As much free liquid should be recovered as possible for disposal as hazardous waste.
- If there is going to be any delay in cleaning up the PCB spillage the affected area should be roped off to prevent persons entering the contaminated site and “Do Not Approach” signs erected.
- Steps must be taken to prevent any spillage or accidental loss of PCBs either by drainage into the sewer systems or percolation into the ground.
- All PCB liquid and contaminated material must be collected for disposal. This may include the top layer of soil/gravel in the affected area. Care should be taken to avoid stirring up subsoil layers. The work is best done by using hand shovels.
- Where any spillage of a PCB fluid occurs oil absorptive material should be used as a clean-up tool. The absorptive material should be spread on the contaminated area and should be left in place for as long as necessary to ensure that all PCB fluids have been absorbed.
- Any surfaces or crevices, which have been exposed to PCBs during the spill, should be decontaminated with swabs containing a suitable material such as kerosene or turpentine[28].
- Any used absorptive material or swabs should be disposed of appropriately.

Report any spillage of PCBs to the EPA, HSA, local authority and fire officer as soon as practicable after the spillage, providing details on the estimated volume spilt and to what extent it has been recovered and the exact location of the spillage.

3.4 Emergency Procedures for Fires Involving PCBs

Although PCBs are classified as non-flammable liquids, they will burn at elevated temperatures. As a result, PCB liquids should be stored in isolation from other flammable materials (such as oils, coal, wood products and compressed gases). Fires involving PCBs are smoky and yield large amounts of black oily soot.

PCB fires are typically "small" and are easily extinguished with chemical foam, nitrogen flood, or carbon dioxide. Water should not be used as an extinguishing agent as contaminated water is very difficult to contain in an emergency situation and could spread contamination. In the case of PCB fires in electrical equipment, always disconnect the equipment from its power source before attempting to extinguish the fire.

Because most of the contamination resulting from a fire involving PCBs is not from PCB liquid release, but from contaminated soot, the transport of soot during the fire must be minimized. This can be accomplished by:

[28] Code of practice on the handling, transportation and disposal of Polychlorinated Biphenyl Waste http://www.epd.gov.hk/epd/english/environmentinhk/waste/guide_ref/files/pcb_e.pdf

- Extinguishing the fire as soon as possible; and
- Shutting down the ventilation system in the fire area.

The automatic ventilation shut-off, where available, should be triggered by the fire alarm system in the PCB location. Unnecessary personnel working in the area of a PCB fire should leave immediately. The local fire brigade station and company PCB-response personnel should always be kept up-to-date on the location of PCB equipment and PCB storage on a particular property so that they are fully aware of the special hazards in the event of a fire.

Response to PCB fires falls into two distinct phases:

- Extinguishing the fire; and
- Cleanup of surfaces contaminated with PCB liquid and soot which may be contaminated with PCBs.

Appendix B: Contacts

Contact	Address	Telephone	fax	E-mail	Website
Environmental Protection Agency	EPA Headquarters PO BOX 3000 Johnstown Castle Estate Co. Wexford Ireland	00353(0)53 91 60600	00353(0)53 9160699	info@epa.ie	http://www.epa.ie
Health and Safety Authority	Workplace Contact Unit The Metropolitan Building James Joyce Street Dublin 1 Ireland	Lo Call: 1890 289 389	00353(0)1 6147020	wcu@hsa.ie	http://www.hsa.ie
National TFS Office,	Dublin City Council Eblana House 68-71 Marrowbone Lane Dublin 8 Ireland	00353(0)1 2224235 or 2224374		nationaltfs@dublincity.ie .	http://www.dublincity.ie/WaterWasteEnvironment/Waste/WasteCollectors/National_TFS_Office/Pages/NationalTFSOffice.aspx
European Committee for Standardisation	36 rue de Stassart, B-1050 Brussels Belgium	0032 2 5500811	0032 2 5500819	infodesk@cen.eu	http://www.cen.eu/cenorm/homepage.htm
ASTM International	100 Barr Harbor Drive, PO Box C700, West Conshohocken, PA, USA				http://www.astm.org

Appendix C: EPA PCB Notification Form

STANDARD NOTIFICATION FORM FOR PCB HOLDINGS

Background information

The Waste Management (Hazardous Waste) Regulations, 1998, S.I. No. 163 of 1998, require that all holders of polychlorinated biphenyls (PCBs), used PCBs or contaminated equipment containing more than 5 litres of PCBs shall notify the Environmental Protection Agency in writing in relation to those holdings. The notification must be made by 1 September each year. The notification must contain the following information:

