

Department of Environmental Quality

# **RCRA Guidance: Industrial Radiography Silver Reclamation from X-Ray Development**

Hazardous Waste Compliance and Enforcement Section

Land Protection Division  
October 2010

## DEQ RCRA GUIDANCE: INDUSTRIAL RADIOGRAPHY

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### Summary:

The Department of Environmental Quality has determined the need for guidance for the industrial radiography industry concerning the Resource Conservation and Recovery Act regulations, specifically concerning waste management from the film development process. Based on the need, the DEQ has developed written guidance to assist the industry in identifying its waste streams; waste counting; generator status determinations; applicable exemptions; and applicable regulations.

The following guidance, along with a PowerPoint presentation, was presented to industry on August 25, 2010. Based on industry feedback, the following guidance provided the industry with a basic understanding of RCRA regulations and how they apply to the industrial radiography industry.

1. Determine Waste Streams:
  - a. Any Exemptions
    - i. Precious Metals reclaimed for economic benefit
    - ii. Recycling Used Oil
    - iii. Universal Waste
  - b. Any Exclusions
    - i. Wastewater Sludge (See Table 1 40 CFR 261.2)
2. Determine Generator Status:
  - a. Large Quantity Generator (over 2,200 pounds hazardous waste per month or more)
  - b. Small Quantity Generator (220 to 2,200 pounds hazardous waste per month)
  - c. Conditionally Exempt Small Quantity Generators (up to 220 pounds hazardous waste per month)
3. EPA Notification
  - a. Required for Large and Small Quantity Generators
  - b. Conditionally Exempt Small Quantity Generators not required to notify
4. Manifest requirements
  - a. Required for Large and Small Quantity Generators
  - b. Conditionally Exempt Small Quantity Generators not required to use manifests
    - i. Documentation to show proper recycling and/or disposal is required
5. Speculative accumulation for storage
  - a. If you store you must document that speculative accumulation is not occurring
  - b. Specifics found at 40 CFR 266.70(c)
6. Hazardous Waste Transporting
  - a. In the state of Oklahoma, must be registered, licensed, and notified with the Oklahoma Department of Transportation and the Oklahoma Corporation Commission
  - b. Hazardous waste transporters must comply with the applicable manifest requirements
  - c. Conditionally Exempt Small Quantity Generators are allowed to self transport if complying with all other state/federal requirements
  - d. Due diligence by generator required when selecting a hazardous waste transporter
    - i. Generator of the waste is liable for the waste even after the waste is accepted by a transporter or recycling facility
7. Destination facilities
  - a. Must be notified with EPA
  - b. Must be authorized to accept the waste
  - c. Must show no speculative accumulation
  - d. Must be a legitimate recycler
  - e. Must comply with the manifest requirements

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### ACRONYMS AND ABBREVIATIONS

CESQG:	Conditionally exempt small quantity generator of hazardous waste; generates less than 220 pounds of hazardous waste per month
D002:	The EPA hazardous waste code for the toxicity characteristic of corrosivity (pH of $\leq 2$ or $\geq 12.5$ )
D011:	The EPA hazardous waste code for the characteristic of silver (5.0 mg/L)
DEQ:	Oklahoma Department of Environmental Quality
EPA:	United States Environmental Protection Agency
HW:	Hazardous waste as defined in 40 CFR 261.3
IR:	Industrial radiography facilities; facilities that use radiation (x-ray or isotope) to generate an image on film
LQG:	Large quantity generator of hazardous waste; generates more than or equal to 2,200 pounds of hazardous waste per month
Mobile Operations:	Film development performed in a location that is not the main IR business location
OAC:	Oklahoma Administrative Code
OCC:	Oklahoma Corporation Commission
ODOT:	Oklahoma Department of Transportation
POTW:	Publically Owned Treatment Works
RCRA:	Resource Conservation and Recovery Act
Silver limit:	The regulatory level of silver in a waste that defines it to be characteristically hazardous. The current silver limit is equal to or greater than 5 mg/L
Stationary Operations:	Film development performed at the main business location only; non-mobile
SQG:	Small quantity generator of hazardous waste; generates between 220 and 2,200 pounds of hazardous waste per month
TCLP:	Toxicity Characteristic Leaching Procedure, the required laboratory test to determine if a waste is hazardous. The analysis simulates disposal in a landfill and evaluates how much of a hazardous constituent leaches out of the waste over time

### BACKGROUND/HISTORY

Industrial radiography is defined in the DEQ Radiation Management regulations (OAC 252:410) as “a non-destructive testing method that uses ionizing radiation such as gamma rays or x-rays to make radiographic images for the purpose of detecting flaws in objects.” The industry is regulated by the DEQ Radiation Management section; however, that section does not regulate the non-radioactive wastes generated by the industry. These wastes include used/waste film, wastewaters (developer, fixer, and rinse waters) from the film development process, and reclaimed silver from the wastewaters, etc. This activity is regulated by the DEQ Hazardous Waste Management regulations (OAC 252:205).

