Scottish Executive Environment Group

UK Guidance: Collection and Disposal of Equipment Containing Small Amounts of PCBs

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UK GUIDANCE ON THE COLLECTION AND SUBSEQUENT DISPOSAL OF PCB CONTAINING EQUIPMENT WHICH IS LESS THAN 5 LITRES IN VOLUME AND WHICH IS CONTAINED WITHIN ANOTHER PIECE OF EQUIPMENT

Who is this guidance aimed at?

1. This guidance provides advice on the identification, removal, storage pending disposal and final destruction of small PCB containing capacitors for anyone who may handle waste electrical goods and who may need to remove and dispose of small PCB capacitors. Such bodies may include local authority civic amenity sites, waste management facilities, electrical retailers, premise re-fitters, vehicle dismantlers etc.

Issue

2. European Directive 96/59/EC on the disposal of polychlorinated biphenyls (PCBs) and polychlorinated terphenyls (PCTs) requires that where reasonably practicable, PCB containing equipment, which is less than 5 litres in volume and which is contained within another piece of equipment, shall be removed and collected separately when the latter equipment is taken out of use, recycled or disposed of. These components will mainly consist of small capacitors in electrical equipment such as refrigerators, washing machines, cookers and fluorescent light fittings manufactured between the 1950s and 1980s.

3. In the past, best practices for processing (shredding, crushing, and bailing) disposed white goods containing small PCB capacitors have resulted in contamination with PCBs of the rest of the waste, processing equipment, soils and surface waters where these materials are stored. Ensuring proper removal, storage and disposal procedures for small PCB capacitors will significantly reduce the volume of PCB contaminated waste generated during white goods processing and will reduce emissions of PCBs to the environment.

What are polychlorinated biphenyls (PCBs)?

4. PCB is the common name for polychlorinated biphenyl. PCBs range in appearance from colourless, oily liquids to more viscous and increasingly darker liquids, to yellow and black resins depending on the chlorine content. They were used in a wide range of ‘open’ applications such as sealants, lubricants and cutting oils and also in ‘closed’ applications such as transformers, capacitors and electrical switching equipment, where PCB-containing oil served as an insulant and coolant. They were used because they are extremely stable and have excellent insulating and heat transfer properties. They also do not degrade appreciably over time or with exposure to high temperatures. However, PCBs are persistent in the environment and bioaccumulate in fatty tissue. They can now be detected at low levels in all environmental media and animal tissues.

The UK production of PCBs ceased in 1976. However, the sale for use in electrical equipment was allowed until 1986.

Health effects of PCBs

5. Evidence from experiments with animals show that PCBs can disturb liver metabolism, affect the endocrine, immune and reproductive systems, and cause cancer, with such affects often seen at relatively low doses. In contrast, the only consistent clinical finding seen in humans after severe PCB exposure is chloracne, a disfiguring skin condition. Although there is inadequate human evidence for effects other than chloracne, the pattern of animal evidence and the marked ability of PCBs to accumulate in the body does give rise to concern for human effects following high exposures to PCBs.

What equipment does this guidance cover?

Small Electrical and Electronic Appliances

6. PCB capacitors may have been used in the following electrical and electronic appliances manufactured between the 1950s and the mid-1980s:

- Fluorescent strip lights for industrial and business premises
- Domestic appliances such as washing machines, spin dryers, mangles, cooker hoods, microwave ovens, freezers and dishwashers
- Audio/visual equipment
- Street and garden lights
- Oil burners and warm air appliances
- Vehicle start motors

7. The service life of domestic appliances and equivalent equipment is between 5 and 25 years so, while the majority of appliances are likely to have been replaced by now, there may still be appliances in use which still contain PCB capacitors. Much of the equipment listed above currently being discarded is liable to be of an age where they do not contain PCBs and so will not need to be covered by the guidance.

Identification of PCB capacitors

8. There is very little information available on the names and types of capacitors manufactured with PCBs. They have not been made for many years, and many of the manufacturers are no longer operating so much information on products containing PCBs has been lost. The European Commission tried to compile a list of production names of certain capacitors containing PCBs manufactured in Europe (see Annex 1), however the data is fairly sparse.