(a) the name and address of the holder,

(b) the location and quantity of the PCBs or used PCBs,

(c) the location and description of the equipment,

(d) the quantity of PCBs contained in such equipment,

(e) the measures taken or proposed to be taken (including a timescale) for the decontamination or disposal, as the case may be, of the said PCBs, used PCBs and equipment,

(f) the date of giving such notice and

(g) a fee of €125

The notification need not specify information listed in items (d) and (e) above as regards any equipment in respect of which it is reasonable to assume that the fluid content of the equipment contains between 0.05% (500ppm) and 0.005% (50 ppm)by weight of PCBs.

Instructions

The standard notification form should be used where possible. Save this file to your computer with a unique filename, for example “PCB holdings at <insert name of company>”. The form should preferably be completed electronically, printed out and signed. If this form is not sufficient to enter your information please use additional pages and include copies with the notification form. The notification form and the notification fee should be sent to the following address:

PCB Inventory
Environmental Protection Agency
PO Box 3000
Johnstown Castle Estate
County Wexford

The notification fee payable is **€ 125**. Any queries in relation to completing the form should be addressed to the EPA by phone at 053-9160600 or by e-mail at info@epa.ie.

Please submit this Notification form to the EPA no later than the 1st of September each year.

Environmental Protection Agency PO Box 3000 Johnstown Castle Estate Co. Wexford	Tel. 053 9160600 Fax. 053 9160699 Web. www.epa.ie E-mail info@epa.ie	PCB Notification Form Version 3.0 May 2008

PCB NOTIFICATION FORM

To be completed in full in respect of all PCB holdings in accordance with Article 15 of the Waste Management (Hazardous Waste) Regulations, 1998, S.I. No. 163 of 1998.

Section 1	**Contact Details**	
Name of notifier	Address of notifier	tel. fax. e-mail.
Name of holder (if same as above, enter 'SAME')	Address of holder (if same as above, enter 'SAME')	tel. fax. e-mail.

Section 2	**PCBs**	
PCBs	If no PCB holdings, enter "NONE" here:	
Location (address, name or reference of building)	Number of containers:	
	Size of containers:	
	Condition of containers:	
	Total quantity (litres) (or tonnes if not liquid):	

Section 3	**Used or waste PCBs**	
Used or waste PCBs	If no used or waste PCB holdings, enter "NONE" here:	
Location (address, name or reference of building)	Number of containers:	
	Size of containers:	
	Condition of containers:	
	Total quantity (litres) (or tonnes if not liquid):	

Section 4	**Equipment (> 5L PCBs)**	
Equipment containing >5litres of PCBs (note 1)	If no items of equipment containing >5L PCBs, enter "NONE" here:	
Location of equipment (address, name or reference of building)	Description of the equipment (tick) …transformer …capacitor …power factor correction	Further details:

	…other (please specify)……..	
	Quantity of PCBs contained in the equipment (litres) (note 3)	
	Concentration of PCBs in the liquid (%) or parts per million (ppm)	
Section 4	**Equipment (< 5L PCBs)**	
Equipment containing <5litres of PCBs (note 2)	If no items of equipment containing <5L PCBs, enter "NONE" here:	
Location of equipment (address, name or reference of building)	Description of the equipment (tick) …transformer …capacitor …power factor correction …fluorescent lighting ballast/starter …other (please specify)……..	Further details:
	Quantity of PCBs contained in the equipment (litres)	
	Concentration of PCBs in the liquid (%) or parts per million (ppm)	
Section 6	**PCB Management**	
Measures taken or proposed to be taken for the decontamination or disposal of PCBs, used or waste PCBs and equipment containing PCBs (notes 2 to 4)		
Section 7	**Notification Fee**	
Notification fee **PCB Holding Reference**	Euro **€ 125** **Reference No:**	Office use only: Fee attached and correct (Y/N)? Office use only: Confirmed Holding: yes no Suspected Holding: yes no
Section 8	**Signature**	
Signed:	Print name:	Date:

Note 1: This information to be provided for each individual piece of equipment which contains greater than 5 litres of PCBs or, in the case of power capacitors, such equipment where the separate elements of a combined set contain amounts of PCBs which in aggregate exceeds 5 litres.

