

## Best Management Practices for Managing Spent Fluorescent Lamps

**Overview:** This document will guide your business through the nitty-gritty details of lamp recycling. The reader is encouraged to read this document and use it to guide development of a lamp management plan for their business. A lamp management plan helps a business think through all the aspects of lamp management and compliance with the universal waste regulations. In several places, we have made suggestions that will help you demonstrate to a local agency, State, or federal hazardous waste inspector that you are in compliance with the regulations. Topics covered in this section include planning for mass lamp replacement, managing incidental burnt out lamps, accumulating lamps safely for shipment, and shipping spent lamps off for recycling. The following topics are covered below:

- Planning for recycling
  - Choosing lamp management alternatives
  - Establishing a lamp accumulation area
  - Training employees
- Managing waste lamps
  - Changing out lamps
  - Accumulating lamps
  - Shipping to a recycler
  - Keeping records
  - Dealing with broken tubes

**1. Planning for recycling.** Your business should plan ahead for recycling lamps. Advance planning ensures that you will use the most efficient alternatives for managing spent lamps and that you will stay in compliance with the State's universal waste regulations. We recommend that any sizeable business develop a formal, written lamp management plan, train employees managing spent lamps using the plan, follow that plan for day to day lamp management, and periodically consider revising the plan when it fails or when simpler or less expensive management alternatives become available. The major considerations for a lamp management plan are discussed below:

Choosing a lamp management alternative. There are two main approaches for businesses to manage spent lamps:

Mass relamping – Many electrical and lighting contractors offer mass relamping services. The contractor moves through the building replacing all the lamps in each fixture. Mass relamping is usually done on a schedule that replaces all the tubes in the building before most tubes fail. By replacing tubes before many fail (about a three to five year period), relamping costs are minimized. The contractor's workers replace all the tubes at once using new tubes bought in bulk. The relamping contractor then takes the spent tubes either to his own place of business or directly

to a lamp recycler. There are many benefits to mass relamping versus replacement when the lamps burn out:

- It is much cheaper to pay for a one-time replacement of all the tubes in a building than to replace them one at a time as they burn out.
- Less lamp burnouts mean happier occupants.
- Lamp management professionals manage most of the spent lamps eliminating the need for specially trained dedicated personnel and a large area dedicated to accumulating spent lamps.
- Lighting contractors have accounts with lamp recyclers; the large volume of spent lamps they generate leads to lower recycling costs.
- Lighting contractors buy lamps in bulk at lower cost than can most businesses.

Choosing a relamping contractor. There are several considerations beyond licensing, cost, and availability for evaluating potential relamping contractors:

- Choose a contractor that relamps with lower mercury lamps. Lower mercury lamps decrease employee and tenant exposure to mercury when lamps break. Additionally, lower mercury lamps protect the environment by releasing less mercury when they accidentally break. All three major American lamp manufacturers make lower mercury lines of lamps.
- Ensure that the contract specifies that the lamps will be safely managed and recycled. The contract should specify who will recycle the lamps.
- Ensure that the contract requires use of trained employees to change and manage the spent lamps.
- Ensure that the contract requires the contractor to be prepared for cleaning up any lamps broken during relamping and subsequent management.
- Ensure that the contract requires the contractor to comply with the State's universal waste regulations for managing spent lamps.

Failed lamp replacement. Replacing lamps when they fail is the alternative to mass relamping. However, every building must plan for some burnout replacement because some lamps fail earlier than others. Factors such as how often a lamp is turned on and off,

vibration, temperature, and manufacturing variability cause some lamps to burn out before the next scheduled relamping. Usually, the building's maintenance staff changes burnouts because it is prohibitively expensive to pay a lighting contractor to replace lamps one or two at a time.

Whether you choose to hire a contractor to mass relamp your building or choose to replace the lamps yourself, you need to plan for replacing and recycling at least the tubes that fail before the next relamping. The points below should be considered in your spent lamp management plan.