In 2008, the DEQ Hazardous Waste Compliance & Enforcement Section performed an inspection at an IR location. Information identified during and after the inspection and subsequent research showed the IR industry may benefit from the DEQ providing guidance regarding the requirements for management of its hazardous waste. Research also showed that no other state had guidance available on the internet that directly addresses this industry.

The DEQ held a workshop on April 16, 2010, where industry members were invited to discuss the HW regulations. The discussions identified to the DEQ that due to the mobile nature of the industry many were confused on how to apply the state and federal regulations to their process. This guidance is to address issues identified in the Industrial Radiography RCRA Workshop.

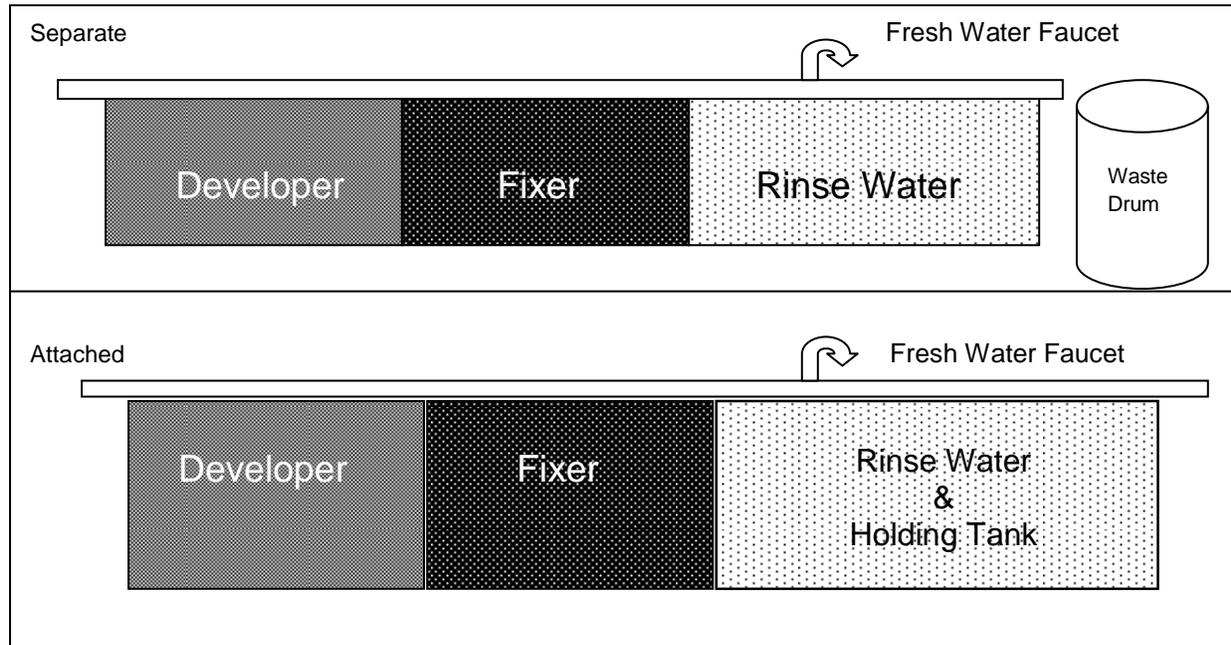
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### PROCESS DESCRIPTION

The basic process involves the industrial radiographer placing film in a particular location and exposing that film to ionizing radiation (either x-rays or isotopes) for a period of time to capture an image of the location on the film. This is a non-destructive testing method used in many industries. This process is generally a contracted service and is performed by the IR facility either at their place of business or at an off-site location, often a very remote location such as a field for a pipeline company where a pipeline weld is being exposed or x-rayed. The film is then developed to determine if the film is a usable image. The development of the film is performed at the remote location so that if another exposure or x-ray is needed, it can be done efficiently. This development away from the IR facility's main location is considered mobile operations.