9. Some guidance on the identification of small PCB capacitors in the most commonly used equipment is given below, but in many cases you will be unable to tell – therefore you should judge on basis of age of the equipment.

10. Many manufacturers included PCBs in all capacitors which they produced during this period of time and it would be prudent to assume that any equipment manufactured before 1986 has PCB-containing capacitors unless it is reasonable to assume the contrary.

Fluorescent lighting

11. The major waste stream containing small PCB filled capacitors is old fluorescent strip and street lighting.

PCB containing capacitors within fluorescent light fittings are likely to have the following:

- A resonant start;
- A capacitor that is cylindrical or rectangular, encased in an aluminium container with a weld running all round the top edge with two terminals with quick connect tags;
- A date mark from the 1950s, 1960s, 1970s;
- A capacitor encased in a rectangular metal container with soldered seams;
- Slightly heavier than similar types of capacitors manufactured after the 1970s (which do not contain PCBs)

12. Fluorescent light capacitors are located in the housing of the light fixtures. You may have to unscrew the back panel to access them.

Electrical and electronic equipment

13. White goods and other domestic appliances such as washing machines, cookers and radios. These are most likely to contain starting capacitors, which are used to assist a single-phase electric motor in starting. These components are used for short periods of time during operation of the motor. Consequently, starting capacitors do not need to dissipate heat and are, therefore, primarily dry capacitors.

- Starting capacitors are most easily identified by black plastic casing or outer shell.
- If the capacitor is dry, the casing is not hermetically sealed or totally enclosed, but generally contains a porous plug at one end. Dry capacitors do not contain PCB and will not need separate collection.

14. The capacitor will be attached to the housing of the motor and may be covered by a protective casing. This cover must be removed to access the capacitor.

Vehicles

15. Vehicles manufactured before 1986 would have had limited electrical circuitry and are therefore likely to have contained just one capacitor as part of the starter motor.

Collection

16. White goods equipment should not be allowed to be crushed before being taken to a site for dismantling. Capacitors containing PCBs should be removed intact from the equipment and disposed of whole – taking care not to release the PCB content. Removal of damaged or leaking capacitors from the equipment must be carried out with care following HSE guidance on the handling of PCBs – see below.

17. After removal, PCB containing equipment should be placed in a polythene bag, which should then be placed in a sealable metal container which is in good leakproof order. If some of the materials are leaking steps should taken to ensure the contents do not escape - for example the container could be partially filled with an absorbent material, such as a commercial absorbent, cat litter, or diatomaceous earth. It is advisable to store intact and leaking capacitors in separate sealed containers. Containers must then be clearly marked with the details of their contents and must be maintained in good order, with no visible signs of damage or corrosion. The total volume of PCBs held in one given area should not exceed 5 litres.

Storage prior to disposal

18. Any PCB containing material should be disposed of as soon as possible, but if they have to be stored for any length of time they should be stored in a separate location well away from food preparation areas to prevent ingestion or cross-contamination, and any sources of heat or flammable liquids. All sealed containers should be stored in an area that prevents any discharge of PCBs to the environment. There should be no drains to avoid leakage to water and no entry from any unauthorised personnel to prevent tampering.

Disposal

19. PCBs, as special wastes, need to be safely disposed of at facilities licensed to dispose of them, and consigned in accordance with the Special Waste Regulations 1996 (as amended) (Special Waste Regulations (Northern Ireland) 1998) and in accordance with the consignment note system. The wastes will need to be transported for disposal by a carrier registered with the Environment Agencies under The Controlled Waste (Registration of Carriers and Seizure of Vehicles) Regulations 1991 and the Controlled Waste (Registration of Carriers and Seizure of Vehicles) Regulations (Northern Ireland) 1999.