Note 2: Holders of equipment containing <5 litres of PCBs are not obliged to notify this information to the EPA. However, the information is requested so as to quantify the total quantity of PCBs in use in Ireland.

Note 3: Holders of equipment containing >5 litres of PCBs are not obliged to notify this information to the EPA where the concentration of PCBs in the equipment can reasonably assumed to be between 0.05% and 0.005%. However, the information is requested so as to quantify the total quantity of PCBs in use in Ireland. Where such an assumption is made, holders are required to provide evidence of the reasonableness of the assumption.

Note 4: Submit plans where documented.

Appendix D: Background information on PCBs uses and possible environmental pollution pathways

PCB USE TREE (prepared by the Lake Superior Work Group)

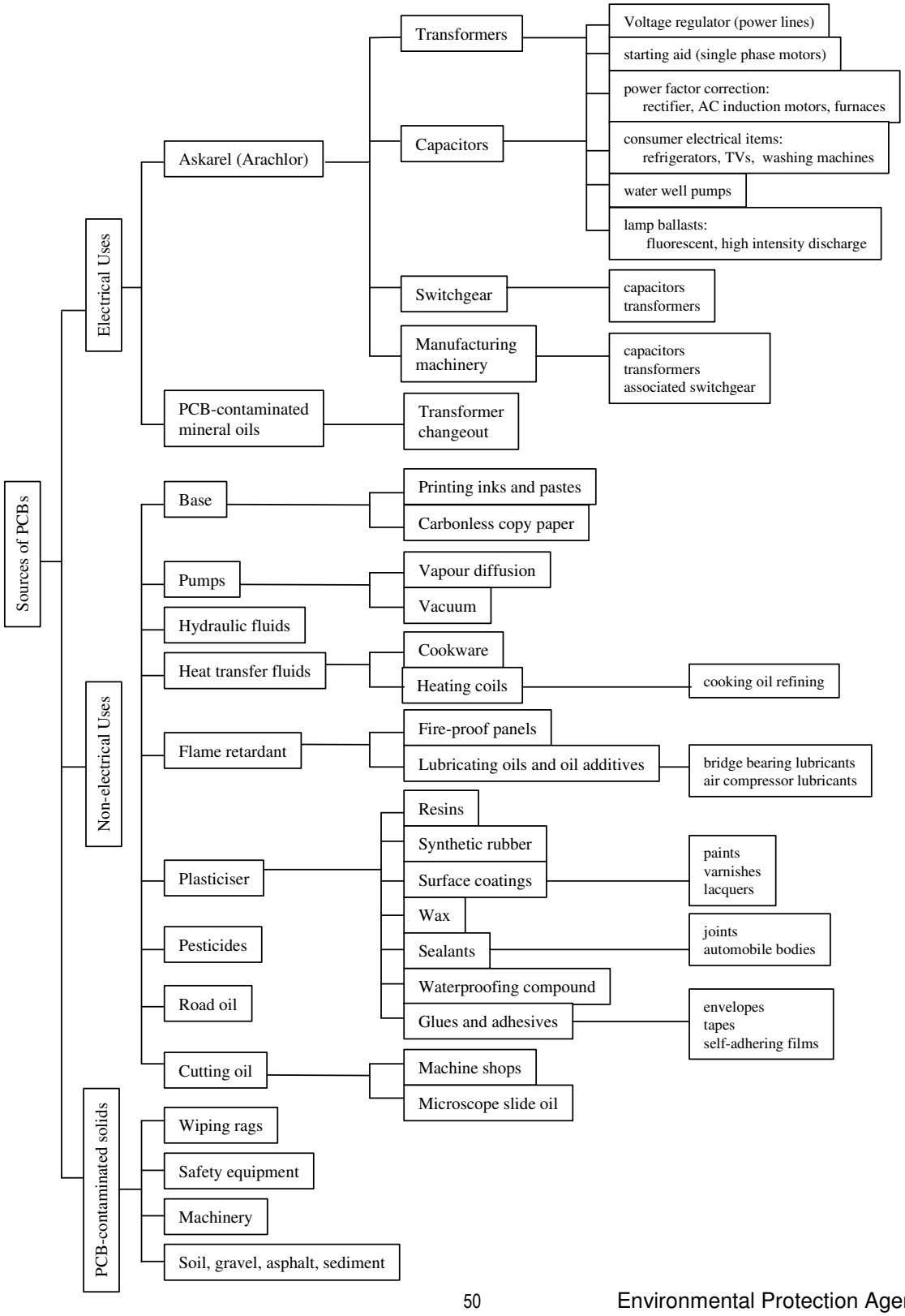

TABLE D1

POTENTIAL PCB INDUSTRIAL SOURCES

SOURCE	COMMON PCB CONTAINING EQUIPMENT
Electric Utilities and distribution networks.	Transformers, large and small capacitors, switches, voltage regulators, liquid filled cables, circuit breakers, lighting ballasts
Industrial Facilities including aluminium, copper, iron and steel smelting, cement manufacturing, chemical manufacturing, plastics, synthetics and petroleum refining.	Transformers, large and small capacitors, power factor correction units, heat transfer fluids, hydraulic fluids, voltage regulators, liquid filled cables, circuit breakers, lighting ballasts
Local Authorities including water treatment and distribution networks, wastewater treatment plants and street lighting	Vacuum pumps, submersible pumps, small capacitors, power factor correction units
Animal Farming including dairies/milking sheds, shearing sheds and piggeries.	Large and small capacitors, power factor correction units, submersible pumps
Railroad Systems	Transformers, large capacitors, voltage regulators, circuit breakers
Underground Mining	Transformers, large capacitors, power factor correction units, hydraulic fluids, voltage regulators, circuit breakers,
Military Installations	Transformers, large and small capacitors, voltage regulators, circuit breakers, lighting ballasts, hydraulic fluids
Large Buildings including residential, commercial, educational and health premises.	Small capacitors, circuit breakers, lighting ballasts
Research Laboratories	Vacuum pumps, lighting ballasts, small capacitors, circuit breakers
Electronics Manufacturing	Vacuum pumps, lighting ballasts, small capacitors, circuit breakers

Source: Guidelines for the Identification of PCBs and Materials Containing PCBs, UNEP, 1999. Augmented by URS Survey data

TABLE D2

POTENTIAL PCB WASTE SOURCES

ACTIVITY/SOURCES	TYPICAL LOCATIONS
Auto-Shredder Residues, fluff [29]	Landfills (Municipal and Industrial)
Inadvertent Production by Chemical Plants	Industrial waste disposal sites Industrial waste water streams