There are several options available for recycling smaller quantities of lamps. These options include:

- **Mail-in boxes.** Most lamp recycling facilities offer pre-paid mail-in boxes for recycling lamps. For a fixed fee, the recycler supplies a strong secure box with partitions for lamps. The fee generally includes mailing or shipping back to the recycler and the cost of recycling the lamps. Mail-in boxes are an excellent alternative for recycling burn outs and for recycling spent lamps from very small buildings.
- **Contract recycling.** Businesses can contract directly with lamp recyclers. The business replaces burnt out lamps, puts them into containers, properly labels the containers, and ships them to (or has them picked up by) the recycler when sufficient spent lamps have been accumulated.
- **Pickup and recycle services.** Major urban areas are increasingly served by businesses that pick up and accumulate universal wastes, including spent lamps, for recycling. These services accumulate lamps from many businesses and contract with various recyclers to recycle them. It is imperative that your contract with a pickup service specify that the lamps be managed in compliance with the law and recycled properly. Remember that you retain environmental liability for your lamps even after a pickup service takes them away!
- **Household hazardous waste collections.** Many cities and counties operate household hazardous waste collection programs with both temporary and permanent collection facilities. These facilities accept hazardous wastes, including universal wastes like spent lamps, from

households and the smallest commercial generators. However, household hazardous waste facilities can legally accept universal wastes like spent lamps from any size business provided that they are managed in compliance with the universal waste regulations. Call your local solid waste management agency to inquire about household hazardous waste collections or visit the California Integrated Waste Management Boards household hazardous waste collection website at [www.ciwmb.ca.gov/HHW](http://www.ciwmb.ca.gov/HHW)

- Other private sector options. DTSC is working the California Integrated Waste Management Board and other interested parties to develop additional private sector options for recycling spent lamps. We envision take back programs at retailers or other alternatives to make recycling spent lamps simple and inexpensive. Visit our webpage at [www.dtsc.ca.gov](http://www.dtsc.ca.gov) occasionally to see if there are any new spent lamp recycling alternatives.

Designating an accumulation area. Once you've chosen how you will get your tubes recycled, it's time to designate a "universal waste accumulation area" for your lamps and prepare the area to receive spent lamps. While you should set aside an area for accumulating spent lamps, you do not need to follow all of the strict rules for access, signs, formal training, and container technical standards that you do for a hazardous waste accumulation area. We've listed some things that you should consider when designating your spent lamp accumulation area below:

- Choosing a suitable location. Spent lamps break easily releasing mercury into the environment. Breakage of tubes exposes both your employees and your customers to mercury and should be avoided. Choosing an appropriate area to accumulate spent lamps is a good start for safe spent lamp management. We've listed some considerations below:
  - You need sufficient room to accumulate as many spent lamps as you expect to accumulate before shipment. This may be as little as two mail-in boxes, or a large quantity of tubes. Note that all spent lamps must be sent to a recycler or other intermediary within one year.
  - The accumulation area should be out of the way of daily stocking and materials movement. Too much

- activity around the accumulated lamps increases the chances of spent lamp breakage.
  - The accumulation area should be protected from traffic like forklifts and workers carrying large objects. Note too that you should choose an area protected from falling objects that could break the spent lamps.
  - The spent lamps should be accumulated on or in a robust structure that will not tip or fall such as a permanently mounted shelf unit.
  - The spent lamps should be accumulated in an area protected from vandalism. Outdoor storage is inappropriate if the area can be visited by children because they would be tempted to break the lamps.
- Signs. The accumulation area should be indicated with a sign of some sort. The sign should inform the reader that the area contains spent mercury-containing lamps. It would be good practice to also warn against actions which would break the tubes. For example: “Do not stack boxes on this rack” and “Handle boxes with care”.

Training employees. All persons handling universal waste must train their employees in proper management of those universal wastes. The level of training depends on whether you are a “small quantity handler of universal waste” (small quantity handler) or a “large quantity handler of universal waste” (large quantity handler).