The following waste management companies are licensed to treat PCB wastes via high temperature incineration:

Shanks Waste Solutions Charleston Road Hardly Hythe Southampton SO45 3ZA	Shanks Waste Solutions Pontyfelin Ind Estate New Road Panteg Pontypool Torfaen NP4 5DQ	Cleanaway Ltd Bridges Road Ellesmere Port Cheshire L65 4EQ

Safe handling of PCBs

20. Guidance on how to handle PCBs is given in an HSE publication HSE Leaflet (1995) “PCBs and You” which can be obtained by mail order from HSE Books, PO Box 1999, Sudbury, Suffolk, CO10 6FS (Tel 01787 313995).

Annex 1: LIST OF PRODUCTION NAMES OF CAPACITORS CONTAINING PCBs

BRAND NAME	**Type of capacitor**	**MODEL**	**Type of PCBs-Impregnating material**
AEG		LFB 71224 EW XI LFB375/385 EW VI	4 CD
AEG (HYDRA)	Power capacitors Fluorescent tubes /motor capacitors	From 1956- 1983	Clophen CPA 30, 40, 50 3 CD 4 CD 5 CD 3 CD 4 CD CD CP
ACEC	High voltage capacitors	CAN 50	
AEROVOX			
ABB (ASEA Dominit, Lepper Dominit, ASEA Lepper)	Power Capacitors	CPN… (except CPN 7and CPN9) CPH CKN CKH	A30 A50 3 CD Cp Cpstab
AXEL ELECTRONIC			
BAUGATZ	Power Capacitors Fluorescent lamps/ motor capacitors	LD… LU… KSE… OVL…. KSE/OVL…. TV… KSE/TV… CpD … CpM … CpN … CpNK … HSE … HSD … RKO … ZZD … CpH … MB… CpL… Motostal…	CD, 3 CD, 4 CD, CPA 30, CPA 40 CP, CPA 40, 3 CD, 4 CD
BICC		All capacitors	
CAPACITOR SPECIALISTS			
CESA			
CINE-CHROME LAB			
COGEGO		PRA 2211210 34202 TS420V	
COMAR	Several uses	50013.5/oil	
CORNELL DUBLIER			
DUBLIER			

DUCATI	Power capacitors	16.52.22.89 HMF 16.52.23.89 HMF	3CD
	Fluorescent tubes / motor capacitors		3 CD LDO
	Washing machine capacitors	16.43.41 90 16.67.06 16.67.11.94	3CD
ELECTRIC UTILITY			
ELECTRICA			No designation
ELECTRONICON RFT/GERA		0.218. xxx 0.219.xxx	Chlordiphenyl Chlordiphenyl
ELOS		560-6 JPF	CP
ERO	Dishwashers capacitors	Up to 1983 BX RCD 5LY5011	CPA 40
	Power capacitors	Phcl	CD CP
	Fluorescent tubes / motor capacitors	LX	
ESTA		BX/LMX/5LY5011 BX/LMX/5LY5010 BX/LMX/5LY5010 BX/LMX/5375 HMC BX/LCX/559 HMF	CD CD CD CD
	Power capacitors	Phclz Phclf Phkc Phfp Phfpw	P25
	Fluorescent tubes / motor capacitors	LCU MCX MCU	CP CD
F+G		Neptun 922-758-50 IPF 922-758-51 IPF 922-758-51 INF 922-758-50 INF 922-758-50 IPF 922-758-50 ISF	CP CP CP CP 4 CD CP
FELTEN & GUILLEAUME	Power capacitors	0.220…output data 0.230… 0.380… 0.400… 0.500… 0.526…	Clophen Cp P CP 25, 30, 40, 50

FRAKO		LR 15TW LR 31T LR 2	3 CD 3 CD
	Kitchen hood capacitors	Up to 1983	CPA 40
	Power capacitors	Ph	3 CD A 30 4 CD A 40 Cp
	Fluorescent tubes / motor capacitors	LR M…RLB M…RKB M…RFB	3 CD A 30 4 CD A 40 CP CD 3 D 76 C CP CPA 40
	Washing machine capacitors		CPA 40 Clophen
GEC			
GENERAL ELECTRIC		36F780G11 61 F39LAA MNP-50 MNP-2531	
	High voltage capacitor	UNIFILM 100	
GENERAL ELECTRICA ESPAÑOLA (currently ABB)		130 CMA-150 CMA-200 CMDK-200 CMA-100	
HYDRA	Dishwashers capacitors	Up to 1983	3 CD
	Fluorescent tubes / motor capacitors		C2 CPA 50 4C 4 CD 3 CD LFB CPA 40
	Washing machine capacitors	MKB/20/2521	
HYDRAVERK			
IBM			