The development process usually generates the following wastes: rinse water, developer, fixer, and film. Because this is a mobile operation, often these wastes are collected into a waste container. Sometimes this waste container is attached to the process (found more often for stationary processes) and sometimes it is physically separate, such as a 55-gallon drum where all liquids are combined and stored. Figure 1 illustrates the difference described above.

Figure 1



### RCRA ISSUES AND CONCERNS

Most facilities will reclaim the silver in the wastewaters for financial benefit. The precious metals exemption is found in 40 CFR 266 Subpart F and will be addressed in this guidance. The discharge and disposal of the wastewater, both with and without reclamation for silver, are also addressed, as well as film disposal and recycling, satellite accumulation, speculative accumulation, storage management, and manifesting/bill of lading.

RCRA regulations define a hazardous waste at the point where the waste is generated. The RCRA management regulations apply at that point forward. The IR RCRA Workshop identified that IR companies have different points of generation. This was usually determined by the size of the IR facility, how many mobile units it possessed, how long a service contract was, and other factors including internal policies.

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Because the point of generation determines when the HW regulations begin to apply, defining the point of generation of the waste is the first step for all IR facilities. Refer back to Figure 1 for this discussion. If a material that is later defined as waste is still in a process unit, it may be considered part of the process. Once the material is removed from the process unit and placed into another container, such as a drum, unless the material is immediately reused in the process, it is considered waste. For the purposes of this guidance, using Figure 1 as an example, the used developer, used fixer, and used rinse water are considered in process until they are removed from the process unit. If the used materials are placed into a storage container, such as a waste drum, they are considered wastes and the point of generation is the point where the materials are removed from the process unit. The facility then must determine if the waste is hazardous. Based on process knowledge, the material is probably hazardous for the toxicity characteristic of silver, and depending on the dilution factor, may be hazardous for the toxicity characteristic of corrosivity from the fixer. These HW characteristics carry the EPA waste codes of D011 and D002, respectively. These wastes are no different physically or chemically from the material in the process unit, which carry no HW codes. The only difference is that since they have been removed from the process unit and placed into the waste drum, they have been determined to be a waste. This is why the point of generation is important in the RCRA regulations.

When storing wastes from this process it is important to understand the difference between storage and satellite accumulation. Storage containers are usually full, whereas satellite accumulation containers are in the process of becoming full. This may take some time. The best example is a container that holds used film. Let's assume the used film will eventually be sent off for disposal as hazardous waste. As the used film is being generated as a waste, it is placed inside a 30-gallon plastic drum. The drum is a satellite accumulation container. The regulations for this container state the container is to remain closed except when adding or removing waste, be labeled to identify its contents, be located at or near the point of generation, and be under the control of the operator at all times. Once the 30-gallon drum is full, the lid is verified closed, the label is dated to show when it became a storage container, and the drum is placed in the waste storage area (i.e., 90-day or 180-day hazardous waste storage area). A generator may accumulate up to 55-gallons of hazardous waste in a satellite accumulation area before it must be moved to the hazardous waste storage area. The full satellite accumulation container must be moved to a hazardous waste storage area within three days of reaching the 55-gallon limit. When moved, the container must be dated to indicate when the storage time begins (90-day or 180-day).

Another important aspect of point of generation is that the EPA assigns site identification numbers (EPA Site ID#s) to facilities that notify as generating HW. This assignment process links the EPA Site ID# to a physical address. If a facility changes address, they must re-notify to receive a new number. The old number stays with the old address forever. Because IR facilities may perform mobile operations and retain responsibility for the wastes from the process, the point of generation of the HW also ties into whether or not the facility is transporting the waste to the main facility location. If they are not transporting the waste back themselves, but having a disposal/recycler facility pick-up the waste at the generation site, confusion may occur when completing the HW manifest (EPA Form 8700-22).

If the IR facility is a SQG or LQG and is required to use a HW manifest for disposal, there can be confusion as to what the EPA Site ID# should be, as well as the location of the generator. In the workshop, IR facilities expressed difficulty in arranging with disposal facilities for remote location pick-ups of the HW. For example, a pipeline is being laid and runs approximately 200 miles across a state. If a central location is used for by all the companies working on the pipeline (a pad site, then the pad site may be the site ID location for notification purposes rather than the 200 miles of pipeline. Notification would be required if the facility working on the pipeline is generating over 220 pounds per month of hazardous waste. Who is responsible for the waste and subsequent management, disposal, and recordkeeping would need to be determined between the owner of the pipeline and the contracted facilities. More often than

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not, the contractor would be responsible and thus would count his/her own waste for reporting and notification purposes.

