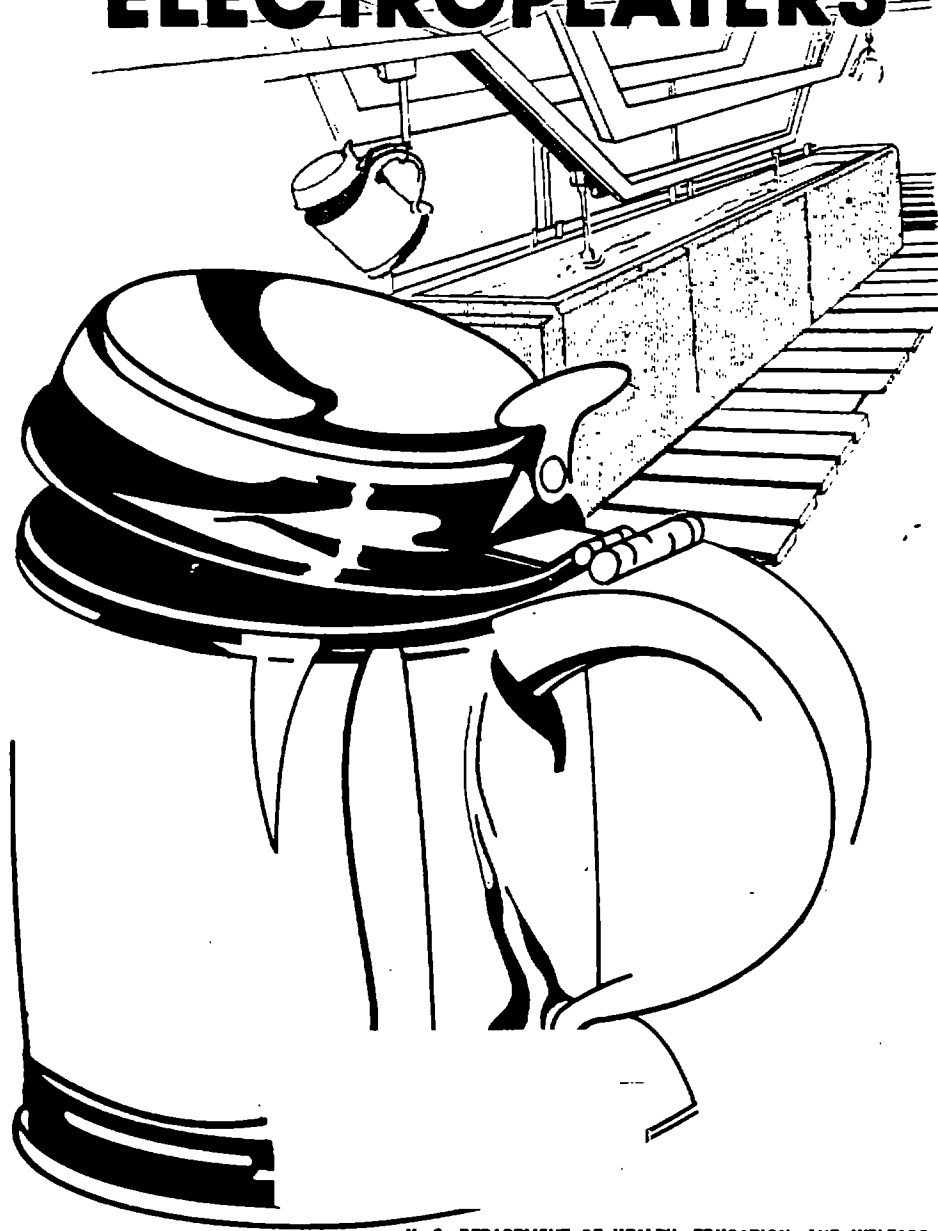


NIOSH PB 274 768
**GOOD WORK PRACTICES FOR
ELECTROPLATERS**



U. S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
Public Health Service
Center for Disease Control
National Institute for Occupational Safety and Health