Navigational Dredging	Dredged water bodies and their sediments
Transfer Spillage[30]	Soil or water near landfills and industrial sites and along the roads between locations
Accidents/Fires	Power distribution networks (e.g. Transformers) Industrial sites Materials from burnt buildings
Vacuum Pump Cooling Water or Condensate	Water discharge sites and leakage
Floor and Equipment Clean-Up Wastes	Landfills Industrial dump sites
Repair or Decommissioning of Equipment	Repair shop grounds Waste disposal sites Equipment repair or decommissioning sites Industrial facility grounds
Building Demolition	Landfills Waste disposal sites
Various Recycling Operations Reused Oil Practices	Recycled oil in equipment Industrial plants Pesticide formulation Soft soap formulations Natural gas pipelines (from compressors) Automobile service stations

Source: Guidelines for the Identification of PCBs and Materials Containing PCBs, UNEP, 1999.

[29] Waste (upholstery, padding, insulation material, etc.) derived from the shredding of cars and appliances.

[30] PCB leakage that may take place during the transfer of PCB-containing waste from one location to another.

Appendix E: Text of the Regulations

Extract from Waste Management (Hazardous Waste) Regulations, 1998, S.I. No. 163 of 1998 (from http://www.gov.ie/ag/).

PART IV

POLYCHLORINATED BIPHENYLS (PCBs)

Interpretation for Part IV.

13. (1) In this Part —

"contaminated equipment" means any equipment (including any transformer, power capacitor or receptacle containing residual stocks) which —

(a) contains PCBs, or

(b) having contained PCBs, has not been subject to decontamination;

"decontamination" means any operation which enables equipment, objects, materials or fluids contaminated by PCBs to be recovered or disposed of without causing environmental pollution, including the replacement of PCBs by fluids which do not contain PCBs, and "decontaminated" shall be construed accordingly;

"disposal" means any of the activities specified at item 6, 7 or 13 of the Third Schedule to the Act, incineration on land or, in the case of contaminated equipment or used PCBs which cannot be decontaminated, safe deep underground storage in dry rock formations;

"equipment containing more than 5 dm3 of PCBs" includes, in the case of power capacitors, such equipment where the separate elements of a combined set contain amounts of PCBs which in aggregate exceeds 5 dm3;

"PCBs" means —

• polychlorinated biphenyls

• polychlorinated terphenyls

• monomethyl-tetrachlorodiphenyl methane

• monomethyl-dichloro-diphenyl methane

• monomethyl-dibromo-diphenyl methane, or

• any mixture of substances containing any one or more of the aforementioned substances in an aggregate amount which by weight exceeds 0.005% by weight of the mixture;

"used PCBs" means PCBs which are waste within the meaning of Section 4(1)(a) of the Act.

