

A Guide for Photo Processors



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DEPARTMENT OF ECOLOGY
REGIONAL OFFICES

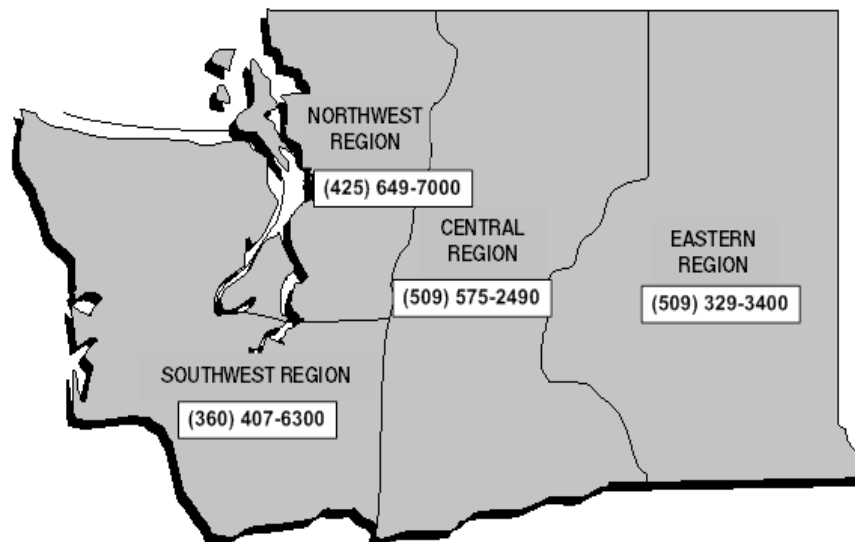
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For questions relating to pollution prevention or additional information and assistance on regulatory concerns from hazardous wastes, solid waste, water quality or air quality, contact the nearest Ecology regional office.

If you need this information in an alternate format, please call the Hazardous Waste and Toxics Reduction Program at 360-407-6700. If you are a person with a speech or hearing impairment, call 711, or 800-833-6388 for TTY.

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WHY SHOULD PHOTO PROCESSORS PAY ATTENTION TO THEIR WASTES?



If you're a photo processor looking for practical environmental management and pollution prevention information, this booklet is for you.

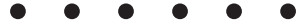
Photo processors across the state regularly generate wastes that are of concern to the environment. Silver found in used fixer, bleach-fixers, washless stabilizer and C-41RA bleach poses dangerous waste and water quality concerns.

Silver has a very high aquatic toxicity and accumulates in the tissue of aquatic organisms. Used photo processing solutions containing more than five parts per million (ppm) silver are a state and federal dangerous waste. Many local sewer authorities have even more stringent silver limits. With thousands of businesses in Washington State generating silver-bearing wastes, it's important that each one do their part to manage these wastes correctly and keep them out of the soils and waters of the state.

So you play an important role. Silver-bearing and other dangerous wastes don't belong on the ground, untreated down the drain, or in the dumpster. Good waste management practices can help you:

- save money through less waste.
- ensure that you stay in compliance with environmental regulations and avoid penalties and litigation.
- provide a safer, healthier workplace for your employees.
- Contribute to a cleaner, healthier environment.
- gain customers who know they have made a wise choice in selecting a business that helps protect the environment.

YOUR BUSINESS AND ECOLOGY REGULATIONS



The Department of Ecology (Ecology) is divided into various programs, each with a different environmental emphasis. Ecology is trying to link the requirements of all the programs together in a more meaningful way helping businesses such as photo processors understand their overall responsibility in meeting Ecology's requirements. This is commonly called a "multimedia" approach. Below is a brief description of how key Ecology programs affect photo processors.

HAZARDOUS WASTE AND TOXICS REDUCTION PROGRAM

Photo processors concern Ecology's Hazardous Waste and Toxics Reduction Program because fixers, bleach-fixers, and washless stabilizers accumulate silver during use and become dangerous wastes. Some developers, if they contain more than one percent hydroquinone as an ingredient and are discarded before used, may also be a dangerous waste. Minilab system cleaners may contain hazardous levels of chromium or fail pH limits. Businesses that generate more than 220 pounds of such dangerous wastes per month (or ever accumulate more than 2,200 pounds on-site) are regulated generators and need to get a RCRA ID number from the state (see page 28). Shops that generate less than 220 pounds are Small Quantity Generators and fall under the jurisdiction of local government (city or county) moderate risk waste programs and need to comply with fewer dangerous waste regulations.

SOLID WASTE AND FINANCIAL ASSISTANCE PROGRAM

Ecology's Solid Waste and Financial Assistance Program provides statewide guidance and technical assistance to local governments developing and implementing moderate risk waste management programs for Small Quantity Generators.

WATER QUALITY PROGRAM

Photo processors are a concern for Ecology's Water Quality Program because improper disposal of photo processing chemicals can have adverse impacts on the state's groundwater, surface waters and sediments. Such chemicals can also affect the proper operation of municipal sewage treatment plants and contaminate biosolids.

Ecology's Water Quality Program hopes that through education about proper waste management, businesses will minimize the amount of wastes sent to the sanitary sewer and discharge any unavoidable wastes in accordance with local sewer limits. Centralized treatment and recovery of silver-bearing waste is one way to do this.