REPRODUCED BY
U.S. DEPARTMENT OF COMMERCE
NATIONAL TECHNICAL
INFORMATION SERVICE
SPRINGFIELD, VA 22161

GOOD WORK PRACTICES FOR

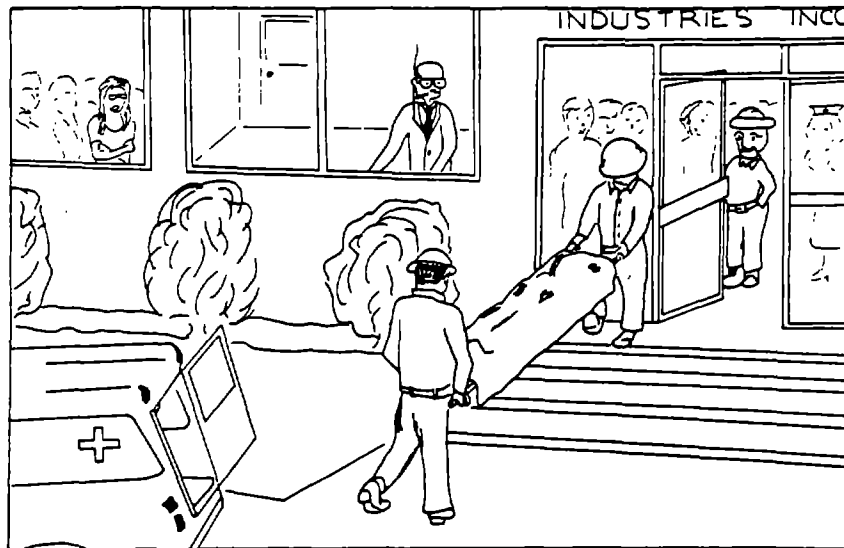
ELECTROPLATERS

U. S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
Public Health Service
Center for Disease Control
National Institute for Occupational Safety and Health
Division of Technical Services
Cincinnati, Ohio
June 1977

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How familiar are you with the chemicals you use everyday in the electroplating industry? Most workers become acquainted with them through bodily contact, which may be painful and even dangerous; or by talking with their fellow employees, who may not know the risks involved. The best way to find out about the hazards of your workplace is to **EDUCATE YOURSELF**. This manual was written to help you.

Look over the sections that apply specifically to you. Then, when you have some free time, sit down and read it thoroughly. If you have any questions, ask your supervisor for help. Keep the manual in your locker or some convenient place at work for future reference. It concludes with handy reference tables on the hazards of electroplating chemicals and on first-aid procedures in case of accident. You may be glad you have it some day.

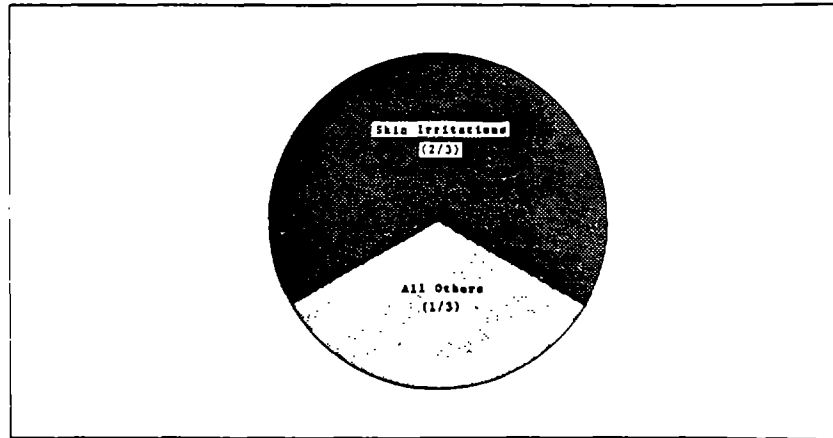


EDUCATE YOURSELF
about the hazards of your workplace before it's
TOO LATE.

PRECLEANING

Solvents

The best way to remember the hazards involved with precleaning operations is to consider the purpose of precleaning. Its purpose is to remove oil, grease, and loose dirt from surfaces to be welded or plated. The chemicals which do this job have a similar effect on human skin — they remove natural oils and dry out your skin. As a result, your hands become chapped and tender, and your job turns into a painful task.