Another area of confusion identified during the IR RCRA Workshop was the regulations that govern the transporting of hazardous waste. In mobile IR operations, the mobile units may transport hazardous waste around the multiple generation points during the process and then back to the main IR facility. In the state of Oklahoma, if you transport a HW then you are a hazardous waste transporter and are required to be notified, registered, and licensed with the DEQ, ODOT and OCC. The exception to that regulation is if you are a CESQG. If the process material is not yet a waste, the HW transporter regulations do not apply; however, other transportation regulations may apply.

The last area of confusion identified during the workshop was the discharge of the waste liquids (rinse water, developer, and fixer), either combined or separated. Common industry practices, such as discharge into a carwash drain, were discussed. Even if the silver is recovered from the wastewaters to below the HW limits, this waste water is still process wastewater and must be managed as such. Any discharge must be approved prior to discharge. Discharge into a carwash drain is strictly prohibited. More than likely, maintaining one waste drum for the silver contaminated waste waters (fixer and possibly fixer rinse water) and one waste drum for the non-hazardous industrial wastewater (developer and last rinse water) would be the most common practice until the waste waters are disposed. If the generator is not a CESQG, contact an authorized hazardous waste transporter for pickup/recycling.

### **REGULATIONS**

There is an exemption for silver recycling that most IR facilities may choose to utilize so as to recoup some costs of the IR process. Reclaiming the silver for recovery under 40 CFR 266 Subpart F is a widely available option which, if utilized, may reduce the level of silver content of the wastewaters to non-hazardous levels. If a silver recovery unit is used, the operator must ensure the unit is operating properly according to the manufacturer's directions. An improperly used or modified recovery unit may not recover enough silver to render the wastewaters non-hazardous for silver. Remember that the characteristic of corrosivity (D002) is also a possibility for any wastewaters, so a pH test should be used to determine if the remaining wastewaters are hazardous for the characteristic of corrosivity. Once the silver has been filtered out and the waters are not  $\leq 2.0$  or  $\geq 12.5$  on the pH scale, the remaining wastewaters can be disposed via any authorized method of disposal for non-hazardous industrial waste waters, (i.e., POTW, evaporation, non-hazardous waste disposal or treatment facility).

The used film may also be sent for silver recovery. If film is not sent for silver recovery, it will likely exhibit the hazardous waste characteristic for silver and if so, must be managed as hazardous waste. IR facilities may choose to have a TCLP test performed on the film to determine if it passes for silver content; however, since each exposure will leave different amounts of silver on the film, it is impractical and may prove cost prohibitive to test the various non-similar exposures. Managing the film under the precious metals recovery exemption may be the most economical method.

The exemption for recyclable materials that are reclaimed to recover silver allows less stringent management requirements than for other hazardous wastes. The exemption requires the facility to notify as a generator (LQG, SQGs only), and use a uniform HW manifest to transport the silver waste when sent for reclamation. The exemption also requires the transporter to use the manifests as well as the persons who store the recovered silver. Speculative accumulation is not allowed. Speculative accumulation is defined by EPA in 40 CFR 261.1(c)(8):

A material is "accumulated speculatively" if it is accumulated before being recycled. A material is not accumulated speculatively, however, if the person accumulating it can

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show that the material is potentially recyclable and has a feasible means of being recycled; and that—during the calendar year (commencing on January 1)—the amount of material that is recycled, or transferred to a different site for recycling, equals at least 75 percent by weight or volume of the amount of that material accumulated at the beginning of the period. In calculating the percentage of turnover, the 75 percent requirement is to be applied to each material of the same type (e.g., slags from a single smelting process) that is recycled in the same way ( *i.e.*, from which the same material is recovered or that is used in the same way). Materials accumulating in units that would be exempt from regulation under §261.4(c) are not to be included in making the calculation. (Materials that are already defined as solid wastes also are not to be included in making the calculation.) Materials are no longer in this category once they are removed from accumulation for recycling, however.

### GUIDANCE

The most comprehensive solution to the HW regulations is to notify as a LQG and become authorized as a HW transporter. The IR facility would comply with all the LQG HW regulations, including documentation, storage limits, employee training, disposal plans, quarterly reporting, biennial reporting, contingency plan requirements, etc. This is appropriate in a scenario where the facility is actually a LQG, transports its containerized waste back to the main facility location, and does not send the silver for reclamation. However, this option will likely prove costly and inefficient for most IR facilities.

