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## Q&A: Electronic Devices and Electronic Device Dismantling



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DTSC has prepared this Question and Answer (Q&A) document to assist electronic waste recyclers in understanding the various types of residuals, including hazardous wastes, that may be generated from the dismantling of electronic devices (as defined in California Code of Regulations, title 22, chapter 23, section 66273.9). This document is not intended to be a comprehensive reference and is not meant to supersede the regulations and requirements governing the management of electronic wastes and their treatment residuals. For complete information on how to manage electronic wastes, please refer to California Code of Regulations, title 22, chapter 23.

### **Question 1: Are all devices that use or transfer electrical power Electronic Devices (EDs)?**

**Answer 1:** No. Electronic equipment/devices contain **circuitry**, such as printed circuit boards, that provide a variety of functions not found in simpler electrical equipment/devices. Electrical equipment/devices can usually be switched on or off, but generally *cannot* perform other functions.

**Programmable devices** contain electronic circuitry and are therefore EDs, whereas **non-programmable devices** would generally be considered electrical equipment. For example, programmable toasters or coffee makers would be considered *EDs*, but non-programmable toasters or coffee makers would be considered *electrical equipment*.

### **Q2: Can you provide some examples of EDs vs. non-EDs?**

**A2:** Examples of EDs include: computers, computer peripherals, telephones, answering machines, radios, stereo equipment, tape players/recorders, phonographs, video cassette players/recorders, compact disc players/recorders, calculators, and some appliances.

Examples of wastes that DTSC does not consider to be EDs include: oil-filled transformers, metal switch gear, electrical power distribution and transmission equipment, large metal microwave ovens, and other items that are not predominantly plastic, and/or hazardous for toxicity.

### **Q3: How do I manage the components of EDs that I dismantle onsite?**

**A3:** Components of EDs, such as printed circuit boards, that are removed via disassembly or shredding are hazardous waste **treatment residuals**. As a condition of their authorization, ED handlers who disassemble or shred must: 1) contain the treatment residuals, 2) perform hazardous waste determinations for the residuals, and, if they are hazardous, 3) must properly manage them as hazardous wastes (an exception is *circuit boards*, which can be toxic for metals but may be managed as exempt scrap metal if they are recycled for their metal content; see item 6 below).

### **Q4: How do I classify and manage a waste microwave oven?**

**A4:** As mentioned in A2 above, some appliances are EDs, but not all. Microwave ovens that are *primarily metal* may be collected by universal waste handlers/recyclers, but if they contain Materials that Require Special Handling (MRSH) they may only be dismantled by a Certified Appliance Recycler (CAR). Microwave ovens that are *primarily plastic* are not subject to the Metallic Discards Act major appliance requirements, but are subject to ED management requirements. These predominantly plastic microwaves may be dismantled by an ED recycler pursuant to the ED requirements *regardless* of whether they contain MRSH or not.

The operator is responsible for justifying whether a microwave is primarily metal or primarily plastic. There is no scientific test available to make the distinction one way or the other. Operators are advised to make their best determination and then manage according to whichever of the two above standards applies.

For information about how to become a Certified Appliance Recycler, please go to [http://www.dtsc.ca.gov/HazardousWaste/Mercury/Certified\\_Appliance\\_Recycler.cfm](http://www.dtsc.ca.gov/HazardousWaste/Mercury/Certified_Appliance_Recycler.cfm).

### **Q5: How do I manage a waste toaster oven?**

**A5:** The analysis that applies to microwaves also applies to toaster ovens. Toaster ovens that are hazardous, but are exempt scrap metal would not be EDs; those that are hazardous (due to toxicity) but are not exempt scrap metal may be classified as EDs.

### **Q6: May I heat printed circuit boards in order to remove chips or other components from the boards?**

**A6:** Yes, once you have classified the circuit boards generated onsite as exempt scrap metal.

The final e-waste regulations (effective February 4, 2009) allow greater flexibility in treatment of circuit boards. This flexibility has been accomplished by viewing the recycler as a “generator” of the circuit board. The circuit board can then be classified as scrap metal and further treated onsite (often by heating to remove the chips) without incurring expensive permit costs.