(2) Any equipment of a type which is likely to contain PCBs shall, for the purposes of these Regulations, be considered as containing PCBs unless it is reasonable to assume the contrary.

Requirements on holders of PCBs.

14. (1) A holder of PCBs, used PCBs or contaminated equipment shall, as the case may be -

(a) ensure that used PCBs are disposed of as soon as possible;

(b) subject to sub-article (3), ensure that PCBs and contaminated equipment and the PCBs contained in such equipment are decontaminated or disposed of as soon as possible;

(c) subject to sub-article (4), affix to equipment containing more than 5 dm3 of PCBs and to the doors of premises where such equipment is located an indelible label, so printed as to be easily visible and legible, stating, as the case may be, that the equipment is, or the premises contain equipment that is, contaminated by PCBs;

(d) keep such PCBs or equipment separate from flammable materials and otherwise take such precautions as are necessary to avoid any risk of fire; and

(e) where reasonably practicable, implement and operate a source separation programme in respect of equipment which contains less than 5 dm3 of PCBs and is a component of another piece of equipment, that is to say, to remove and arrange for the separate collection of such components with a view to their recovery or, where that is not economically feasible, their disposal, in a facility authorised for that purpose.

(2) Transformers containing more than 0.05% by weight of PCBs shall be decontaminated in accordance with the following conditions:—

(a) the objective of decontamination shall be to reduce the level of PCBs to less than 0.05% by weight and, if possible, to 0.005% or less by weight;

(b) the replacement fluid not containing PCBs must entail markedly lesser risks;

(c) the replacement of the fluid must not compromise the subsequent disposal of the PCBs, and

(d) the labelling of the transformer after its decontamination must be replaced by labelling in the form set out in the Second Schedule to these Regulations.

(3) (a) In the case of contaminated equipment containing more than 5 dm3 of PCBs, decontamination or disposal in accordance with sub-article (1)(b) shall, subject to paragraph (b), be effected not later than the 31st day of December, 2010.

(b) As a derogation from the requirements of sub-article (1)(b) in the case of a transformer or other equipment the fluid content of which contains between 0.05% and 0.005% by weight of PCBs, such equipment may be decontaminated in accordance with sub-article (2) or disposed of at the end of its useful life.

(4) For the purposes of paragraph (c) of sub-article (1), equipment in respect of which it is reasonable to assume that the fluid content of the equipment contains between 0.05% and 0.005% by weight of PCBs may be labelled as "PCBs contaminated 0.05%".

Provision of information to the Agency.

15. (1) Subject to sub-article (2), a holder of PCBs, used PCBs or contaminated equipment containing more than 5 dm3 of PCBs shall, not later than the 1st day of September 1998 and not later than the 1st day of September in each year thereafter, give notice in writing to the Agency in relation to such PCBs, used PCBs or equipment of, as appropriate —

(a) the name and address of the holder,

(b) the location and quantity of the PCBs or used PCBs,

(c) the location and description of the equipment,

(d) the quantity of PCBs contained in such equipment,

(e) the measures taken or proposed to be taken (including a timescale) for the decontamination or disposal, as the case may be, of the said PCBs, used PCBs and equipment, and

(f) the date of giving such notice.

(2) A notice under sub-article (1) need not specify information for the purposes of paragraphs (d) and (e) of that sub-article as regards any equipment in respect of which it is reasonable to assume that the fluid content of the equipment contains between 0.05% and 0.005% by weight of PCBs.

(3) The Agency shall monitor the accuracy of information notified to it under sub-article (1).

Prohibition on certain uses of PCBs.

16. The following are hereby prohibited —

(a) the importation, production or supply to another person of PCBs or contaminated equipment;

(b) with effect from 1 September, 1998, the holding or use of PCBs or contaminated equipment, other than PCBs or equipment which have been notified to the Agency under article 15;

(c) the separation of PCBs from other substances for the purpose of reusing the PCBs;

(d) the addition of PCBs to transformers or other equipment, and

(d) the maintenance of transformers containing PCBs, other than the maintenance of transformers which are in good working order and do not leak and where such maintenance is for the purpose of ensuring that the PCBs contained in the transformers comply with technical standards or specifications regarding dielectric quality.