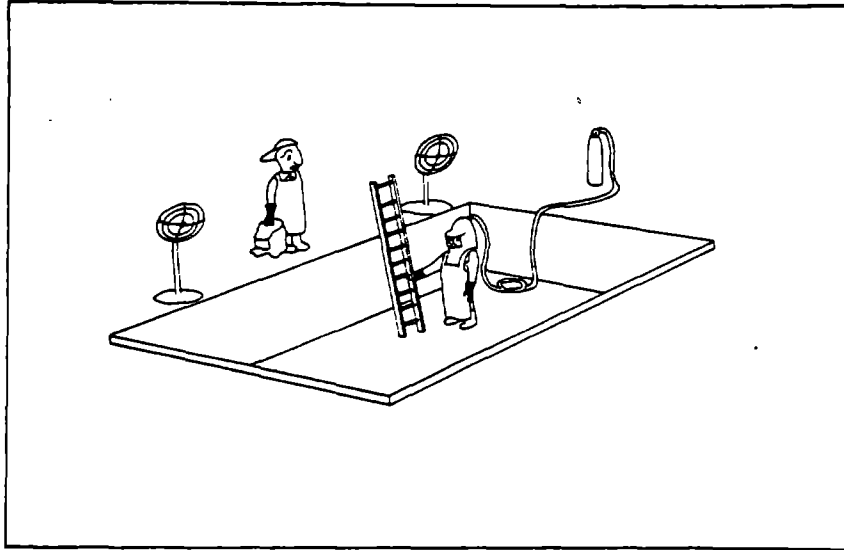


Skin irritation or "dermatitis" is the most common industrial ailment.

While most problems associated with the use of precleaning solvents deal with skin irritation, other potential dangers are more serious. Prolonged exposure to excessive amounts of trichloroethylene or perchloroethylene, two "chlorinated hydrocarbon" solvents commonly used for degreasing, may result in fainting or even death. Other symptoms of overexposure include headache, dizziness, fatigue, nausea, and drowsiness. Fortunately, solvents of this type are rapidly eliminated from the body if you can get to fresh air. Symptoms of overexposure disappear quickly, with no permanent after-effects if the exposure has been mild.

Tank Cleanout

Most serious accidents involving precleaning solvents occur during tank cleanout operations.



Some of the most serious accidents occur during tank clean-out operations.

You are probably familiar with jobs that have to be done in a hurry so as not to slow down production. Perhaps you will be told to clean out a degreasing tank, and do the job immediately. **What precautions should you take to protect yourself?**

- Allow the degreaser to cool to near room temperature before proceeding further.
- Drain solvent from tank into proper containers and make sure the containers are properly sealed and clearly labelled.
- Open cleanout doors and allow the degreaser to "air out" thoroughly. Ventilating the tank with forced air will speed this process.

- Wear protective rubber gloves and boots.
- Wear a supplied-air respirator if cleaning requires you to work inside the degreaser tank. A second worker, similarly equipped, must be stationed outside the tank to help in an emergency. The second worker must be able to communicate by voice or visual signals with the worker inside the confined space.
- Continue to ventilate the degreaser even while using an air-line respirator. Illness may occur from skin absorption if solvent concentrations are allowed to rise to unsafe levels.

Safety Considerations for Degreasing Operations

Relative to other industrial processes, vapor degreasing does not present excessive dangers to conscientious workers. However, carelessness in handling degreasing solvents such as trichloroethylene and perchloroethylene have led to serious accidents in the past.

The comments listed below and elsewhere in this manual are not meant to cover all of the possible hazards which you, the worker, may encounter. They are presented to illustrate the types of pitfalls encountered by persons who disregard the rules of safe practice.

- **Never substitute** one solvent for another unless specified as acceptable for the degreaser by the manufacturer. Improper use of **carbon tetrachloride** (a very toxic solvent) has produced serious illnesses among workers. Flammable liquids such as **ethyl alcohol** have been used with catastrophic effects.
- Never enter an operating degreaser to perform repair work. Follow procedures outlined previously for tank cleanout.
- Make sure the degreaser you are working with is properly ventilated. Check to see if fans and condenser are on and ventilation is working before starting work.
- Don't overload degreasers. Proper draining of cleaned parts is essential. Overloading may prevent or delay drainage, and the parts basket may be unwieldy for the hoist operator.

Hand-Operated Degreasing

While large-scale degreasers are often enclosed and mechanized, many operations are small enough to necessitate hand-operated degreasers. The person in charge of a small, hand-operated degreaser should be aware of the rules of safe operation.

- Do not raise and lower parts into the degreaser so rapidly that splashing occurs.
- Rack parts so as to avoid dragout of solvent. Cup-shaped parts and the like should be placed upside down in the rack.
- To promote quick drying, leave the parts in the vapor zone until solvent condensation ceases.
- Be sure work is dry before removing it from the tank. Wear rubber gloves if you must handle parts coming from the degreaser.
- Close machine covers when the degreaser is not in use.