- Small quantity handlers:
  - Am I a small quantity handler? A small quantity handler is one that never has 5,000 Kg (11,000 pounds or 5 ½ tons) of universal waste on hand at any one time. This is a very large number of spent lamps; virtually all businesses that generate universal wastes, but don’t accept them from other generators (are not in the business of universal waste management) will be small quantity handlers.
  - Training requirements. Small quantity handlers must “inform all employees who handle or have responsibility for managing universal waste.” The information must describe proper handling and emergency procedures for lamps. At a minimum, the training should inform employees of the following:
    - The fact that spent lamps are regulated and MUST be recycled, not discarded in the trash.

- Where to store spent lamps.
- How to package spent lamps.
- How to label spent lamps or containers of spent lamps.
- How to indicate the proper accumulation time.

Employees may be trained by several methods:

- A poster on the wall of the facility where employees will see it – for instance, on the wall of the break room.
  - Photocopies pages handed out to employees.
  - A short training session delivered at an employee meeting or safety meeting.
  - Any other method that “informs” the employee.
- Demonstrating compliance with training requirement. It is important to be able to demonstrate that you have complied with the training requirements. Retain some type of documentation in your files showing how you trained your employees. Clearly, a poster on the break room wall demonstrates compliance. A photocopied page handed out to employees with the date distributed can be kept in the businesses files. Or, use some other method to record that you have met the training requirement.
- Large quantity handlers. Because most businesses that generate spent lamps are not large quantity handlers, this document will not address large quantity handler standards in detail.
    - Am I a large quantity handler? Are you a large business that has more than 5,000 kg (12,000 pounds) of universal waste on hand at any one time? Note that most businesses that are not in the business of collecting and accumulating universal waste from other generators are unlikely to be large quantity handlers.
    - Training requirements. Employers must ensure that employees that work with universal wastes are trained in universal waste management. Ensuring that they are trained requires formal training sessions.
    - Recordkeeping. Detailed training records must be kept for employees that work with universal wastes.

**2. Managing lamps.** This section of the spent lamp management website will address practical considerations that should become part of any universal waste generator’s operating procedures. We will discuss practical physical

management of spent lamps, compliance with regulatory requirements, and documenting compliance for a number of topics.

Changing lamps. How many \_\_\_\_\_ (fill in the blank) does it take to change a light bulb? Just one, unless it's an 8 foot fluorescent tube! In this document, we are not addressing how lamps are physically removed or put into the fixtures or safety outside of the risks from breaking mercury lamps. However, your procedures for changing lamps should take all occupational safety rules into account including the very important issue of safe ladder use. Likewise, the personnel changing lamps should know how they fit into the fixture before leaving the ground – the top of an 8 foot ladder is a bad place to learn how to change bulbs.

- Proper care. This document's lesson for changing out lamps is to encourage careful handling of the lamps to prevent breakage. The lamp should be removed gently and handled carefully after removal to avoid striking other objects that could shatter the lamp.
- Movement. After the lamp has been removed from the fixture (and before the new lamp is placed into the fixture), it must be transported through the facility from the fixture to the spent lamp accumulation area. The best practice is to place the lamp immediately into a protective container such as a spent lamp accumulation box. However, this will often be impractical for single lamp replacement. The employee replacing the lamp should move the lamp directly from the fixture to the spent lamp accumulation area being extra careful to avoid breaking the lamp.

Accumulating lamps. Lamps are accumulated in the accumulation area. They should not be stored in multiple locations or left to be put away later.