SECOND SCHEDULE

Article 14

Labelling of Decontaminated Equipment

Each item of decontaminated equipment must be clearly marked with an indelible and embossed or engraved sign which must include the following information:

DECONTAMINATED PCB EQUIPMENT

Fluid containing PCBs was replaced

- with ……..(name of substitute)
- on ……(date)
- by …… (undertaking)

Concentration of PCBs in

- old fluid ……(% by weight)
- new fluid ……..(% by weight)

Appendix F: List of PCB trade names

TRADE NAME	MANUFACTURER/COUNTRY OF ORIGIN
Asbestol	American Corp, USA
Adkarel	
Asbestol	Monsanto, USA
Askarel	UK and USA
Auxol	Monsanto, USA
Aceclor	ACEC, Belgium
Aceclor	France
Arochlor 1221, 1232/1248, 1254, 1260, 1268, 1270, 1342, 2565/4465/5460	Monsanto, USA
Apirolio	Caffaro, Italy
Apirolia	Caffaro, Italy
Aroclor	UK and USA
Areclor (t)	
Arubren	
ASK	
Bakola 131	Monsanto, USA
Biclor (c)	
Chorextol	
Chlorextol	Allis Chalmers, USA
Chloroextol	Allis Chalmers, USA
C(h)lophen A30	Bayer, Germany
C(h)lophen A50	Bayer, Germany
Clophen A60	
Clophen Apirorlio	
Chlorphen	Jard Corp, USA
Chloresil	
Chlorintol	

TRADE NAME	MANUFACTURER/COUNTRY OF ORIGIN
Chlorinol	USA
Chlorinated Diphenyl	
Clorphen (t)	
Deler	
Delor	Czech Republic
Dialor (c)	
Diaclor	USA
Diachlor	Sangamo Electric
Diachlor	Sangamo Electric
Diaconal	
Diconal	
Disconon (c)	
Dykanol	USA
Duconal	UK
DK	Italy
DP 3, 4, 5, 6.5	
Educarel	
EEC-18	Power Zone Transformer, USA
Electrophenyl	PCT, France
Elaol	Bayer, Germany
Elemex (t, c)	
Elexem	McGray Edison, USA
Eucarel	
Fenclor 42, 54, 64, 70	Caffaro, Italy
Hexol	Russian Federation
Hivar (c)	
Hydol	USA
Hyvol	Aerovox, Italy
Inclor	
Inclar	Caffaro, Italy
Inerteen 300, 400, 600	Westinghouse, USA
Kan(e)chlor (KC) 200-600	Kanegafugi, Japan

TRADE NAME	MANUFACTURER/COUNTRY OF ORIGIN
Kanechor	
Kaneclor	
Kaneclor 400	
Kaneclor 500	
Keneclor	
Kennechlor	
Leromoli	
Leromoll	
Magvar	
MCS 1489	
Montar	
Nepolin	USA
Niren	
No-Famol	
No-Flamol	Wagner Electric, USA
NoFlamol	
Non-Flamable Liquid	ITE Circuit breakers, USA
Phenoclar DP6	Baylor, Germany
Phenoclor DP6	Prodelec, France
Plastivar	UK
Pydraul	USA
Pyroclar	Monsanto, UK
Pyroclor	Monsanto, UK
Pyrochlor	
Pyranol	USA
Pyronal	General Electric, UK
Pysanol	
Physalen	
Phyralene	Prodelec, France
Pyralene 1460	Prodelec, France
Pyralene 1500, 1501	Prodelec, France
Pyralene 3010, 3011	Prodelec, France

TRADE NAME	MANUFACTURER/COUNTRY OF ORIGIN
Pyralene T1	Prodelec, France
Pyralene T2	Prodelec, France
Pyralene T3	Prodelec, France
Safe-T-America	
Safe-T-Kuhl	Kuhlman Electric, USA
Saft-Kuhl	
Sant(h)osafe	Mitsubishi, Japan
Santosol	
Santvacki	Monsanto, USA
Santovac	
Santovac 1	
Santovac2	
Santowax	
Santothern FR	UK
Santotherm	France
Sant(h)othern FR	Mitsubishi, Japan
Saut(h)otherm	Mitsubishi, Japan
Siclonyl (c)	
Solvol	Monsanto, USA
Sorol	So(1) vol, USSR
Sovol	So(1) vol, USSR
Therminol	USA
Therminol FR	USA
Terpenylchlore	PCT, France