Cold Cleaning Operations — Diphase Type

Most of the comments made about the traditional tank-and-solvent method of precleaning hold true for two-phase (water and solvent) cleaning operations. Whereas typical degreased parts come from the tank virtually dry, parts that are cold-cleaned in a tank with a water layer over a solvent are left with a wet finish. Use of rubber gloves is recommended if parts must be manually unloaded after being cleaned.

With a two-phase system the problem of solvent vapor escape is less than with a single solvent. Therefore, the primary areas of concern for workers include tank cleanout and materials handling. The special precautions to be taken during tank cleanout (listed earlier in this section) apply here as well. Use of boots and a supplied-air respirator is required if the tank must be entered for cleaning or repair work.

CAUSTIC CLEANING

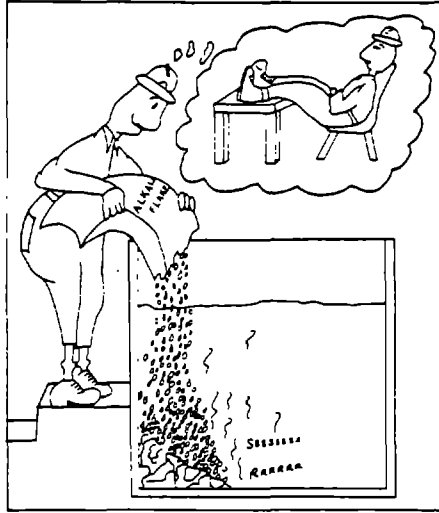
Presoak

The purpose of the alkaline presoak bath is to remove, among other things, the layer of organic soil on the parts to be plated. The cleaning solution consists of chemicals that can dissolve fats and oils. When these chemicals come in contact with your skin, either in solution or in powdered form, they can dissolve the natural oils of the skin. This may result in dermatitis (skin irritation), or it may cause painful burns which require a long time to heal. Washing the skin quickly after exposure to caustic chemicals will reduce the chance of irritation or burns.

Tank recharging — Most of the dangers involving caustic cleaning solutions can be avoided if care is taken while working around the cleaning tanks. However, major problems can develop during the recharging of tanks. A proper scheme for tank recharging is presented below:

- Fill tank approximately 2/3 full with **cold** water.
- Add the prescribed amount of cleaner at a **slow** rate to the tank. Provide forced air agitation to ensure complete mixing.
- Fill remaining tank space with cool water and provide air agitation to effect total mixing.

The reason for taking the above steps is to avoid a **flash steam explosion** which could be caused by the reaction of the cleaner with water. For example, if the water is not cold initially, or if the cleaner collects in a pile at the bottom of the tank (because of rapid addition of cleaner) an explosion could occur as a result of the large quantity of heat evolved.