If an IR facility does not generate any other HW, only the silver waste which is being sent for reclamation, and they are not a mobile operation, then they should determine what generator category they are in, notify the DEQ if LQG or SQG, and receive a site ID number. They should also use a recycling unit to recover the silver to below RCRA limits, and use the manifest as required by the exemption when sending the recovered silver and used film to the reclamation company. CESQGs are not required to notify and receive a site ID or use a manifest. CESQGs should review 40 CFR 261.5. That generator category has the least amount of requirements including the documentation required to show proper disposal/recycling.

Any facilities that discharge wastewaters to a POTW must notify and get approval from their local POTW for such discharge. The POTW will identify any testing required prior to discharge, or other discharge parameters. Any other discharge point must have written consent from the governing water authority of that area. Please consult the DEQ Water Quality Division at (405) 702-8100 for questions related to the governing water authority in your area. No facility is allowed to discharge their wastewater into any septic system or carwash drain.

When collecting the silver at a remote location (mobile unit), if the wastewaters containing silver are stored prior to recovery, containers should be labeled and dated. If silver is going to be recovered, it must be done prior to reaching the storage limits. Speculative accumulation cannot occur. If silver is not going to be recovered on site, but an independent hazardous waste transporter is going to pick up the wastewaters that are hazardous for silver and/or corrosivity, containers should be labeled and dated. On site storage limits are as follows: ≤90-days for LQGs, ≤180-days and ≤6,000 kg (12,200 lbs) for SQGs, and no more than 2,200 lbs for CESQGs.

If an IR facility wants to self-transport the hazardous waste (wastewaters in a container other than the process unit, prior to silver recovery) including transport back to their main location, authorization as a hazardous waste transporter must be obtained, or an authorized hazardous waste transporter must be used. To become a HW transporter, authorization/notification is required by the ODOT, OCC and DEQ. This

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process involves multiple agencies, if you need further information about becoming a hazardous waste transporter contact the DEQ at (405) 702-5100.

When sending film for reclamation under the precious metals exemption, generators have the responsibility to ensure the facilities they use are authorized to transport and accept the waste for recycling. EPA has a database that users can search for facility information to determine if the facilities are notified, inspection history, are authorized to transport or accept the waste for recycling, and other information. This searchable database can be accessed by the public on the internet at the following link: [http://www.epa.gov/enviro/html/rcris/rcris\\_query\\_java.html](http://www.epa.gov/enviro/html/rcris/rcris_query_java.html). If you prefer, you can contact the applicable state environmental office and they can provide you information on any facility you are performing due diligence on prior to use as a transporter or recycler.

This guidance only applies to IR facilities operating in Oklahoma, including out of state IR facilities operating in Oklahoma using mobile operations. Please check with the regulatory authority in other States to determine if that State has different requirements.

The DEQ is providing this information as a general guidance only. This guidance does not create any legal rights and does not relieve any person from fully evaluating, understanding, and complying with applicable laws and regulations. Compliance with this guidance does not necessarily constitute full compliance with applicable laws and regulations and this guidance is not a permit or permission of any kind or nature.

The rules promulgated by the DEQ may be obtained from the office of the Oklahoma Secretary of State, Office of Administrative Rules or from the DEQ. The websites for each are [www.oar.state.ok.us](http://www.oar.state.ok.us) and [www.deq.state.ok.us](http://www.deq.state.ok.us), respectively.

The instructions and form needed to apply for an EPA identification number may be found at <http://www.deq.state.ok.us/LPDnew/forms/Haz%20Waste/Form%20Notification%20of%20Regulated%20Waste%20Activity.pdf>. Please also note the requirements for a disposal plan found at OAC 252:205, Subchapter 5, Additional Generator Requirements.

You may find information to help you determine your hazardous waste generator classification at [www.epa.gov/epawaste/hazard/generation/index/htm](http://www.epa.gov/epawaste/hazard/generation/index/htm).

Regulations relative to hazardous waste transporter activities may be found at 40 CFR 263 and OAC 252:205, Subchapter 7. Your transportation activities may also be regulated by the federal Department of Transportation, the Oklahoma Department of Public Safety and local ordinances. Helpful information regarding federal hazardous waste transporter regulations may be found at [www.epa.gov/epawaste/hazard/transportation/index.htm](http://www.epa.gov/epawaste/hazard/transportation/index.htm).