AIR QUALITY PROGRAM

Photo processors usually have few air pollution problems. However, odors and emissions, when located close to the public and other businesses (like in a mall or office building with common walls), can bring complaints to the local air authority, and an inspector to your door. So be a good neighbor. It makes good business and environmental sense.

POLLUTION PREVENTION: REDUCE AND RECYCLE YOUR WASTES



Environmental management is a growing concern for businesses. Whether it's about disposal costs, filling up our landfills, resource depletion, air pollution, or your business image, environmental management issues are receiving more and more attention. That's where pollution prevention fits in.

In the world of waste, the greatest economic and environmental benefits usually come from avoiding the generation of waste in the first place. This is known as waste reduction and it's the number one waste management priority in Washington State. Examples of simple waste reduction techniques include using both sides of paper, using durable products instead of disposable ones, or simply not purchasing a product unless it's really needed.

It may not be as hard as you think! A good place to start is to walk through your shop and review all the processes which use chemicals or generate solid, liquid or air wastes. Look for ways to reduce waste.

When you begin to look at the wastes generated by your business, you may feel overwhelmed by how much there is to do. Begin by making small changes. Start in areas where waste reduction and recycling are easy, and build up to the more complicated items. Even small changes can make a big difference. As each process is considered, try to think of ways to reduce or eliminate waste or the toxicity.

Identifying materials that your business can reuse or recycle is another great way to reduce the amount of disposable waste in your business. Recycling takes materials that might have been thrown away and makes them available to be reused. For example, silver recovery systems bind up silver that would have been sent to the sewer and allows the silver to be recycled.

Recycling material is much better than disposing materials, but it is less beneficial than waste reduction because it requires a lot of energy to collect and remanufacture the materials into new products. In addition, for recycling to be successful, products made with recycled material must be purchased by consumers.

The chart below includes most of the wastes that may be generated in your photo processing business.

Photo Processing Waste Streams of Concern		
Waste Streams of Concern	Program of Concern	Environmental Concern
Developer	Hazardous Waste Water Quality	Hydroquinone
Fixer, Bleach fixer	Hazardous Waste Water Quality	High silver content
Washless Stabilizer	Hazardous Waste Water Quality	High silver content
System Cleaners	Hazardous Waste Water Quality	High chromium or pH
Plastic Film Containers	Solid Waste	Non-hazardous, reusable or recyclable
Scrap Film and Paper	Solid Waste	Non-hazardous, recyclable
Steel Film Magazines	Solid Waste	Non-hazardous, recyclable
Wash Water	Water Quality	Silver

To find out more specific information about regulatory compliance, recycling options and alternative chemical products, see *Practical Do's and Don'ts* on page 10.

PRACTICAL DO'S AND DON'TS



Below are some common wastes generated by photo processors, along with some do's and don'ts for implementing better pollution prevention and staying in compliance with Ecology regulations.

Some of these do's and don'ts are simple suggestions that may help save you money and lead you to regulatory compliance. Others are federal or state regulatory requirements (*printed in Italics to distinguish them*). Businesses should always check with their local government agencies (city or county) to see if there are additional or more stringent regulatory requirements as well.

BLEACH SOLUTION

The bleach bath converts metallic silver on film back to a silver halide through an oxidation reaction. An iron solution is commonly used to accomplish this. Used C-41 RA bleach may contain up to three parts per million (ppm) silver.

Do's

- ✓ If you only use chemical recovery cartridges (CRCs) for on-site silver recovery, consider mixing used C-41 RA bleach and washless stabilizer with the used fixer prior to recovery.
- ✓ Ensure you have sewer service if you are considering on-site treatment.
- ✓ Consider regenerating your used bleach solutions. Ask your chemical supplier.

Don'ts

- ✗ *Don't ever put bleach, treated or not, into a septic system, storm drain, dry well, or onto the ground.*

Do's

- ✓ If you send silver-bearing chemicals off-site for recovery, ask your service company if they accept C-41 RA for pick up.
- ✓ Make sure your employees know that used C-41 RA bleach may be a local sewer discharge concern.

DEVELOPER

Most developers for black and white film contain a small percentage of hydroquinone. These developers, if disposed as an **unused** product will be dangerous due to hydroquinone levels. However, hydroquinone does not show up in **used** developer in concentrations that are considered dangerous waste because it is consumed during use.

Do's

- ✓ Consider using low replenishment developers for film and paper. They can substantially reduce replenishment rates.
- ✓ If possible, purchase developer solutions that contain less than one percent hydroquinone—check with your supplier or look on your Material Safety Data Sheet.
- ✓ Check with your local sewer provider to make sure it will accept used developer in the sanitary sewer.
- ✓ Make sure your employees know that unused developer may be a hazardous waste.

Don'ts

- ✗ *Don't ever put used or unused developer into a septic system, storm drain, dry well, or onto the ground.*
- ✗ *Don't dispose of unused or past shelf life developer to the sanitary sewer.*
- ✗ Don't put developer into silver-bearing wastes when using CRCs. Developer can plug the cartridges causing a dangerous pressure buildup.

FIXER AND BLEACH-FIXER SOLUTION

Fixer allows silver to dissolve out of the film and paper into the solution. As a result, used fixer and bleach-fixers contain high concentrations of silver, usually between 3,000 and 8,000 ppm. Because of these high silver levels, used fixer is a dangerous waste.

