Photography — Health and Safety Guidelines

The guidelines in this document describe health and safety information pertaining to the photography area of the Art Department at SUNY Oswego. All students enrolled in photography classes need to be aware of the information contained in this document and practice health and safety procedures accordingly. Once this document is shared with students in class, each student must sign a contract, acknowledging they have read these guidelines and agree to these policies and practices while using the photography facilities for class and open studio.

Photography Studio

1. Avoid use of frayed electrical cords.
2. Avoid use of broken equipment. Notify faculty and photo worker of broken equipment.
3. Keep floor clean and clear of clutter, and all equipment stored in its place.
4. Use the lower rungs of tripods and light stands first to maximize stability.
5. Ceiling lights must be attached to a safety cable mechanism.
6. Screens must be used with Tota lights.
7. One must never touch Tota (hot light) bulbs with bare hands, only with gloves, when fully cooled, to avoid oil on the lamp.
8. Tota lights must be fully cooled before breaking down and storing.
9. Immediately clean up a spill or broken glass.
10. Only photo faculty and trained photo workers may:
    a. Use the ladder.
    b. Replenish seamless roll paper.
    c. Remove and attach ceiling lights.
    d. Replace Tota light bulbs, strobe modeling lights, and strobe flash tubes.
11. Always turn off and unplug lights when adding or removing accessories such as softboxes.

General Health and Safety Guidelines for the Darkroom

1. Absolutely no food or drink in the darkroom.
2. Wear gloves when chemistry will come in contact with you hands especially when developing film.
3. Wash hands thoroughly after working in the darkroom and before consuming food and drink.
4. Use an eyewash station if chemistry splashes in your eyes.
5. If chemistry splashes on your clothes or skin remove contaminated clothing and wash skin thoroughly with soap and water.

6. Always make sure the ventilation system is running when working in the lab.
7. It is imperative that no chemistry drip on the floor or be left to dry on any surface.
8. Use trays to transport wet prints.
9. Clean up a chemistry spills immediately with a paper towel and wipe clean with water or cleaner. 10. Thoroughly rinse trays, containers, sinks etc with hot water to remove chemistry.

BLACK-AND-WHITE PHOTOGRAPHIC PROCESSING

A wide variety of chemicals are used in black and white photographic processing. Film developing is usually done in closed canisters. Print processing uses tray processing, with successive developing baths, stop baths, fixing baths, and rinse steps. Other treatments include use of hardeners, intensifiers, reducers, toners, and hypo eliminators.

DEVELOPING BATHS

The most commonly used developers are hydroquinone, monomethyl para-amino phenol sulfate, and phenidone. Several other developers are used for special purposes. Other common components of developing baths include an accelerator, often sodium carbonate or borax, sodium sulfite as a preservative, and potassium bromide as a restrainer or antifogging agent.

Hazards

1. Developers are skin and eye irritants, and in many cases strong sensitizers. Monomethyl-p-aminophenol sulfate creates many skin problems, and allergies to it are frequent (although this is thought to be due to the presence of para-phenylene diamine as a contaminant). Hydroquinone can cause depigmentation and eye injury after five or more years of repeated exposure, and is a mutagen. Some developers also can be absorbed through the skin to cause severe poisoning (e.g., catechol, pyrogallic acid). Phenidone is only slightly toxic by skin contact.
2. Most developers are moderately to highly toxic by ingestion, with ingestion of less than one tablespoon of compounds such as monomethyl-p-aminophenol sulfate, hydroquinone, or pyrocatechol being possibly fatal for adults. Symptoms include ringing in the ears (tinnitus), nausea, dizziness, muscular twitching, increased respiration, headache, cyanosis (turning blue from lack of oxygen) due to methemoglobinemia, delirium, and coma. With some developers, convulsions also can occur.
3. Para-phenylene diamine and some of its derivatives are highly toxic by skin contact, inhalation, and ingestion. They cause very severe skin allergies and can be absorbed through the skin.
4. Sodium hydroxide, sodium carbonate, and other alkalis used as accelerators are highly corrosive by skin contact or ingestion. This is a

particular problem with the pure alkali or with concentrated stock solutions.

5. Potassium bromide is moderately toxic by inhalation or ingestion and slightly toxic by skin contact. Symptoms of systemic poisoning include somnolence, depression, lack of coordination, mental confusion, hallucinations, and skin rashes.
6. Sodium sulfite is moderately toxic by ingestion or inhalation, causing gastric upset, colic, diarrhea, circulatory problems, and central nervous system depression. It is not appreciably toxic by skin contact. If heated or allowed to stand for a long time in water or acid, it decomposes to produce sulfur dioxide, which is highly irritating by inhalation.

Precautions

1. See the section on Mixing Photo chemicals for mixing precautions.
2. Do not put your bare hands in developer baths. Use tongs instead. If developer solution splashes on your skin or eyes immediately rinse with lots of water. For eye splashes, continue rinsing for 15-20 minutes and seek medical attention.
3. Do not use para-phenylene diamine or its derivatives if at all possible.