Circuit boards that disassemblers remove, and/or facilities treat, are regulated as “Residual Printed Circuit Boards” (RPCBs). Once the disassembler and/or treater removes the circuit board from the device, they have to label and containerize them as RPCBs, promptly respond to spills, and comply with any Title 22 permit requirements that may apply. A facility that uses only heat to remove chips from circuit boards will rarely require a permit. A facility that uses chemicals to treat circuit boards may be required to obtain a Tiered Permit, standardized permit, or even a full Resource Conservation and Recovery Act (RCRA) permit; see [http://www.dtsc.ca.gov/PublicationsForms/prog\\_pubs\\_keyword.cfm?prog=Managing%20Waste&keyword=Permit](http://www.dtsc.ca.gov/PublicationsForms/prog_pubs_keyword.cfm?prog=Managing%20Waste&keyword=Permit) for more information.

The RPCBs must be labeled and contained pursuant to California Code of Regulations, title 22, chapter 23, section 66273.9 until they’ve been classified as scrap metal and will be shipped offsite, or once they have been classified as scrap metal and have gone through the onsite shredder.

Circuit boards already removed from electronic devices prior to receipt, or never installed in an electronic device, are considered scrap metal and are not subject to the management requirements for EDs.

In either case, the handler must be able to prove that some fraction of the material was recycled to recover metal values, in order to fulfill the scrap metal exemption.

**Q7: How do I classify and manage Cold Cathode Fluorescent Lamps (CCFLs) removed from EDs such as fax machines and digital scanners?**

**A7:** CCFLs would qualify as *treatment residuals* once they are removed. While CCFLs meet the definition of a hazardous waste due to their concentration of *mercury*, they also meet the definition of a *universal waste lamp* and can be managed as such. See Title 22, California Code of Regulations, §66273.33(c).

**Q8: Should I remove the small CCFL tubes from the back of LCD panels?**

**A8:** LCD panels are typically lined with small fluorescent tubes (CCFLs) that you may need to remove in order to fulfill CalRecycle Covered Electronic Waste (CEW) Payment Program cancellation requirements. These tubes should be removed if they do not cause the release of mercury vapor.

If the CCFLs are glued to the back of the LCD panel in such a manner that removing them could cause breakage (and mercury vapor release), the CCFL tubes should not be removed. Instead, set aside such LCD panel(s) and arrange to ship them to a facility that can safely recycle CCFLs. The U.S. Environmental Protection Agency (U.S. EPA) provides guidance on how and where to recycle CCFLs; go to <http://www.epa.gov/cfl/cflrecycling.html> for more information.

**Q9: How do I classify spent printer toner cartridges removed from EDs?**

**A9:** Used printer toner cartridges are commonly found in EDs. Toner cartridges can be removed from EDs in accordance with the universal waste regulations. Once removed, they are considered *treatment residuals*. They may be classified as **exempt empty containers** if they are empty. As empty containers, the toner cartridges may be sent for disposal or refill. Toner cartridges that are not empty may be hazardous wastes and, if so, must be managed accordingly.

A container is considered “empty” once no material can drain or drip, or (for non-pourable materials) no material can be feasibly removed by physical methods, including scraping and chipping. For more information on management of “empty” containers, see California Code of Regulations, title 22, section 66261.7.

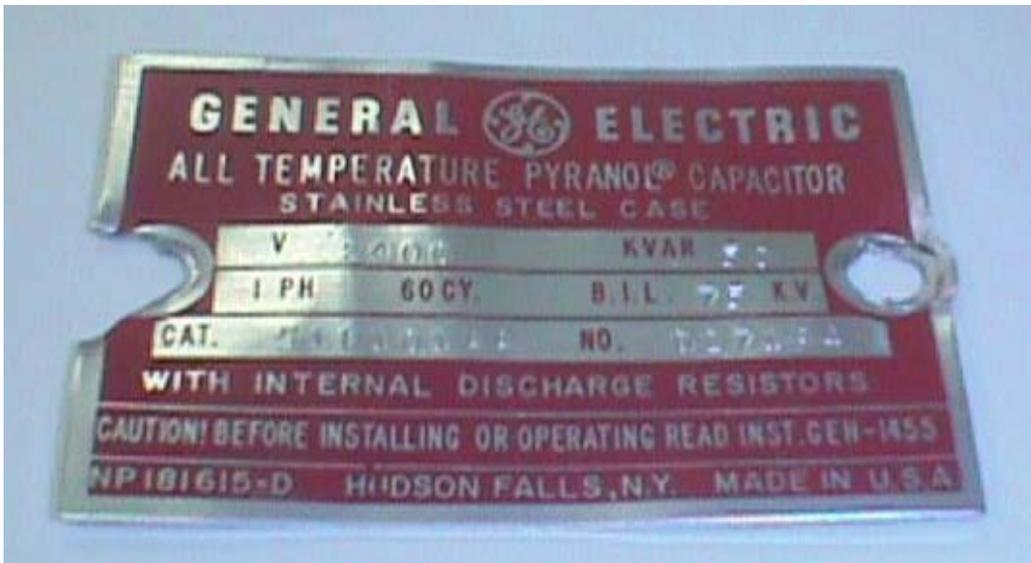
Partially empty containers, containing hazardous waste ink, that are returned to a retailer or manufacturer for refill must be managed as hazardous waste until they are returned to service as a product. See <http://www.calrecycle.ca.gov/ReduceWaste/Electronics/InkAndToner.htm> for more information on toner ink and cartridge management.