- Managing the accumulation area. There are a number of considerations that must be addressed when managing spent lamps:
  - Choosing containers. All spent lamps must be placed in containers while in storage (and for shipment.) Containers must be "that are structurally sound, adequate to prevent breakage, and compatible with the contents of the lamps." Some firms use the same boxes in which the lamps were sold, although these boxes can be flimsy. Boxes meant for recycling lamps are also available. Contact your lamp recycler to explore options for packaging lamps. Remember that many recyclers sell pre-paid mailing boxes for recycling smaller quantities of spent lamps.
  - Labels. Each spent lamp or each container of spent lamps must be labeled with one of the following: "Universal Waste-- Lamp(s)," or "Waste Lamp(s)," or "Used lamp(s)."

- Label placement. The label should be placed on the lamp or container of lamps as soon as the first spent lamps are placed in the accumulation area or the container of spent lamps.
- Accumulation time limits. You may accumulate spent lamps for up to one year prior to shipment to a recycler (or intermediary). Note that you must be able to demonstrate that you are in compliance with the one year time limit. There are a number of acceptable methods for doing so:
  - Mark each spent lamp with the date it was generated (removed from the fixture).
  - Mark each container with the date that the first spent lamp was placed into the container.
  - Maintain an inventory system that tracks the date on which each spent lamp was removed from the fixture.
  - Maintain an inventory system that records the earliest date that a spent lamp entered the accumulation area. That is, record the date when the first spent lamp is removed from the fixture. That first lamp will reach one year before the other lamps in the accumulation area reach one year.
  - Employ some other form of tracking system for spent lamps that can demonstrate to an inspector that spent lamps are not kept at the business for more than one year.
- Containerizing. They should be placed into their storage/shipping container immediately upon arrival. The box should then be closed or otherwise secured to prevent lamps from falling out of the container. The container should be placed into the designated area where it will be safe from accidental breakage.
- Recording accumulation dates. If the lamp being stored is the first lamp in the accumulation area, the accumulation start date should be recorded using the system chosen by the business to demonstrate compliance with the accumulation time limits. Depending on the recordkeeping system chosen to track accumulation times, you may want to record the date generated for each spent lamp.
- Maintaining the accumulation area. The accumulation area should be kept clean and free of obstacles and debris. It should not be used for storing miscellaneous materials and equipment if that storage could cause breakage by, for instance, falling onto a box of spent lamps. The entry, aisle way, and exit should, like all entries,



aisle ways, and exits, be kept clean and free of obstacles that could cause an employee to trip or stumble, breaking lamps.

- Labeling boxes. Labels should be affixed to the spent lamps or the container of spent lamps as soon as spent lamps are generated. The label should be affixed according to the business's spent lamp management plan and should be clearly visible to persons entering the area.

Shipping lamps. When a sufficient quantity of lamps has been accumulated, they must be prepared for shipment and sent off for recycling. The following points should be considered:

- When to ship. Depending on the management option selected for spent lamps, spent lamps should be packaged and shipped when:
  - The pre-paid mailing box is filled, if that option has been chosen for recycling spent lamps.
  - A full shipment of lamps has been accumulated for either self-transport to a recycler or intermediary, or, for a pickup and recycle service.
  - A periodic pickup service is scheduled to visit the business, if that management option has been selected.
  - A scheduled household hazardous waste collection event (if that event accepts business wastes – inquire first) will take place.
  - When the oldest spent lamps are approaching one year from generation. Note that no spent lamp may be accumulated for more than one year without prior approval by the local agency implementing California's hazardous waste program, the Certified Unified Program Agency (CUPA). However, households and the very smallest businesses may accumulate lamps for a longer period without any additional authorization.
- Where to ship spent lamps. Spent lamps may only be shipped to a facility that recycles the lamps or to another "handler of universal waste". That other handler is another business that accumulates spent lamps to accumulate them for shipment to a recycler. Note that, if you have multiple locations, you can ship lamps between your own facilities. Often you can accumulate sufficient lamps at one of your locations to get a better price from a lamp recycling facility. Your lamp management plan should clearly state where lamps will be sent.
- How to ship spent lamps. Spent lamps may be shipped in your own vehicle or by any common carrier. This is different than regular hazardous waste which must be shipped using a "registered hazardous waste transporter". Options for shipment include your

own vehicle, a common carrier, the U. S. mail, or a package service. Your lamp management plan should specify how lamps will be shipped.