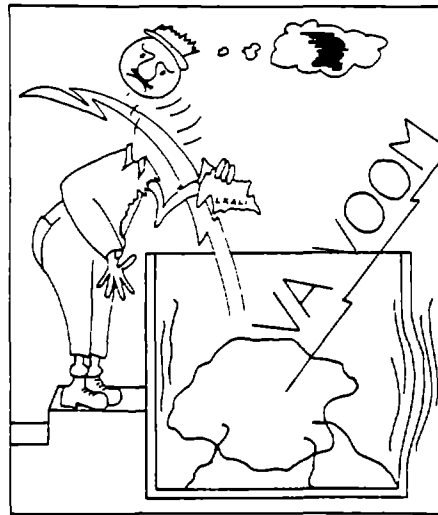


Daydreaming

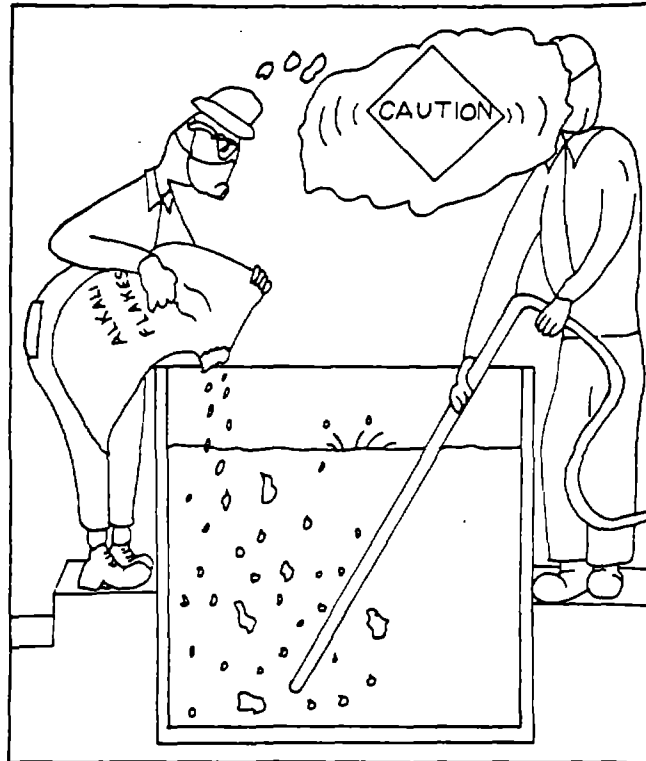
can cause

MISTAKES!

**Don't add
alkali to water
rapidly!**



As mentioned previously, most of the hazards associated with caustic cleaning solutions can be avoided if more care is taken by the worker on his job from day to day.



Add alkali slowly. It must go into solution and not cake or build up.

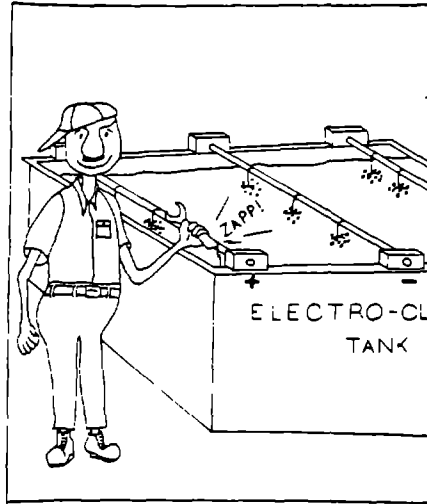
Electrocleaning

Electrocleaning differs from the caustic presoak because bubbles are formed on the plating surface due to electrolytic action. These bubbles produce a scouring effect which cleans the plating surface to a greater extent than could be achieved in a presoak.

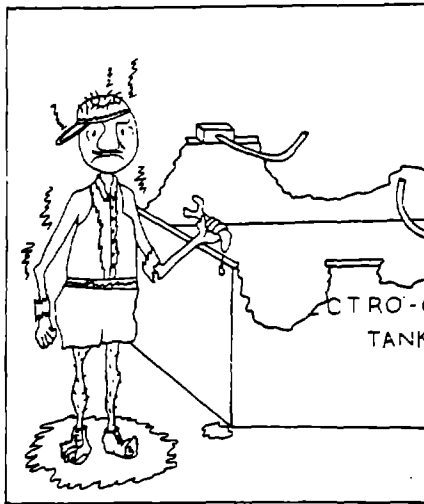
Alkali Handling and Storage — The alkaline solution used for electrocleaning is basically the same as that used for presoaking. The same procedures on recharging tanks should be used for both presoak and electrocleaning tanks. Rules for material handling and storage are the same for both cleaners due to their similarity in composition.

- Do not mix caustic soda powder, flakes, or pellets with any acid solutions. To do so can cause a reaction from mild sputtering to a violent explosion (depending upon the strengths of the materials).
- When recharging alkaline baths take care not to breathe the dry chemicals. Use a respirator approved for protection against dust and particulate matter if you are required to shovel (or transport by other means) chemicals from barrels to the cleaning tanks.
- Be sure that lids are tightly resealed when storing unused portions of alkali powders. Drums should be clearly labeled.
- Store alkali drums in a dry area of the plant, or off the floor on a platform if the floor is likely to become wet. **Never store alkalis next to acids.** The inadvertent mixing of alkalis and acids can trigger an explosion.

Operating precautions — Electrocleaning solutions produce scrubbing bubbles on plating surfaces to be cleaned by breaking down water molecules into hydrogen and oxygen. Hydrogen is a highly explosive gas which can be ignited by a spark. Because of this, excessive amounts of foam must not be allowed to form on the surface of the solution in the tank. Also, as a precaution against explosions, always use a knife switch to break the current flow to the cleaning tank when putting work into the tank or removing it from the tank.