ICAR-SLIMOTOR	Kitchen hood capacitors	1411051 up to 1983	
	Dishwashers capacitors	all between 1972-76	3 CD, MS 55
	Power capacitors		CP
	Fluorescent tubes / motor capacitors		5 CD 3 CD C 100 C 125 C 180 CD
	Washing machine capacitors	From 1976-1986 MS 55 697 JTYP MS	3 CD C C100 C 105 C 180 C 125 CD
INCO	Power capacitors		3 CD
	Fluorescent tubes / motor capacitors		3 CD
	Dishwasher capacitors	Up to 1983 6911	
	Washing machine capacitors	717	
INDUKON		All capacitors until mid 1970's	
INF			
IPF			
ISF			
ISKRA	Fluorescent tubes / motor capacitors		9D 8D
	Washing machine capacitors	KPM 1015 KPM KPM 1017	9D 8D
ISOKOND	Power capacitors	BK LKC LKP LKCA LKCI LKPA KCI KPI	Orophen Cp, CD A 50, A 30 5 CD, 3 CD
ITAL-FARAD	Fluorescent tubes / motor capacitors		C
	Washing machine capacitors	All between 1969-1970 RL4546 KPM.711 KPM.1015	C
ITT			
JARD CORP			

JENSEN	Motor capacitors	CXX NXX	
KAPSCH	 Power capacitors Fluorescent tubes / motor capacitors	KO 7943 RLO	CD CP CD 3C 3CD
LCC			
LILJEHOLMEN	Low voltage capacitors	DRA…	
LK		All capacitors 1960-1980	
LUMAX	Fluorescent tubes / motor capacitors	LFB 922 933 922-758-59 922-758-51 ISF LBF 3.74/380Xi KPF LFB 9/222 XI	CPA 40 CP
MALLORY			
MARON	Fluorescent tubes / motor capacitors	M22AMFL256W	
McGRAW-EDISON		5	
NATIONAL INDUSTRY	High voltage capacitor	FPF-U 2C-0100A03	
NETO			
NEUBERGER	Fluorescent tubes / motor capacitors		CP CD 3LP 3CP LDO3
NOKIA Nokia/Nordisk Brown Bovery	Power capacitors Low-voltage capacitors High-voltage capacitors	AD* AY* ED* EY* HD* HY* RD* RY* *= A, D, E, I, K, O, P, S, U or V between 1960-1976 the first two characters of the batch number indicate the year of manufacture between 1960-1978 the first two characters of the batch number indicate the year of manufacture	
NORDFALK		All capacitors between 1959-1982 Capacitors are numbered in succession 19.500 aprox <Capacitor number < 58.500 aprox	

OTTO JUNKER	Power capacitors	CF^{pc}… CE^{pc}… CP^{pc}… CD^{pc}… CW^{pc}… BZW	A 30; CP 30 A 40, CP 40 A 50, CP 50 3 CD 4 CD 5 DC
PHILIPS	Fluorescent tubes	 2222 240 26031 2222 240 26035 2222 240 11431 C120 BA UDE 2222 240 76035 2222 240 241 C 120 C 124 C 125 C 126 82280-82228	CP 3 CD 3 CD
RF INTERONICS			
RIFA	Fluorescent tubes/ motor capacitors	PLJ 5011 PLJ 5013-5015 PLJ 503-505 PLJ 605	
ROEDERSTEIN (ERO-ESTA)	Power capacitors Fluorescent tubes / motor capacitors	Phcl Phclz Phclf Phkc Phfp Phfpw LCX LCU LMX LMU MCX MCU	CPA 40 P 25 CD Cp
SANGAMO ELECTRIC			