STOP BATHS AND FIXER

Stop baths are usually weak solutions of acetic acid. Acetic acid is commonly available as pure glacial acetic acid or 28% acetic acid. Some stop baths contain potassium chrome alum as a hardener.

Fixing baths contain sodium thiosulfate ("hypo") as the fixing agent, and sodium sulfite and sodium bisulfite as a preservative. Fixing baths also may also contain alum (potassium aluminum sulfate) as a hardener and boric acid as a buffer.

Hazards

1. Acetic acid, in concentrated solutions, is highly toxic by inhalation, skin contact, and ingestion. It can cause dermatitis and ulcers, and can strongly irritate the mucous membranes. The final stop bath is only slightly hazardous by skin contact. Continual inhalation of acetic acid vapors, even from the stop bath, may cause chronic bronchitis.
2. Potassium chrome alum or chrome alum (potassium chromium sulfate) is moderately toxic by skin contact and inhalation, causing dermatitis and allergies.
3. In powder form, sodium thiosulfate is not significantly toxic by skin contact. By ingestion it has a purging effect on the bowels. Upon heating or long standing in solution, it can decompose to form highly toxic sulfur dioxide, which can cause chronic lung problems. Many asthmatics are particularly sensitive to sulfur dioxide.
4. Sodium bisulfite decomposes to form sulfur dioxide if the fixing bath contains boric acid, or if acetic acid is transferred to the fixing bath on

the surface of the print.

5. Alum (potassium aluminum sulfate) is only slightly toxic. It may cause skin allergies or irritation.
6. Boric acid is moderately toxic by ingestion or inhalation and slightly toxic by skin contact (unless the skin is abraded or burned, in which case it can be highly toxic).

Precautions

1. All darkrooms require good ventilation to control the level of acetic acid vapors and sulfur dioxide gas produced in photography.
2. Wear gloves and goggles.
3. Cover all baths when not in use to prevent evaporation or release of toxic vapors and gases.

INTENSIFIERS AND REDUCERS

A common after-treatment of negatives (and occasionally prints) is either intensification or reduction. Common intensifiers include hydrochloric acid and potassium dichromate, or potassium chlorochromate. Mercuric chloride followed by ammonia or sodium sulfite, Monckhoven's intensifier consisting of a mercuric salt bleach followed by a silver nitrate/potassium cyanide solution, mercuric iodide/sodium sulfite, and uranium nitrate are older, now discarded, intensifiers.

Reduction of negatives is usually done with Farmer's reducer, consisting of potassium ferricyanide and hypo. Reduction has also be done historically with iodine/potassium cyanide, ammonium persulfate, and potassium permanganate/sulfuric acid.

Hazards

1. Potassium dichromate and potassium chlorochromate are probable human carcinogens, and can cause skin allergies and ulceration. Potassium chlorochromate can release highly toxic chlorine gas if heated or if acid is added.
2. Concentrated hydrochloric acid is corrosive; the diluted acid is a skin and
   eye irritant.
3. Mercury compounds are moderately toxic by skin contact and may be absorbed through the skin. They are also highly toxic by inhalation and extremely toxic by ingestion. Uranium intensifiers are radioactive, and are especially hazardous to the kidneys.
4. Sodium or potassium cyanide is extremely toxic by inhalation and ingestion, and moderately toxic by skin contact. Adding acid to cyanide forms extremely toxic hydrogen cyanide gas which can be rapidly fatal.
5. Potassium ferricyanide, although only slightly toxic by itself, will release hydrogen cyanide gas if heated, if hot acid is added, or if exposed to strong ultraviolet light (e.g., carbon arcs). Cases of cyanide

poisoning have occurred through treating Farmer's reducer with acid.

6. Potassium permanganate and ammonium persulfate are strong oxidizers and may cause fires or explosions in contact with solvents and other organic materials.

Precautions

1. Chromium intensifiers are probably the least toxic intensifiers, even though they are probable human carcinogens. Gloves and goggles should be worn when preparing and using these intensifiers. Mix the powders in a glove box or wear a NIOSH-approved toxic dust respirator. Do not expose potassium chlorochromate to acid or heat.
2. Do not use mercury, cyanide or uranium intensifiers, or cyanide reducers because of their high or extreme toxicity.
3. The safest reducer to use is Farmer's reducer. Do not expose Farmer's reducer to acid, ultraviolet light, or heat.

TONERS

Toning a print usually involves replacement of silver by another metal, for example, gold, selenium, uranium, platinum, or iron. In some cases, the toning involves replacement of silver metal by brown silver sulfide, for example, in the various types of sulfide toners. A variety of other chemicals are also used in the toning solutions.