Hydrogen gas is very explosive. . .
all it needs is a spark.



This fellow learned the hard way.
Be smarter than he was!

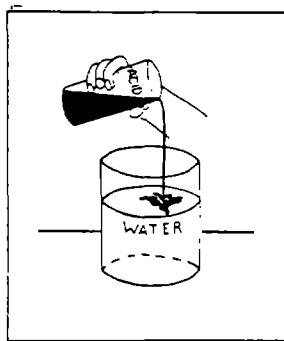
Note also that the mist created when the bubbles burst on the surface of the solution is caustic and can burn the skin and eyes.

PICKLING

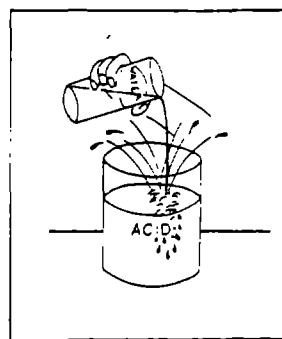
The pickling or acid-dip step occurs after the cleaning steps and before the plating process. The purpose of the acid-dip is to remove any scale, oxides, or other impurities from metallic surfaces which may have remained after the cleaning steps.

The pickling operation is not as hazardous as any of the cleaning operations discussed earlier because there are usually no fumes involved. However, acid contact with the skin can produce serious burns and, because of this, care should be exercised when dealing with acid solutions.

The proper handling of acid carboys should be practiced by all personnel who have to recharge or maintain acid tanks. Anyone involved with acid handling should be cautioned and reminded: **always add acid to water** — never the reverse. Stirring or agitating the solution while adding the acid will prevent “layering” and the resulting sputtering. Protective clothing including rubber gloves, boots, and eyeshields should be worn when pouring concentrated acid from carboys, or when cleaning tanks. Carboys should be stored in an area away from all alkali powders and cyanide salts.



When mixing—always add
ACID TO WATER.



NEVER
Water to Acid

The danger of acid carry-over into tanks containing cyanide solutions is important due to the production of lethal hydrogen cyanide gas. Hydrogen cyanide gas is toxic if breathed and cyanide solutions are toxic by absorption through the skin. Either way cyanide can kill you.

PLATING

Up to now we have talked in general terms about precleaning, cleaning, and pickling operations. We have been able to discuss the chemicals involved in such operations as group hazards because of their similarity. However, plating operations differ somewhat from one another depending upon the materials to be plated. For this reason, each major plating type is given special consideration in this manual. The most common plating types are discussed first, and a summary of the hazards of each of the plating types covered is presented at the end of this section.

Nickel Plating

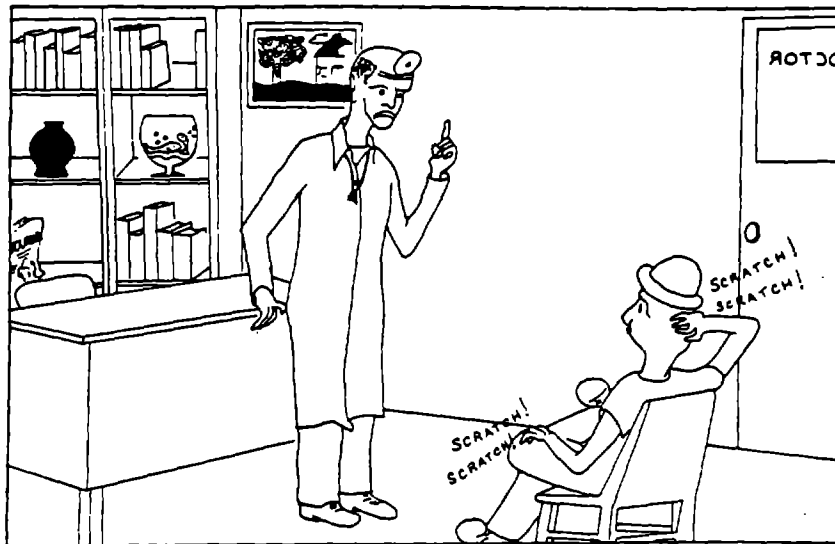
There are a number of different solution compositions for nickel plating; probably the most widely used one is the Watts nickel solution. Most nickel-plating solutions contain the chemicals listed below:

nickel sulfate	boric acid
nickel chloride	wetting agents
nickel carbonate	brighteners
sulfuric or hydrochloric acid	