Large processors typically generate high enough volumes of silver-bearing waste to make on-site recovery a realistic option. However, photo processors should investigate the pro's and con's of both off-site and on-site management. For most small photo processors, Ecology recommends off-site management. See the discussion of off-site versus on-site management beginning on page 19.

Do's

- ✓ Investigate whether on-site recovery or off-site management is the best option for you.
- ✓ Consider using low replenishment bleach-fixers. It can substantially reduce replenishment rates.
- ✓ If you're recovering silver on-site, assure compliance with dangerous waste and sewer discharge limits by routinely testing your effluent through a lab accredited for silver analysis (see Testing, page 31).
- ✓ If you're recovering silver on-site, get approval from your local sewer authority to discharge the remaining effluent.
- ✓ If you're recovering silver on-site, properly operate and maintain your equipment.

Don'ts

- ✗ *Don't put used fixer into the sanitary sewer unless it meets dangerous waste regulations and sewer discharge limits.*
- ✗ *Don't ever put used fixer into a septic system, storm drain, the ground, surface water or any other drain not connected to a sanitary sewer.*
- ✗ If your used fixer or bleach-fixers is hard-piped to an on-site treatment system, don't count it towards your monthly dangerous waste total.

Do's

- ✓ Make sure your employees know that used fixer and bleach-fixers are dangerous wastes.
- ✓ Count the amount of used fixer and bleach-fixers generated during the month toward your dangerous waste total if accumulated or stored prior to recycling.
- ✓ Attach labels to silver-bearing waste containers, identifying them as dangerous waste.

PAPER CORES

Kodak, Konica, and Agfa will take fiber cores from rolls of photographic paper and color paper plastic core plugs. Each manufacturer will accept these only from their own brands of paper.

Do's

- ✓ Use available paper core recycling programs and encourage other film manufacturers to begin their own recycling program.

Don'ts

- ✗ Don't consider paper cores a dangerous waste. If a recycling option is not available, they can be put in the garbage.

PHOTOGRAPHIC SOLUTION FILTERS

Film and paper developing machines contain filters that remove particulates from processing solutions. These are made out of spun cotton similar to cotton swabs. Fixer and washless stabilizer filters probably leach enough silver to be considered dangerous, so these filters should not be put in the garbage unless a business can show that they don't fail the leachability test for silver (Testing, page 31).

Do's

- ✓ Drain excess fluid from filters into the appropriate photo chemical waste container.

Don'ts

- ✗ *Don't put filters containing silver-bearing wastes into the garbage.*

Do's

- ✓ Collect drained filters and ask your silver waste hauler to take them for refining.

PLASTIC FILM CONTAINERS

Photo processors often have a surplus of these containers. Most plastic film containers are made of two different kinds of plastic and both are recyclable. Kodak and Agfa accept containers of all brands through their solid waste recycling program. You'll be responsible for shipping costs, but this can be weighed against the cost of throwing them away.

Do's

- ✓ Use Kodak's or Agfa's plastic container recycling programs.
- ✓ Encourage other film manufacturers to begin a recycling program.
- ✓ Offer the containers to customers for home use, such as sewing kits or fishing tackle.

Don'ts

- ✗ Don't consider plastic film containers dangerous waste. If you cannot find a way to recycle them, they can be put in the garbage.

SCRAP FILM AND PAPER

In color photo finishing, all of the silver is removed from the film or paper during the photo finishing process. Because of this, processed scrap film and paper do not designate as a dangerous waste and can be treated as solid waste. Unprocessed film or paper will have some silver on it, but data indicate that silver in this form will not leach out of a landfill over time. However, soaking film ends in fixer to remove silver will leave a coating of leachable fixer that may make the film ends dangerous waste.

Do's

- ✓ Look for a recycling company that will collect your unprocessed film ends.
- ✓ If you recover silver on-site, ask your silver recovery equipment supplier if they will take your scrap film.

Don'ts

- ✗ Don't soak film ends in used fixer to remove silver; it will leave a coating of leachable fixer that may make the film ends a dangerous waste.

SINGLE USE CAMERAS

Most single use cameras can be returned to the manufacturer for recycling and in some cases for reuse. Fuji, Konica, and Kodak will reimburse photo labs for shipment plus \$.05 per camera. Most often there is a minimum number of cameras required to receive reimbursements. Agfa will accept all brands—no presorting is required, however, no reimbursement is offered.

Do's

- ✓ Use existing camera recycling programs.

Don'ts

- ✗ Except for Agfa, don't send brand name cameras to anyone other than the original manufacturer.
- ✗ Don't throw cameras away after film has been extracted for processing.

STABILIZER

Washless stabilizer solutions are used in the last step of the photo finishing process. Stabilizers enhance image stability and stop the reaction started by the developing solution. Washless stabilizers typically contain silver in the range of 100 to 300 ppm, making them a dangerous waste and exceeding local sewer discharge limits.

Do's

- ✓ Check with your local sewer utility to make sure it is okay to discharge treated stabilizer to the sanitary sewer.
- ✓ If you recover silver on-site, mix used washless stabilizer with your used fixer and bleach-fixers prior to recovery.
- ✓ If you send silver-bearing chemicals off-site for recovery, ask your service if they will accept washless stabilizer for pick up.
- ✓ Make sure your employees know that washless stabilizer is a dangerous waste.