**Q10: How do I classify and manage coolant removed from projection TVs?**

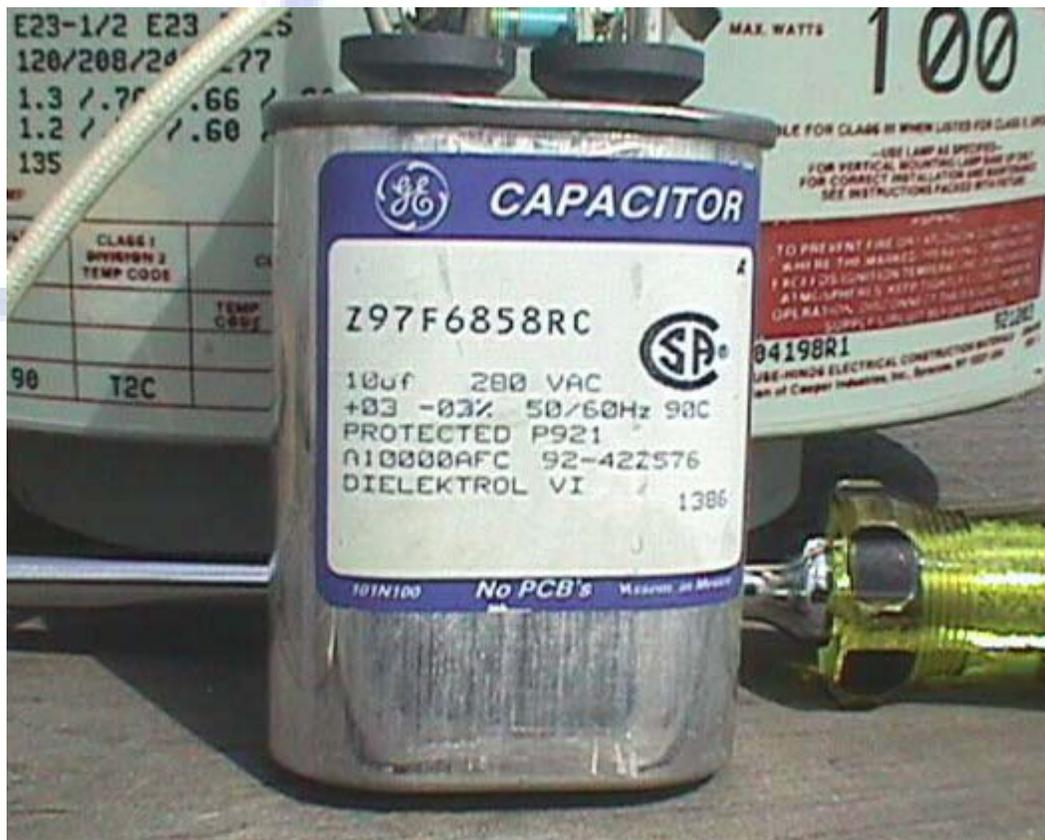
**A10:** DTSC is aware of two coolants commonly used in projection TVs: mineral oil and glycol solutions. Once removed, these *treatment residuals* must be properly classified as discussed in item A3 above. Generally speaking, mineral oil will be **used oil** and would be regulated as a non-RCRA hazardous waste, whereas the glycol solutions should be evaluated to determine if they are hazardous wastes (due to toxicity).

**Q11: How do I distinguish between capacitors that contain PCBs and those that don't?**

**A11:** Many EDs contain capacitors that must be removed before the devices can be further processed. A capacitor containing PCBs will have a marking on the back indicating such. PCBs were banned in products after 1978, but existing stocks were allowed to be sold, so products through 1980 should be assumed to contain PCBs (unless marked as not containing PCBs). You should train your employees to look for these markings and **segregate** capacitors that have PCBs. If there are no markings on the back of the capacitor, set it aside for a hazardous waste determination, or assume that they contain PCBs in order to avoid misclassifying a hazardous waste as non-hazardous.