- Preparation for transport. Finish packaging the lamps and securely close the box with packaging tape. Prepare the shipping documents and attach properly to the box. Because each tube has very little mercury, few, if any, shipments will require placarding and labeling under the U.S. DOT hazardous materials shipping regulations.

Keeping Records. A number of records must be kept to demonstrate compliance with the universal waste regulations. Note that most of the records you're required to keep are records that are regularly kept anyway by well run businesses. You should keep all of these records in one place; although not required, consolidation will make retrieving these records much simpler if you are inspected.

- Records of shipments. Keep a record of each shipment of spent lamps for at least three years after the shipment. The best record is likely to be the bill of lading for the shipment or the form used to ship via mail or a package express system. Other recordkeeping possibilities include a log book or retained invoices from a tube recycler. The records must contain the following information:
  - The name and address of the universal waste handler, destination facility, or foreign destination to whom the universal waste was sent;
  - The quantity of each type of universal waste sent (e.g., batteries, thermostats, lamps, mercury switches, etc.);
  - The date the shipment of universal waste left the facility

Many recyclers will return a "certificate of recycling" to customers upon recycling of the customer's lamps. The certificate is another good document to retain.

- Retaining records of third party lamp management (relamping service). Businesses that contract with third party relamping contractors should require documentation from the contractor that the lamps have been recycled. This documentation should be retained for at least three years. Remember that hiring a relamping contractor does NOT eliminate your liability for mismanaged spent lamps.
- Training documentation: For a small quantity handler, training is informal. Records should be retained, however, demonstrating that a business has complied with the requirement that employees

involved in managing spent lamps be “informed” of proper spent lamp management. Retain photocopied handouts discussing spent lamp management and record the dates at which the handouts were distributed. Likewise, if you use a poster to inform employees, date the poster with the posting date and write a note to file documenting its posting. Keep this documentation with other spent lamp documents so it can be shown to any State or local agency inspector.

- Training documentation: For large quantity handlers, training is more complex. The business must retain records showing that they have “ensured” that employees handling spent lamps are properly trained. The documentation should record dates and names of trained employees and the material used for the training, or copies of any training certificates received from outside training services. Because most businesses that are not in the business of managing other businesses’ spent lamps will almost uniformly be small quantity handlers, this document does not explore the large quantity handler standards in detail.

Responding to broken tubes. Everyone that works with fluorescent tubes occasionally breaks one. The Universal Waste Regulations allow accidentally broken lamps to be cleaned up and the residue managed as universal waste alongside the intact spent lamps. If a tube is broken, carefully sweep up the pieces and place them in an airtight container (a Ziploc bag, a mayonnaise jar, or a pail with a tight fitting lid.) Label the container “Accidentally broken mercury lamps”. This label will make it clear to an inspector that the lamps were not intentionally broken.

Cleaning up one or a few broken spent lamps:

- Sweep up debris with a small broom or a whisk broom, sweeping gently to avoid suspending the phosphor powders in the air.
- Place the debris in an airtight container, seal it, and label it.
- DO NOT VACUUM broken lamp debris. Vacuuming will disperse mercury throughout the area in the exhaust from the vacuum.

***NOTE:*** *Bulb crushing devices such as drum-top tube crushers cannot be used in the State of California without obtaining a hazardous waste facility permit. DTSC has studied drum-top crushers in detail and has not found any crusher that can reliably contain mercury below allowable workplace exposure standards. If a safe and effective tube crusher is identified, regulations will be adopted to authorize its use. Deliberately breaking spent lamps is unsafe and is an illegal activity in this State.*

Response to breaking a large number of tubes. If a more serious incident breaks a significant number of spent lamps, there is a high potential for exposure to airborne mercury. The business should close off the area with the broken spent lamps and call the local hazardous materials response agency.