SIEMENS		Since 1954	C1p30 C1p40 P25
	High voltage capacitors (above 1Kw)	All capacitors between 1954-1975 The year of manufacture appears from the batch number, identified by the first two digits after the designation D.	PCB Askarel
	Low voltage capacitors (below 1Kw)	4RA Co Cd NSP: Ce… Co… Cd… Cod… 4 RA Msp: ICd… fCe ICp… frCE… 4 RG… 4 RH… MF: lCe… lCy WCe… kCe… RI… (up to 1976)	Clophen CP A 30 CP A 60 CP A40
	Power capacitors	B 13311… B 13312 … B 13314 (up to 1973)	
	Fluorescent tubes / motor capacitors	B 13319 … B 15030 … B21311 B21312 B21313 B21314 B21315 B21316 B21317 B21318 B21319	

SIEVERTS (ASEA) cable plant	Low voltage capacitors		CRA 3 CLE 01 CLD 01 CLD 1 CLD 2 CLD 3 CLD 4 CLD 5 CLFA 100 CRK 5 CRK 8 CRK 10 CRK 20 CRK 40 CRKS 5 CRKS 8 CRKS 10 CRKS 25 CRKS 40
	High voltage capacitors		CTVA 6 CVGA CHF 31 CVF 31 CVFA 50 CVFA 100 CVGA 50 CVGA 100 CVH
	Shunt or series capacitors and furnace capacitors		CKTA 5 CTDA 6 CHA 50 CHA 100 CHX CR 50 CR 100 CRS 50 CRS 100 CPNI CHF CHF 20 CHF 50 CHF 100
	Special capacitors		CLFL 100 CRU CUD HMRV 25 HMRV30

SPA	All capacitors	Up to 1988 KSK…	
SPRAGUE	All capacitors labeled CHLORINOL		
SUKO	Power capacitors Fluorescent tubes / motor capacitors	Ph…380 PH…400 (up to 1974) MCAL [f](up to 1970) 31…260 up to 450 (up to 1982) CLA… (up to 1970) CDA… (up to 1970) 11/13…220 (up to 1982) 12/14…380 (up to 1982) 12/14…420 (up to 1982) 560-665F R	CD CPA CD CP BE(5) BEE
THOMSON		LS3 LCX 559	3 CD
THOMSON-CSF (Elos, Ducati)	Fluorescent tubes / motor capacitors	LEUKO – LS xxx 250-420 MOTKO – 16.60XXX DCT – MS xx Elos	3 CD 3 DC
TOBE DEUTSCHMANN LABS			
UNIVERSAL MANUFACTURING CORPORATION			
VALVO	Fluorescent tubes / motor capacitors		P CP
VEB Spindelberg	Washing machine capacitors	TS 66 TS 60	
VEB Schwarzenberg	Washing machine capacitors	WM 66 ELECTRO 02 WA 45 WA 46 WVA 500 WM 60 TM 64	
WESTINGHOUSE	 High voltage capacitors	FE 65549-1 65549-1 200KVAR-9.6KV DV…	
YORK ELECTRONICS			

UNKNOWN	Kitchen hood capacitors	Italian manufacturer 03834 P.RIC up to 1983	
	Washing machine capacitors	ex-DDR manufacturers up to 1976 0291 TLG 10589 Up to 1977 A-TGL 8699 25/070/56 10/070/56 KPM 1013 DB 764 Up to 1984 TLG 200/8268	Chlordiphenyl CD AK 50
	Unknown appliance	LFB ewl BB LR 2211 210 23017 (Philips?) 2222 240 90091 560-6 0277 FP (Philips?) 2222 240 11431 QF (Philips?) LCX GIO BO 40 MF EUC 958-501401 2-3 S 120 ZX X.3 2222 290 11055 (Philips?) N NEUKO LS 2222 240 90059 (Philips?)	3CD 3 CD 3 CD 3 CD CD 3 CD 3 CD

Small changes in the way we perform everyday tasks can have huge impacts on Scotland's environment.

Walking short distances rather than using the car, or being careful not to overfill the kettle are just two positive steps we can all take.

This butterfly represents the beauty and fragility of Scotland's environment. The motif will be utilised extensively by the Scottish Executive and its partners in their efforts to persuade people they can do a little to change a lot.