

Summary of Analytical Test Results for Portable DVD Players

Background

The Electronic Waste Recycling Act of 2003 established a statewide program to promote and fund the collection and recycling of hazardous electronic devices beginning July 1, 2004. Under the law, retailers collect an advance recycling fee on covered electronic devices at the time of purchase. The money collected is used to fund an electronic waste recycling program that reimburses authorized electronic wastes collectors and recyclers. The California Department of Toxic Substances Control (DTSC) and the California Integrated Waste Management Board (CIWMB) jointly administer the program. Covered electronic devices include cathode ray tubes (CRTs), flat panel screens, and other, similar devices that DTSC has determined to be hazardous. DTSC's Environmental Chemistry Laboratory recently completed testing of portable DVD players with liquid crystal displays (LCDs) greater than four inches when measured diagonally to determine if they are hazardous.

How Were the Devices Tested?

DTSC randomly selected and tested five different portable DVD players from five different manufacturers. Testing methods used for this analysis include U.S. EPA method 3050B for the determination of total metals in each device, the California Waste Extraction Test (WET) for the determination of extractable metals in each device, and U.S. EPA method 7471A for the determination of mercury in each device. The data were compared to the respective hazardous waste regulatory thresholds described in California Code of Regulations, title 22, section 66261.24, subsection (a), paragraph (1), subparagraph (B) (for mercury), and paragraph (2), subparagraph (A) (for metals). Based upon these test results, DTSC may amend Division 4.5 of the California Code of Regulations, title 22, chapter 11, appendix X, section (c) to include portable DVD players in the list of electronic devices that are presumed to be hazardous waste when discarded.

What Were the Test Results?

All of the devices tested exhibited at least one of the State's criteria for toxicity (See Tables I through III, attached). Three of the devices exhibited the toxicity characteristic for lead, one of the devices exhibited the toxicity characteristic for nickel, one of the devices exhibited the toxicity characteristic for antimony, and all five of the devices exhibited the toxicity characteristic for copper. None of the devices exhibited the toxicity characteristic for mercury. (However, when the Cold Cathode Fluorescence Lamps (CCFLs) were removed from each device and tested separately, they did exhibit the toxicity characteristic for mercury.) The analytical data for the portable DVD players suggests that these devices contain hazardous levels of copper, lead, nickel, and/or antimony.

For More Information

Applicable regulations and related information are available on DTSC's Web site at: <http://www.dtsc.ca.gov/HazardousWaste/EWaste/index.cfm>.

Table I

Reference Values		Calculated total metals ¹ for the component fractions of various portable DVD players (mg/kg), based on total mass of device														
Analyte	Regulatory Threshold (TTLC, mg/kg)	Magnavox			Panasonic			Insignia			LGDVP7772			Initial		
		Panel	Plastic	CB ²	Panel	Plastic	CB	Panel	Plastic	CB	Panel	Plastic	CB	Panel	Plastic	CB
Antimony	500	0.35	9.71	41.37	1595.06	0.60	2.36	0.26	1.38	65.27	ND	3.13	21.95	1.89	0.52	5.81
Arsenic	500	4.35	1.17	0.83	3.52	1.94	0.68	9.53	0.80	ND	7.15	ND	3.61	2.62	14.25	3.81
Barium	10,000	1.11	10.78	3075.86	257.81	5.05	1065.59	1.38	3.36	1821.60	4.26	12.15	2159.40	26.33	14.76	1769.97
Beryllium	75	ND	ND	6.76	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.10
Cadmium	100	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	7.60	ND
Chromium	2500	10.88	3.52	14.97	6.52	3.81	8.36	7.90	8.69	98.80	4.55	2.04	17.22	6.38	3.01	185.63
Cobalt	8000	0.19	0.24	1.40	ND	3.20	2.62	0.13	0.54	4.87	0.47	5.51	6.34	0.04	1.08	2.71
Copper	2500	3.06	799.99	45865.70	7.04	17.86	32627.80	51.18	364.47	39088.50	10.67	2889.23	39825.00	7.01	267.96	43313.90
Lead	1000	0.54	0.09	2722.00	0.40	0.10	105.62	0.14	ND	1302.95	0.85	20.76	228.33	0.06	1.86	4921.38
Molybdenum	3500	0.21	0.37	0.68	0.05	0.21	0.24	3.85	0.72	0.63	3.33	0.72	0.68	0.14	0.21	1.58
Nickel	2000	5.14	127.80	1959.84	3.96	14716.32	890.19	5.40	910.14	1555.95	4.20	595.55	4071.00	5.13	153.57	677.77
Selenium	100	0.09	0.06	ND	0.21	ND	ND	0.09	0.02	ND	ND	ND	ND	0.08	0.25	ND
Thallium	700	ND	0.02	5.93	ND	0.31	8.49	0.01	ND	2.59	ND	ND	12.96	ND	ND	9.60
Vanadium	2400	ND	0.24	ND	0.19	0.27	ND	ND	0.09	ND	ND	ND	0.89	ND	0.38	0.89
Zinc	5000	2.20	4.06	617.89	1.55	90.64	268.76	2.08	47.99	382.03	1.45	8.05	1531.05	0.46	8.91	611.58

