

## APPENDIX D

### Best Management Practice (BMP) for Silver-Rich Solutions

All facilities generating silver-rich solutions must comply with the BMP Requirements shown below. Silver-rich solutions contain sufficient silver for cost-effective recovery, either on-site or off-site. These solutions include used fix and bleach-fix solutions, low replenished (low-flow) washes following a fix or bleach-fix solution, and stabilizers for the washless minilab film and paper processes.

#### **I. SILVER-RICH SOLUTION MANAGEMENT REQUIREMENTS:**

A. Either: (1) Haul silver-rich spent film processing solutions off-site for recovery or disposal, or (2) Using technology that is equivalent to or exceeds the equipment listed below, based on the volume of silver-rich solutions generated by each piece of equipment per day, pretreat all silver-rich spent film processing solutions to remove silver prior to discharge of the solutions to sewer; operate and maintain silver recovery equipment so that it provides the percent recovery for which it was designed.

(a) If the equipment generates an average of **less than 0.5 gallons/day of silver-rich solutions:** treat silver-rich solutions using a single chemical recovery cartridge (CRC) with manufacturer specified flow control, or alternative technology providing at least 90% silver recovery or management.

(b) If the equipment generates an average of **0.5 to 20 gallons/day silver-rich solutions:** treat silver-rich solutions using two chemical recovery cartridges in series with manufacturer-specified flow control, or an electrolytic unit followed by a chemical recovery cartridge with manufacturer-specified flow control, or alternative technology providing at least 95% silver recovery or management.

(c) If the equipment generates an average of **more than 20 gallons/day silver-rich solutions:** treat silver-rich solutions using an electrolytic unit plus two or more CRCs with manufacturer specified flow control or an electrolytic unit plus a precipitation unit, or alternative technology providing at least 99% silver recovery or management.

**Note: recovery systems serving more than 1 processor must be designed to meet removal requirements for the combined flow.**

#### **II. SELF-MONITORING AND RECORD-KEEPING REQUIREMENTS:**

##### **A. For each silver recovery system in operation:**

1. **Test the silver concentration in the recovery system effluent at least once every three months, using silver test paper.** If the paper turns black, the recovery system is not operating properly and needs immediate attention. Cease discharge and take all measures necessary to restore recovery system efficiency prior to re-initiating discharge. (Facilities whose silver recovery systems are serviced by a contract maintenance service at a frequency of at least once every three months are exempt from this requirement.)

2. **Maintain a silver recovery log** to record flow through the silver recovery system and test results resulting from (1) above, if applicable.

##### **B. If more than one silver recovery system is used:**

Develop and maintain a list of silver recovery systems in use and their location, and document which processors each recovery system serves. Maintain the list on-site and make it available to Wastewater Pretreatment Inspectors upon request.

#### **III. REPORTING REQUIREMENTS:** (Facilities generating less than .5 gallons/day silver-rich solution are exempt)

A. Twice a year, by the due dates specified in Attachment B of your permit, submit a statement to this office certifying that, during the previous six months, all silver-rich solutions generated at your facility have been either: (1) treated on-site to remove no less than the percentage of silver required by the BMP, prior to disposal to sewer, or; (2) hauled off-site for treatment and disposal. A Certification Form will be mailed to your facility for signature approximately five weeks prior to the due date.

#### **IV. DEFINITIONS:**

1. **% silver recovery:** The percent of silver recovered from the silver-rich solutions by the silver recovery treatment system, calculated as follows: 
$$\% \text{ recovery} = \frac{1 - \text{concentration (in mg/l) silver in effluent}}{\text{concentration (in mg/l) silver in influent}}$$

2. **CRC:** A chemical recovery cartridge which recovers silver through a process known as metallic replacement.

3. **Electrolytic Silver Recovery:** A method of recovering silver in which a direct current is applied across two electrodes immersed in a silver-rich solution.

4. **Metallic Replacement:** A method of recovering silver from silver-rich solutions by an oxidation-reduction reaction with elemental iron and silver thiosulfate to produce ferrous iron in solution and metallic silver sludge. The device used is commonly called a chemical recovery cartridge (CRC).

5. **Silver Recovery System:** One or more silver recovery treatment units which, alone or in combination, are used to treat a given silver-rich solution to remove silver prior to discharge of the solution to the sanitary sewer.