Appendix G: List of transformer trade names

TRANSFORMER MANUFACTURERS HISTORICALLY USING PCBs

MANUFACTURER	COUNTRY OF ORIGIN
Westinghouse General Electric Company Research-Cottrell Niagara Transformer Corp. Standard Transformer Co. Helena Corp. Hevi-Duty Electric Kuhlman Electric Co. Electro Engineering Works R.E. Uptegraff Mfg Co. H.K. Porter Van Tran Electric Co. Esco Manufacturing Co.	**USA**
British Power Transunal	**UK**
AEG (Divisions in Germany) Trafo Union (TU)	**GERMANY**

Source: Guidelines for the Identification of PCBs and Materials Containing PCBs, UNEP, 1999.

Appendix H: List of capacitor trade names

The product or company names in Tables H.1 and H.2 are associated with PCB-containing capacitors. Further published information is available on specific equipment and designations.

The United Nations Environment Programme has published several reports on PCBs identification, management and disposal. Reports available at http://www.chem.unep.ch/pops/newlayout/repdocs.html

A 40 page listing of PCB-containing capacitors was published by ANZECC and is available at http://www.ea.gov.au/industry/chemicals/swm/pcbs/pcbid.html [31].

Table H.1

Source: *Guidelines for the Identification of PCBs and Materials Containing PCBs*, UNEP, 1999. Available at http://www.chem.unep.ch/pops/pdf/PCBident/pcbid1.pdf

- ASEA
- Sieverts
- Siemens
- Nokia
- Sprague
- AEG or Hydrowerk
- ACEC
- National Industry
- General Electric
- Westinghouse
- Liljeholmen
- Aerovox
- Universal Manufacturing Corp.
- SPA “Condensator”
- Cornell Dubilier
- P.R. Mallory & Co. Inc.
- Sangamo Electric Co.
- Electric Utility Co.
- Capacitor Specialists
- Jard Corp.
- York Electronics
- McGraw-Edison
- RF Interonics
- Axel Electronic Inc.
- Tobe Deutschmann Labs
- Cine-Chrome Lab, Inc.

[31] *Identification of PCB-Containing Capacitors - An Information Booklet for Electricians and Electrical Contractors,* Australian and New Zealand Environment and Conservation Council (ANZECC) 1997.

Table H.2

Source: *http://www.safetyline.wa.gov.au/* On this website, details are available on the make, type, capacitance, dimensions, power and PCB status of a large number of capacitors. Clicking on a manufacturer's name on the website provides data on a particular capacitor.

A.H. HUNT LTD	FRAKO	RIC
ACEC	FUJI KEN	RIC CAPACITORS LTD
AEE	GE	RIFA
AEG	GEC	ROEDERSTEIN
AEI AEROVOX	GLASSMIKE	RS
ALPHA	ICAR	SAMHWA CAPACITOR CO
AME	INCO	SANGAMO
AME BICC	INTERCAP	SCC
AME DUBILIER	IRH	SEI
AME HUNTS	ITAL FARAD	SEIKA ELECTRICS CO LTD
ANDREW ICAR	ITT	SEIRAY
ASEA	JARD	SELENIUM
ASSOCIATED LIGHTING	JOHNSON & PHILLIPS LTD	SH
ATE CO.	KCC	SHIZUKI
ATE	LMT	SIC-SAFCO
AWA	MALLORY	SIEMENS
BAL-CO	MARCON	SIMPLEX
BHC	MAZDALUX	SLIMCAP
BICC	ME	SOLTRA
BICC-NEECO	MEPCO/ELECTRA	SPRAGUE
BOSCH	METALECT	STABILAC PTY LTD
BTH	MF	STATIC
CDG	MF PHILLIPS	STC
CPL	MICRO (ALELKO)	STEDEPOWER
CTS	MKL	SUDD
D	MKP	TCC
DALY	MOTOR START	TEAPOL
DANCO	MOTOROLA	THE CAPACITRON CO
DAWCO	MP	THE TELEGRAPHIC CONDENSOR CO
DAWSON	MPW	THORN
DICC	MSP	TMC
DUBILIER	NATRONIC	TOC
DUCATI	NICHICON	UCC
DUCON	NICHICON CAPACITOR CO	USHA
DUCONOL	NIPPON	WATSON
ELNA	NOVEA	WEGO
ENDURANCE	NTK	WEGO CONDENSOR CO