1-The total metals in each component fraction (i.e., panel fraction, plastic fraction, or circuit board fraction) were determined for each DVD device using method 3050B, and the total metals in each component fraction with respect to the total mass of each device were then calculated by multiplying the metal concentration (as determined by method 3050B) for each component fraction by the mass ratio of that fraction in each device.

2-CB denotes the circuit board fraction of each device.

Note: Gray shading denotes calculated total metal concentrations that are above the respective TTLC.

Table II

Reference Values		Calculated extractable metals ¹ for the component fractions of various portable DVD players (mg/L), based on total mass of device									
Analyte	Regulatory Threshold (STLC, mg/L)	Magnavox		Panasonic		Insignia		LGDVP7772		Initial	
		Plastic	CB ²	Plastic	CB	Plastic	CB	Plastic	CB	Plastic	CB
Antimony-Sb	15		ND	1.86			ND				
Barium-Ba	100		4.25		2.35		4.05		4.18		3.07
Copper-Cu	25	14.24	ND		0.01	7.03	ND	93.76	0.03	15.16	ND
Lead-Pb	5		0.11		0.03		0.20		0.05		0.89
Nickel-Ni	20	8.93	0.59	114.10	0.29	18.82	0.80	3.15	1.79	10.25	0.31
Zinc-Zn	250		0.64		0.36		1.25		1.37		1.76
% Total Mass ³		48.78	13.61	53.32	9.43	41.37	12.65	40.24	17.7	39.58	14.39

1-The extractable metals in each component fraction (i.e., plastic fraction, or circuit board fraction) were determined for each DVD device using the California Waste Extraction Test, and the extractable metals in each component fraction with respect of the total mass of each device was then calculated by multiplying the extractable metal concentration (for each component fraction by the mass ratio of that fraction in each device.

2-CB denotes the circuit board fraction of each device.

3-% Total Mass was calculated in worksheet "Total Metals Data and Calc"

ND=Not Detected

Table III

Mercury Data For DVD Players By Method 7471A.

Pool	Calculated average mg/kg mercury per portable DVD devices (based on calculations shown below)
A	0.46
B	0.32
Overall average mg/kg mercury per portable DVD device	0.39

Calculated average mg/kg mercury per CCFL for all devices (based on calculations shown below)
260.00

Analytical Data from ECL:

Pool	Devices in Pool	Analytical results, mg/kg mercury in pool (based on EPA 7470A)
A	Panasonic + Insignia	380
B	Magnavox + LGDVP7772 + Initial	140

Calculations:

	Devices in Pool A		Devices in Pool B		
	Panasonic	Insignia	Magnavox	LGDVP7772	Initial
Mass of CCFL fraction, in grams (before milling)	0.7	1.8	1.4	1.4	2.2
Mass of device before disassembly	868	1186.1	896.5	633.5	688
% Total mass from CCFL	0.08	0.15	0.16	0.22	0.32
Average mass of CCFLs in pool (g)	1.25		1.67		
Std. Deviation of average CCFL mass	0.78		0.46		
Average mass of DVD player in pool (g)	1027.05		739.33		
Std. Deviation of average DVD mass	224.93		138.81		
% Total mass from CCFL, based on calculated average mass of each DVD player in pool	0.12		0.23		
Std. Deviation of % Total Mass CCFL	0.05		0.08		