Hazards

1. Sulfides release highly toxic hydrogen sulfide gas during toning, or when treated with acid.
2. Selenium is a skin and eye irritant and can cause kidney damage. Treatment of selenium salts with acid may release highly toxic hydrogen selenide gas. Selenium toners also give off large amounts of sulfur dioxide gas.
3. Gold and platinum salts are strong sensitizers and can produce allergic skin reactions and asthma, particularly in fair-haired people.
4. Thiourea is a probable human carcinogen since it causes cancer in animals.

Precautions

1. Carry out normal precautions for handling toxic chemicals as described in previous sections. In particular, wear gloves and goggles. See also the section on mixing photo chemicals.
2. Toning solutions must be used with local exhaust ventilation.
3. Take precautions to make sure that sulfide or selenium toners are not contaminated with acids. For example, with two bath sulfide toners, make sure you rinse the print well after bleaching in acid solution before dipping it in the sulfide developer.
4. Avoid thiourea whenever possible because of its probable cancer status.

OTHER HAZARDS

Many other chemicals are also used in black and white processing, including formaldehyde as a pre-hardener, a variety of oxidizing agents as hypo eliminators (e.g., hydrogen peroxide and ammonia, potassium permanganate, bleaches, and potassium persulfate), sodium sulfide to test for residual silver, silver nitrate to test for residual hypo, solvents such as methyl chloroform and freons for film and print cleaning, and concentrated acids to clean trays.

Electrical outlets and equipment can present electrical hazards in darkrooms due to the risk of splashing water.

Hazards

1. Concentrated sulfuric acid, mixed with potassium permanganate or potassium dichromate, produces highly corrosive permanganic and chromic acids.
2. Hypochlorite bleaches can release highly toxic chlorine gas when acid is added, or if heated.
3. Potassium persulfate and other oxidizing agents used as hypo eliminators may cause fires when in contact with easily oxidizable materials, such as many solvents and other combustible materials. Most are also skin and eye irritants.

Precautions

1. See previous sections for precautions in handling photographic chemicals.
2. Cleaning acids should be handled with great care. Wear gloves, goggles and acid-proof, protective apron. Always add acid to the water when diluting.
3. Do not add acid to, or heat, hypochlorite bleaches.
4. Keep potassium persulfate and other strong oxidizing agents separate from flammable and easily oxidizable substances.
5. Install ground fault interrupters (GFCIs) whenever electrical outlets or electrical equipment (e.g. enlargers) are within six feet of the risk of water splashes.

DISPOSAL OF PHOTO CHEMICALS

There is considerable concern about the effect of dumping photographic chemicals and solutions down the drain. The following recommendations are for disposing small volumes of photographic solutions daily.

1. Old or unused concentrated photographic chemical solutions, toning solutions, ferricyanide solutions, chromium solutions, color processing solutions containing high concentrations of solvents, and non-silver solutions should be treated as hazardous waste

2. Alkaline developer solutions should be neutralized first before being poured down the drain. This can be done with the stop bath or citric acid, using pH paper to tell when the solution has been neutralized (pH 7).
3. Stop bath left over from neutralization of developer can be poured down the drain, once mixed with wash water.
4. Fixing baths should never be treated with acid (e.g mixing with stop bath), since they usually contain sulfites and bisulfites which will produce sulfur dioxide gas.
5. Fixing baths contain large concentrations of silver thiocyanate, well above the 5 ppm of silver ion allowed by the U.S. Clean Water Act. Collect fixers and either pour into the silver recovery unit or dispose as hazardous waste.

MIXING PHOTO CHEMICALS

Photo chemicals can be bought in liquid form, which only need diluting, or powder form, which need dissolving and diluting.

Hazards

1. Developer solutions and powders are often highly alkaline, and glacial acetic acid, used in making the stop bath, is also corrosive by skin contact, inhalation and ingestion.
2. Developer powders are highly toxic by inhalation, and moderately toxic by skin contact, due to the alkali and developers themselves (see Developing Baths below).

Precautions

1. Use liquid chemistry whenever possible, rather than mixing developing powders. Pregnant women, in particular, should not be exposed to powdered developer.
2. When mixing powdered developers, use a glove box (a cardboard box with glass or plexiglas top, and two holes in the sides for hands and arms), local exhaust ventilation, or wear a NIOSH-approved toxic dust respirator.
3. Wear gloves, goggles and protective apron when mixing concentrated photo chemicals. Always add any acid to water, never the reverse.
4. In case of skin contact, rinse with lots of water. In case of eye contact, rinse for at least 15-20 minutes, preferably using an eyewash station, seek medical attention.
5. Store concentrated acids and other corrosive chemicals on low shelves so as to reduce the chance of face or eye damage in case of breakage and splashing.
6. Do not store photographic solutions in glass containers.

“Black-and-White Photographic Processing.” *Princeton University*, The Trustees of Princeton University, 2018, ehs.princeton.edu/health-safety-the-campus-community/art-theater-safety/art-safety/photography#db.
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