Don'ts

- ✗ *Don't ever put stabilizer into a septic system, storm drain, dry well or onto the ground.*
- ✗ *Don't put untreated washless stabilizer into the sanitary sewer—you will be in violation of dangerous waste and sewer discharge limits.*
- ✗ *Don't count the amount of washless stabilizer during the month toward your dangerous waste total if recycled on-site without first being accumulated or stored (e.g., hard-piped).*

STEEL FILM MAGAZINES

Steel film magazines have many parts including the magazine, spool, felt tip, and end caps. Kodak, Konica, Fuji and Agfa will accept and recycle all brands of steel film magazines through their solid waste recycling program. Although you will be responsible for shipping costs, you won't be paying to throw them away.

Do's

- ✓ Use steel film magazine recycling programs.
- ✓ Encourage other film manufacturers to begin their own steel film magazine recycling program.

Don'ts

- ✗ Don't consider steel film magazines to be dangerous waste. If a recycling option is not chosen, they can be put in the garbage.

OTHER WASTES

Some color and specialty photo processing shops may use system cleaners and bleaches that result in dangerous wastes due to chromium, cyanide, other heavy metals, or pH.

Do's

- ✓ If you are currently using a system cleaner that contains a dichromate compound, investigate switching to a system cleaner that does not contain dichromate.
- ✓ Make sure that system cleaners and other chemicals you are using do not cause you to exceed your local sewer discharge limit for pH.

Don'ts

- ✗ *Don't ever put system cleaners or cyanide-containing wastes, treated or not, into a septic system, storm drain, dry well or onto the ground.*

WASH WATERS

Wash waters used in the film developing process may contain small amounts of film developing chemicals, including used fixer. Typically, these chemicals are found in such small amounts that wash waters aren't a dangerous waste. However, in areas with very low sewer discharge limits for silver, even wash waters can present a concern.

Do's

- ✓ Routinely test the silver levels in your wash water to ensure compliance with silver discharge limits.
- ✓ Maintain your photo processing equipment and regularly check to ensure bleach, developer, and fixer are not being lost by being carried over into the wash water which is not treated. Test results may identify problems before they are visible through inspection. Test strips are appropriate for this purpose.

Don'ts

- ✗ Don't dispose of wash water to the sanitary sewer until you find out what your local silver discharge limit is.

MANAGING SILVER-BEARING WASTES

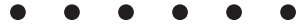


Photo processors generate developer, used fixer, bleach-fixers, washless stabilizers and C-41 RA bleach as a normal part of doing business. Used fixer and bleach-fixers solutions from photo processors contain up to 8,000 ppm silver. This number greatly exceeds state dangerous and federal hazardous waste limits for silver (set at 5 ppm) and various local water quality discharge limits. Used washless stabilizer contains 100-300 ppm silver and used C-41 RA bleach may contain up to 3 ppm silver. None of these silver-bearing wastes should be discharged to the sanitary sewer without proper silver recovery, either at your place of business or through off-site management. And they should never be put into storm drains, septic systems or dry wells.

ON-SITE OR OFF-SITE MANAGEMENT?

For most small facilities, Ecology recommends off-site waste management. However, managing silver-bearing wastes is unique because silver has value. Whether you choose on-site treatment, off-site treatment or a combination of both for your waste streams, the choice is yours — and it's an important one. While a business generating large volumes of used fixer may recover the costs of their on-site recovery system in a matter of months, smaller volume producers like grocery store minilabs may not see a similar payoff. It is important to remember that whichever strategy you choose, your business must meet dangerous waste and local sewer discharge limits for silver-bearing wastes.

Many photo processors use on-site systems to reclaim silver from their used silver-bearing wastes. However, on-site silver recovery has focused on economics rather than meeting dangerous waste and sewer discharge limits. On-site silver recovery designed to meet such limits is not as simple as plugging in a machine and walking away — it takes a lot of time, effort and trial and error to

do it right, and even then may not meet some of the more stringent local water quality discharge limits. This booklet contains guidance to help you do a better job if you choose to use on-site recovery.

Off-site Management Options

Off-site management of silver-bearing wastes has certain advantages over on-site recovery. Capital, operation and maintenance expenses for equipment are non-existent. Administrative costs, such as analytical monitoring, are not incurred. If a business has space limitations, the off-site option may help ease crowding. Most importantly, having your silver-bearing wastes managed off-site ensures your facility will not violate the dangerous waste and local silver discharge limits. Some companies also give customers credit for the silver recovered from their waste. Be sure to ask about this.

A potential downside to off-site management may be in using a third party. Choose your waste management company carefully — you remain responsible for the proper management of your wastes.

WASTE MANAGEMENT COMPANIES

Consider using a waste management company to pick up your used silver-bearing wastes, or ask your chemical supplier if they have or will start a program that will supply you with new chemicals as they pick up and reclaim your old silver-bearing solutions.