Label from a PCB capacitor (Pyranol is a PCB fluid trade name)



Example of a non-PCB capacitor (note the marking at the bottom of the label)

**Q12: I've heard that certain rechargeable batteries are highly flammable. How should I instruct my employees to properly handle them while dismantling EDs?**

**A12:** Different types of common batteries, especially lithium “button” batteries, can be highly flammable and dangerous if the contacts touch one another. It is recommended that the button batteries be individually placed on tape to keep them separate from each other.

Some non-automotive batteries removed from EDs may also contain acid. If employees will be removing many different types of batteries and commingling them, they should take the precaution of bagging like batteries and separating them from other types to prevent a potentially hazardous situation. The U.S. Department of Transportation regulates the packaging and transport of batteries. Go to <http://www.phmsa.dot.gov/portal/site/PHMSA/menuitem.ebdc7a8a7e39f2e55cf2031050248a0c/?vgnnextoid=43530725a4645210VgnVCM1000001ecb7898RCRD> for an interpretive letter on the packaging requirements for various batteries.

**Q13: Do I have to provide my personnel with written training on the management of EDs and ED Dismantling?**

**A13:** Yes. Before the final e-waste regulations became effective February 4, 2009, an e-waste handler did not need to provide written training to personnel on the hazards of electronic devices. However, handlers are now responsible for providing initial training and annual refresher training to all personnel who manage or who supervise those who manage EDs, and for documenting that training.

Training materials must be in the form of any written media (e.g., brochures, electronic mail, company letters, pamphlets, posters, etc.) and include the types and hazards of EDs handled at your facility, their proper disposition, and procedures for responding to a release. The detailed requirements are found in California Code of Regulations, title 22, section 66273.36.

DTSC cannot recommend, endorse, or provide training material for you to include in your facility training content, since all e-waste facilities are different and handle various types of EDs. However, you may consider including relevant content of this Q&A in your training material, with the understanding that on its own it will be insufficient to meet all the training requirements.

**Q14: I understand that plasma TV glass panels may not be managed the same as CRTs and CRT glass. What do I do with them after I dismantle plasma monitors?**

**A14:** DTSC has evaluated plasma panel glass and determined that the *inner glass panel* exhibits the hazardous waste characteristic of toxicity due to lead (see [http://www.dtsc.ca.gov/HazardousWaste/EWaste/upload/HWMP\\_REP\\_SB20\\_LCD.pdf](http://www.dtsc.ca.gov/HazardousWaste/EWaste/upload/HWMP_REP_SB20_LCD.pdf) for more information). If your facility dismantles (“cancels”) plasma TV monitors to the bare panel, you should be aware that plasma panel glass has not been designated as universal waste in California. DTSC has observed facilities commingling inner glass panels, which are fully-regulated hazardous waste, in Gaylord boxes (or other

containers) of Universal Waste Cathode Ray Tubes (CRTs) destined for lead reclamation.

Plasma panel glass generated from the dismantling of plasma screens is an e-waste treatment residual; pursuant to section 66273.72(a)(2)(B) of title 22 of the California Code of Regulations, a facility (universal waste handler) that generates treatment residuals must perform a hazardous waste determination pursuant to section 66262.11 of title 22 of the California Code of Regulations. Because plasma glass is **not** universal waste, it is not eligible for the relaxed alternative management standards that apply to CRT glass.

Residuals that are hazardous waste are fully regulated as such, and the handler that generates them is a hazardous waste generator. By commingling inner plasma panels with CRTs and/or CRT glass, a facility will render the entire container a hazardous waste, subject to the manifest, Land Disposal Restriction (LDR), and other requirements imposed on hazardous waste generators. DTSC will cite a serious violation for mismanagement of fully-regulated hazardous waste as universal waste. A container consisting entirely of inner plasma panels would also be subject to hazardous waste requirements unless the panels qualify for a hazardous waste recycling exclusion.

DTSC is unaware of any plasma panel glass recycling options at this time. DTSC is interested in learning from the industry about current or planned recycling options for plasma panel glass.

**Comments or Questions:**

If you have questions about the material presented in this document, contact DTSC's Electronic Waste Team Leader, Rita Hypnarowski, at (916) 255-3699 or [rhypnaro@dtsc.ca.gov](mailto:rhypnaro@dtsc.ca.gov), or DTSC's Consumer Products Section at (916) 322-0348 or [electronicwaste@dtsc.ca.gov](mailto:electronicwaste@dtsc.ca.gov).