ERICSSON/RIFA
ERO
ESHA
FAC
FERGUSON
FIRBOURG
FLUORSEAL
OMD
PHILLIPS
PLESSEY
PLESSEY CAPACITORS
PLESSEY UK
PYE
RDE
WESTERN ELECTRIC
YESHA
YESHA ELECTRICALS
YUNCHANG

Appendix I – List of Hazardous Waste Contractors

Table I.1 - Licensed and permitted facilities for hazardous waste treatment and transfer, 2006*

Company name	Licence or Permit Reg. No.	Treatment or transfer facility	Principal hazardous wastes authorised for ***treatment***	Contact Phone Number	e-mail address	Website address
AVR-Safeway	W0050-01	Transfer and treatment	Solvents blending	+353 (0) 25 42944 0818 300 777	info@avr-safeway.com	www.avr-safeway.com
Eco-Safe Systems	W0054-02	Transfer and treatment	Healthcare risk waste	+353-1-6239135	services@ecosafesystems.ie	www.ecosafesystems.ie
Enva (Portlaoise)	W0184-01	Transfer and treatment	Waste oils and sludges, contaminated soils	+353 (0) 57 8678600	mdunne@enva.ie	www.enva.ie
Indaver Ireland	W0036-02	Transfer and treatment	Solvents blending	+353 (0) 1 280 4534	info@indaver.ie	www.indaver.ie
Rilta	W0192-01	Transfer and treatment	Oily sludges, waste oils, oil filters, photographic waste, contaminated soil, contaminated drums, containers and IBCs, WEEE	+ 353 1 401 8000	info@rilta.ie	www.rilta.ie
Veoilia (Previously Sorundon - Irish Environmental Services)	W0040-01	Transfer	None	Tel: (01) 450 1100	Rachel.doyle@veoilia.ie	www.veoilia.ie

Table I.2 – List of WEEE Contractors

Company name	Licence or Permit Reg. No.	Treatment or transfer facility	Principal hazardous wastes authorised for ***treatment***	Contact Phone Number	e-mail address	Website address
Electronic Recycling	WP98109	Treatment	WEEE	+353 1 864 0806	info@electronic-recycling.ie	www.electronic-recycling.ie
Immark Ireland (previously Cedar Resource Management)	W0185-01	Transfer and treatment	WEEE	+353 (0) 1 4010250	info@immark.ie	www.cedar.ie
Irish Lamp Recycling	WP02/2000	Treatment	WEEE (fluorescent lamps)	+353 (0) 59 8631377	info@ilr.ie	www.ilr.ie
KMK Metals Recycling	W0113-02	Transfer and treatment	WEEE		info@metalsrecycling.ie	www.metalrecycling.ie
Recycling Village	2004/015	Treatment	WEEE	:+353 41 686 2366,	admin@therecyclingvillage.ie	www.therecyclingvillage.ie
Techrec	W0233-01	Treatment	WEEE	+353 1 620 4300	info@techrec.ie	www.techrec.ie

Legend

* This list of hazardous waste contractors does not purport to be all inclusive and includes contractors who have dealt with PCB waste in recent years. Please refer to the EPA National Hazardous Waste Management Plan for a full list of hazardous waste contractors in Ireland. http://www.epa.ie/whatwedo/resource/hazardous/

Appendix J – List of Testing Laboratories

As of October 2008, the companies listed in Table J.1 are known to the EPA to provide PCB testing services. The companies are listed in alphabetical order and no endorsement by the EPA of any individual company's services should be construed by its appearance on this list. Other companies who provide this service should contact the EPA for inclusion on this list. Any updates will be published on the EPA's website at http://www.epa.ie/

Table J.1 Laboratories or agents for the analysis of PCBs

Company	Telephone
Powerpoint Engineering Agents for; TJ|H2b Analytical Services Ltd, UK	057 8662162 +44 1513395100 http://www.tjh2b.com/
T.E Laboratories Ltd Tullow Industrial Estate Tullow Co Carlow (At the time of preparing this management plan T.E. Labs were in the process of providing PCB analysis service that complies with standard IEC 61619)	Tel +353 (0) 59-9152881 Fax +353 (0) 59-9152886 www.tellab.ie