The pick up fees charged by many silver recovery and waste management facilities range from \$50-\$100 per service visit. While some will only pick up silver-bearing wastes, others will manage other waste streams as well, so shop around. Many facilities will allow spent silver-bearing wastes to be dropped off free of charge but prior arrangements should be made. Other facilities will accept shipments of used fixer through common carriers, such as UPS. (**Do not send fixer through the U.S. mail.**) Shipping small amounts of silver-bearing wastes is allowed under Department of Ecology and Department of Transportation rules. The cost of shipping a five gallon carboy from Seattle to Spokane ranges from \$12-\$63. These prices include pick up at your business. The carriers should be contacted directly for the most accurate pricing information.

RECLAMATION AT ANOTHER BUSINESS

If you generate less than 220 pounds of total dangerous waste per month (approximately 26 gallons including used silver-bearing wastes), you have the option of taking silver-bearing wastes to another business that is willing and properly set up to do on-site silver recovery. Neither the Department of Ecology or the Department of Transportation regulates the transport of such Small Quantity Generator (SQG) volumes of silver-bearing waste. This may be an attractive option for businesses with small volumes of silver-bearing waste that do not wish to do on-site recovery themselves. Check with your local government Moderate Risk Waste Program for similar reclamation services.

Businesses using this option should request a receipt for wastes accepted. Businesses receiving silver-bearing wastes from Small Quantity Generators need to ensure that these wastes are legitimately recycled or treated and that dangerous waste and local water quality discharge limits are being met. Businesses receiving silver-bearing wastes from other businesses do not need to count these wastes toward their own monthly hazardous waste total.

On-Site Recovery Options

There are several different types of equipment that fall under the broad heading of silver recovery units. The most common units found in photo processing shops are electrolytic recovery units and metallic replacement or chemical recovery cartridges. While other technologies are mentioned, most of the discussion will center around these commonly used technologies.

METALLIC REPLACEMENT OR CHEMICAL RECOVERY CARTRIDGES

Chemical recovery cartridges (CRCs) are hollow canisters that contain steel fibers or fiberglass impregnated with iron filings. Fixer, bleach-fixers, C-41 RA bleach and washless stabilizer are filtered through the cartridge. When the solution containing dissolved silver contacts the iron, the iron is dissolved and the silver comes out of the solution.

Using two CRCs in series, in conjunction with other recommended management practices, can reduce silver concentrations to about one ppm — but this takes time and effort and may be

achievable only under ideal circumstances. Even with proper care, two CRCs may not be able to meet the sewer discharge limits adopted by many municipalities. Costs for photo processors setting up two CRCs in series range from \$200 to \$1,700. Operating, changeover, and silver testing costs on a three to six month changeover schedule range from \$150 to \$300 annually.

If you are currently using CRCs or a combination of electrolytic recovery and CRCs for on-site reclamation, the following management practices will help bring you closer to meeting dangerous waste and sewer discharge limits. These recommendations are not guaranteed to automatically bring a business into compliance — each business will need to monitor its progress to see if dangerous waste and sewer discharge limits are being met.

MAINTAINING AND OPERATING CRCs

- Businesses using CRCs for on-site reclamation need to use two CRCs in series, at a minimum, to meet state and local BMPs (unless they can document through routine testing that they consistently meet dangerous waste and local water quality discharge limits with only one CRC). Using just one canister, even if it is high quality, will show diminishing effectiveness after being used a few times and will eventually stop working. An electrolytic recovery unit alone will not meet dangerous waste or sewer discharge limits. If you use an electrolytic recovery unit, you still need to use two CRCs.

- Have a sample valve installed between canisters. Use this valve to take samples of the effluent from the first CRC canister. Using silver test papers, check the sample to see when the first canister is spent. Silver test paper can detect silver at levels between 200 and 500 ppm. When your first canister reaches this level, it is time to rotate it out, putting your second canister first in line and adding a new, second canister. In addition, if your tubing between canisters is clear plastic, you can visually inspect the solution flowing through — if it is brown or has debris in it, it's a good sign that the working ability of the first canister is spent.

- Monitor the flow of used solutions into the canisters. If the flow is too fast, the proper reaction won't happen inside the canister and you won't meet silver discharge limits. If it is too slow, it may deteriorate the canister too soon. Use a metered pump system or a restricted gravity feed system and keep flow rates at manufacturer's recommendation, usually between one and three gallons per hour.
- Test your out flow. If you are doing on-site silver recovery, take periodic samples of recovered silver-bearing waste over the life span of a canister and have the waste analyzed for silver to see if it meets the 5.0 ppm dangerous waste threshold or lower local sewer discharge limits. Keep a file with all test data in it — you'll have a starting point from which to make refinements to your on-site process. See the Testing section on page 31.
- Combine your silver-bearing wastes before treatment. Add washless stabilizers and C-41 RA bleach into spent fixer and run them through CRCs as a single batch. Used washless stabilizers have enough silver in them to make them a dangerous waste, and used C-41 RA bleach may have enough silver to exceed some water quality discharge levels.
- Keep a maintenance/changeover log. Perform regular maintenance as recommended in the manufacturer's instruction manual. Work closely with your supplier for help in developing a changeover schedule based on your volumes of silver-bearing solutions. Ask your supplier if they provide a full service waste management option.
- If you're using electrolytic recovery before CRCs, monitor/adjust the pH of the silver-bearing waste before it enters the CRCs. Using simple pH testing papers as an indicator, keep the pH of silver-bearing wastes entering CRCs between 5.5 and 6.5, which is the optimum range for pulling out the most silver and lengthening the life of the canisters. Look for units that have a sample valve in the tubing entering the canisters where a small sample can be periodically taken. Record pH monitoring levels and occurrences in your maintenance/changeover log.

- Fill CRCs with water before initially putting them into service. This will extend the life of canisters by preventing the steel wool from dissolving as the canisters fill with fixer.

ELECTROLYTIC RECOVERY UNITS

An electrolytic recovery unit works by attracting positively-charged silver ions to a negatively-charged cathode that is immersed in used silver-bearing waste. Electrolytic recovery units remove the majority of easily recoverable silver in a nearly pure metallic state. This purity translates into lower refining and shipping costs than other silver recovery methods. An advantage of a properly functioning electrolytic recovery unit is that the solutions processed can be reused in the photo finishing process, given proper attention to pH levels. A disadvantage is that it can only reduce silver concentrations down to a range of 100 to 300 ppm. Without further reclamation, your effluent will not meet hazardous waste or sewer discharge limits. An average unit costs around \$2500.

For optimum silver recovery efficiency, solutions entering an electrolytic recovery unit should have a pH between 7.5 - 8.0. Since the normal pH of silver-bearing solutions ranges from about 5.5 to around 7, pH adjustment is generally necessary. Do not put bleach into electrolytic units.

CHEMICAL PRECIPITATION

Chemicals can be added to silver-bearing solutions that cause silver to settle to the bottom of the container. Once the clear liquid is removed, the silver sludge is filtered and sent off-site for refining. Although the oldest and cheapest method of silver recovery, this procedure has not been commonly used by photo processors. However, manual systems are available (and automated systems are under development) that can reclaim silver and bring down silver levels of the remaining waste to 3-4 ppm. An automated batch system that reclaims 15 to 20 gallons of silver-bearing waste will cost approximately \$3500.

ION EXCHANGE

Ion exchange uses a resin that attracts negatively charged silver thiosulfate complex to positively charged sites on the ion exchange resin. When all the positively charged sites are filled, breakthrough occurs and the resin is regenerated and the silver recovered. Ion exchange is only used to recover silver from wash waters. Cost, space required, and technical requirements typically make ion exchange suitable only for larger photographic facilities.

REVERSE OSMOSIS

In reverse osmosis, effluent is forced through a thin membrane that has microscopic holes. Water molecules pass through the membrane while larger molecules, such as those containing silver and other contaminants remain. A reverse osmosis unit usually produces purified water, which can be reused as wash water, other process water, or discharged to the sewer, as well as a concentrated effluent stream which is high in silver and other photoprocessing chemicals. The silver must then be removed from this concentrated stream by one of the other silver recovery techniques. The sludges or solids that remain are typically hazardous because of the silver they contain. If ammonia is present in the waste stream, as in the case of fixers and bleach-fix, the ammonia must be removed prior to evaporation/distillation. This can be done using activated carbon. Your local air authority should be consulted if you use an evaporator that discharges directly to the air.

EVAPORATION/DISTILLATION

Evaporation and distillation units are used to reduce the volume of liquid waste that has been produced. Evaporators must comply with "Treatment By Generator" requirements and used only on inorganic wastes for the purpose of removing/reducing water content while distillation units condense the vapors and the resulting liquids are either discharged to the sewer or reused. The sludges or solids that remain are typically hazardous because of the silver they contain. If ammonia is present in the waste stream, as in the case of fixers and bleach-fix, the ammonia must be removed prior to evaporation/distillation. This can be done using activated carbon. Your local air authority should be consulted if you use an evaporator that discharges into the air.

Water Quality Requirements

LOCAL SEWER DISCHARGE LIMITS

As the chart below shows, some sewer districts in the state have set their own local silver discharge limits for businesses in order to help the sewage treatment plant meet its own discharge levels for silver. In many locations, sewer discharge levels are so low that businesses using on-site silver recovery technologies such as electrolytic recovery and CRCs will have difficulty meeting these levels. Similar low limits are continuing to be developed in other areas of the state. Businesses located in areas with strict current or future local sewer limits may have no choice but to explore off-site options unless the sewer authority will accept compliance with best management practices in lieu of a numeric limit. All businesses conducting on-site silver reclamation should contact their local sewer utility for more information about local limits.

Municipality	Silver Limit (ppm)	Delegated?
Aberdeen	0.2	No
Chehalis	0.2	No
Clark County	0.1	No
Everett	0.69	Yes
Federal Way	0.5	No
Kalama	0.1	No
King County (Metro)	3.0	Yes
Lynnwood	0.5	Yes
Olympia (LOTT)	0.2	Yes
Pasco	0.2	No
Pierce County	0.2	Yes
Pullman	0.2	No
Richland	0.2	Yes
Spokane	0.43	Yes
Tacoma	0.2	Yes
Vancouver	0.1	Yes
Walla Walla	0.37	No
Yakima	5.02	Yes

DELEGATED AND NON-DELEGATED SEWER

Some sewer utilities, as noted in the right hand column of the above table, are delegated the power to function as the pretreatment control authority. These utilities may control or condition all discharges to their sanitary sewer collection system in the manner described in their approved program or as needed to meet the goals of the pretreatment program. As such, they routinely issue permits to significant sources of non-domestic wastewater, and often adopt best management practices for smaller flows such as when photo processing wastes are the only sources of wastewater which is not similar to domestic wastewater in character and strength. Ecology is responsible for controlling sources of non-domestic wastewater outside these delegated municipalities. Sources of non-domestic waste water in these areas should check with the Ecology regional water quality program to determine whether they need to apply for a "State Waste Discharge Permit" to discharge to the sewer. If so, once the application is reviewed and determined to be complete, Ecology's reviewer will determine if the facility requires a discharge permit or other controls and will initiate followup.

HAZARDOUS WASTE REQUIREMENTS FOR PHOTO PROCESSORS



STEP 1: IDENTIFY YOUR WASTE AND GENERATOR STATUS

Photo processors generate dangerous silver-bearing wastes from fixer, bleach-fixers, washless stabilizer and C-41 RA bleach. Developers are also dangerous as they contain more than one percent hydroquinone and are disposed of before use. Used system cleaners may be dangerous due to toxicity and pH. Most businesses need to “count” these wastes toward a monthly hazardous waste total.

You are a Small Quantity Generator if you always generate less than 220 pounds of dangerous waste per month and always dispose of the waste before you accumulate more than 2,200 pounds. Small Quantity Generators are required to comply only with Steps 1, 8 (and 3 if you already have an active RCRA ID number).

If you generate over 220 pounds but only generate silver-bearing dangerous waste (i.e., no developer, system cleaner, or other dangerous wastes) and you recycle or treat this material immediately through hard pipes, you need not count this waste. If you accumulate your waste prior to recycling, or recycle in another way you must count that waste and need to comply with Steps 2, 3, 8, 9 and 10.

If your total monthly amount of dangerous waste totals over 220 pounds (about 26 gallons) and this count includes more than just silver-bearing wastes, you are a Regulated Generator required to meet compliance Steps 2-11.

STEP 2: OBTAIN A GENERATOR ID NUMBER

If you are a regulated generator, you are required to notify Ecology of your dangerous waste activities and obtain a site-specific RCRA ID number using Ecology's Site ID Form. To get a Site ID Form, call (800) 874-2022 or (360) 407-6170, or visit Ecology's Web site at <http://www.ecy.wa.gov/programs/hwtr/waste-report/index.html>

STEP 3: REPORT ANNUALLY

If you have an active RCRA ID number, you must submit an annual report (Ecology's Annual Report Form) by March 1 of each year, even if you have not generated waste in that year. Record your dangerous waste activities for the previous calendar year on this report, including how much waste you've generated or accumulated on-site and waste you've sent off-site. Ecology conducts annual workshops for businesses seeking assistance in completing their annual reports. Annual reporting forms and instructions for paper filers and electronic reporting can be found at <http://www.ecy.wa.gov/programs/hwtr/waste-report/index.html>

STEP 4: PERFORM PREVENTIVE MAINTENANCE

Dangerous wastes must be handled in a manner that prevents leaks, spills, fires and explosions. Develop and follow a written inspection schedule for all dangerous waste storage areas, containers and tanks and include all emergency, safety and monitoring equipment on site. Keep the necessary emergency equipment (such as fire extinguishers and telephones) on hand and accessible to employees. You must regularly test and maintain all your emergency equipment. Notify police, fire departments and local hospital of the characteristics of any dangerous wastes generated at your site, as well as the facility layout and access routes.

STEP 5: PROPERLY ACCUMULATE DANGEROUS WASTE

Photo processors typically generate less than 2,200 pounds of dangerous waste per month. If so, you can accumulate your dangerous waste on-site for up to 180 days from the date it is first generated before you must manage it on-site or send it to an appropriate facility. If you generate more than 2,200 pounds per month you can only accumulate the waste for up to 90 days. While accumulating wastes, you must follow certain requirements:

1. Establish and clearly mark a dangerous waste accumulation area. If constructed after September 30, 1986, it must have a containment system able to hold spills and leaks.
2. Place the waste in an appropriate container and mark it with the words "Dangerous Waste" or "Hazardous Waste," the waste's major risk (such as "Toxic"), and the date you first put waste in the container.

STEP 6: PLAN FOR EMERGENCIES

There must be an emergency coordinator on the premises or on call at all times who is familiar with the operations and activities at the site and has the authority to commit the resources necessary to deal with a hazardous waste emergency. In a small shop, this will probably be the owner or manager. Make sure you train your employees to know how to react to different types of emergencies in your shop.

STEP 7: USE PROPER CONTAINERS

Many dangerous waste incidents and work related injuries are linked to improper or unsafe container management. To avoid such accidents:

- Accumulate your wastes in containers which are sturdy, leakproof, properly labeled, and kept closed unless waste is being added or removed. Use your empty product containers as convenient waste accumulation containers.
- Don't accumulate incompatible wastes in the same containers or areas.
- Store reactive and ignitable wastes according to the International Fire Code.
- Maintain a minimum aisle space of 30 inches between container rows.
- Inspect containers at least once a week, keeping a log of inspections.

STEP 8: ENSURE PROPER TRANSPORTATION AND DISPOSAL

Regulated generators must hire a transporter that has a RCRA ID number and insure that wastes are handled at a permitted dangerous waste facility or a facility that legitimately recycles and reclaims dangerous waste. Small Quantity Generators can transport their own wastes or make sure they are sent to a permitted facility, a legitimate recycler, or the sanitary sewer (with written authorization only).in your shop.

STEP 9: MANIFEST SHIPMENTS OF DANGEROUS WASTE

To ship dangerous wastes off-site, regulated generators must prepare a Federal Uniform Hazardous Waste Manifest Form which identifies the contents of the shipment, the transport company used and the facility receiving the wastes. This form accompanies the waste from the site where it is generated to its ultimate resting place and then is sent to you for your records. If you are a regulated generator, your waste hauler needs to use a manifest and may not just issue a bill of lading or receipt.

STEP 10: DON'T SPECULATIVELY ACCUMULATE

If you are a regulated generator and you accumulate silver-bearing wastes for more than 180 days, you need to document that you are not speculatively accumulating this material. Speculative accumulation means collecting a waste with the hope that it may one day have value. You need to keep records showing the volume of these materials stored at the beginning of the year, the amount of these materials generated or received during the calendar year, and the amount of materials remaining at the end of the calendar year. You must also be able to show that at least 75 percent of that year's silver-bearing wastes were recycled, or transported elsewhere for recycling.

STEP 11: KEEP RECORDS

There are a number of records that regulated generators must prepare and keep on the premises for at least five years, including annual reports and manifest forms. Keep copies of notification reports (Site ID Form), inspection records, results from waste analyses or tests, and on-site recycling records for as long as you are in business. Small Quantity Generators should also keep records of their dangerous waste management activities.

IMPORTANT TOPICS



TESTING

Businesses discharging reclaimed silver-bearing wastes are responsible for knowing if they meet dangerous waste and sewer discharge limits. Sending a sample of a waste to a laboratory for analysis is the most accurate way to determine if the waste is dangerous or meets sewer discharge limits — and it's relatively inexpensive.

For analyzing concentrations of metals, a total metals test is used to determine compliance with local sewer discharge limits while a TCLP (Toxicity Characteristic Leaching Procedure) test is used to determine whether a waste is dangerous. A total metals test checks for the total amount of a metal in a waste while a TCLP checks for the amount that could leach into the ground in a landfill. For used fixer, a total metals test can be used for determining sewer discharge and dangerous waste levels. If you're using CRCs, regular testing over the life span of a canister can indicate if your maintenance schedule could be extended, saving you the cost of an additional unit. Test strips may be used for this purpose as well and this option is considerably economical and faster.

Once you have established a track record of consistent compliance (e.g., testing your silver-bearing waste stream over time and continuing to meet dangerous waste and sewer discharge limits), you can use those test results and changeover schedules as an indicator of future compliance with regulatory levels. See page 28 for a list of testing services available.

MATERIAL DATA SAFETY SHEETS (MSDS)

A material data safety sheet (MSDS) is required to come with each of the chemical products you purchase from a manufacturer or

vendor. As a business, you are required to keep MSDSs for all products available to employees. This is a Washington Industry Safety and Health Act requirement. MSDSs have a reputation for being long, overly technical and difficult to read. While this may be true, the ability to scan through an MSDS and pick out the following information is important. MSDSs are valuable because they describe:

- physical and chemical properties of the hazardous substances contained in the product,
- spill cleanup instructions,
- health hazards and appropriate first aid,
- fire and explosion hazards, and
- proper management and disposal practices.

Not all MSDSs are formatted the same way, but they are all required to contain certain information. If you want additional information about a chemical product, contact the manufacturer using the phone number provided on the MSDS.

FOR MORE INFORMATION

You can find more information about properly managing your wastes as well as this and other publications on Ecology's Web site at <http://www.ecy.wa.gov>



For information about businesses that can help you manage your wastes go to the Hazardous Waste Services Directory at <http://www.ecy.wa.gov/apps/hwtr/hwsd/default.htm>

The first screen lists the services available to hazardous waste generators. Select which type of waste management service is needed, click "Search" and a listing of all the companies that offer that service will appear. Select a firm and click on "Details" to get more information.

Although the directory is updated routinely to keep the information current and useful, these listings do not constitute a recommendation, and the Department of Ecology does not assume any liability for the accuracy or completeness of the information in the directory. If you have questions or comments about the on-line directory, e-mail Dave Zink at dzin461@ecy.wa.gov



PLAY IT SAFE!

Before you agree to let a company handle your waste, ask for, and check, the company's references. The following questions might be useful in assessing the management practices of a business you are considering:

- How do you manage the waste you collect or analyze?
- Do you reduce or recycle waste before disposal? Do you contract out for such services, and if so, to whom?
- How do you train your employees?
- Do they have a basic understanding of regulations/liabilities pertaining to your waste stream?
- Are you insured? In some cases it may be appropriate to ask for a RCRA Identification number.
- Do you or your affiliate companies have any current, recent (3-5 years) or pending enforcement actions or fines with state, federal or local authorities? (Call your nearest Ecology regional office to verify.)

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ISLAND COUNTY SOLID WASTE DEPARTMENT

KODAK

LEWIS COUNTY PUBLIC HEALTH DEPARTMENT

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