Fluoroborate nickel solutions contain:

- nickel fluoroborate
- fluoroboric acid

Fortunately, in spite of its relatively high toxicity, plating hazards involving nickel are relatively few. Nickel Dermatitis, commonly referred to as "nickel itch", occurs frequently among nickel plating personnel. Some people are more sensitive to nickel than others and, as a result, some platers develop serious rashes while others are not affected at all. Although the itch may only produce an area of dry reddish skin, more severe problems can result if the skin is left untreated. Eczema may develop on the surface of the skin, and ulceration may follow. Development into the ulcer stage is rare, but not unheard of.



Severe problems can result from
"Nickel Itch" if untreated.

To avoid "nickel itch," it is necessary to keep all clothing free from nickel solutions. Wear rubber gloves, boots, and aprons when you may come in contact with plating solutions. If possible, have a complete change of clothes available at the plant in case you are splashed with solution. Do not continue to work before changing if your clothing is soiled with plating solution. It is advisable to shower before leaving work and to change into other clothes before going home.

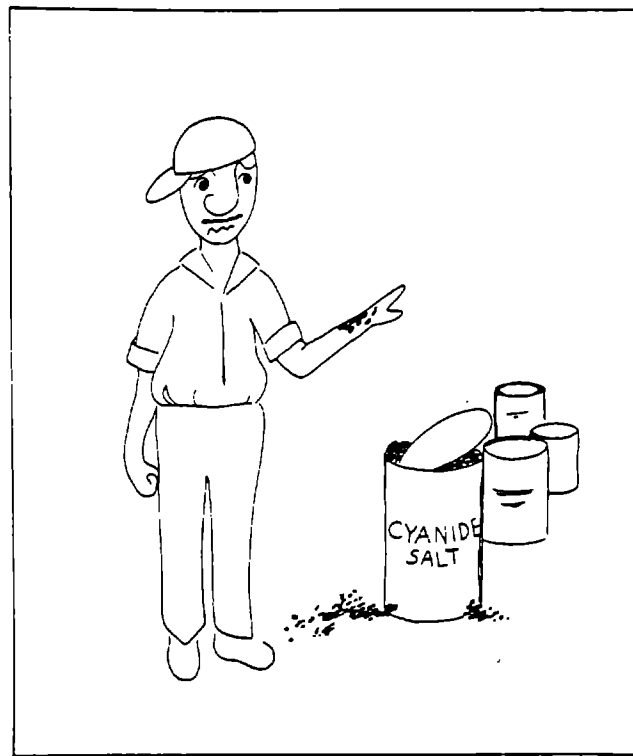
Copper Plating

The alkaline copper plating bath is hazardous due to the presence of cyanide salts. The major constituents of alkaline baths are:

- copper cyanide
- sodium (or potassium) cyanide
- sodium carbonate
- sodium thiosulfate
- sodium (or potassium) tartrate

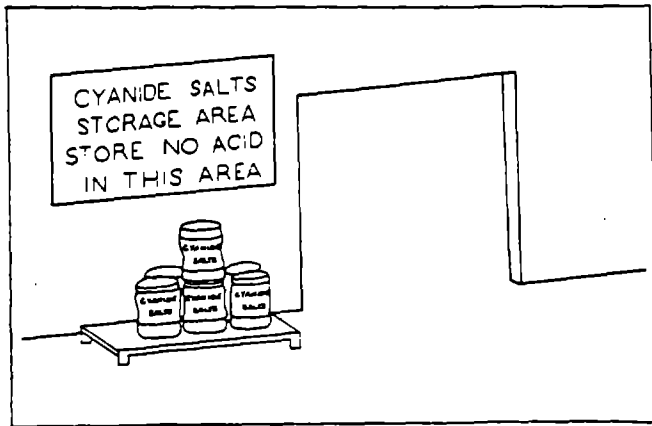
Handling of Chemicals for Alkaline Copper Plating — Copper cyanide and sodium cyanide are very poisonous chemicals, whereas the other chemicals listed are generally harmless. The two cyanide compounds can be hazardous in solid or powder form, or in solution.

It is extremely important to wear a respirator when handling copper, sodium, or potassium cyanide salts so as to avoid breathing the fine powders. Cyanide salts or solutions should not be allowed to come in contact with the skin as they can be readily absorbed.

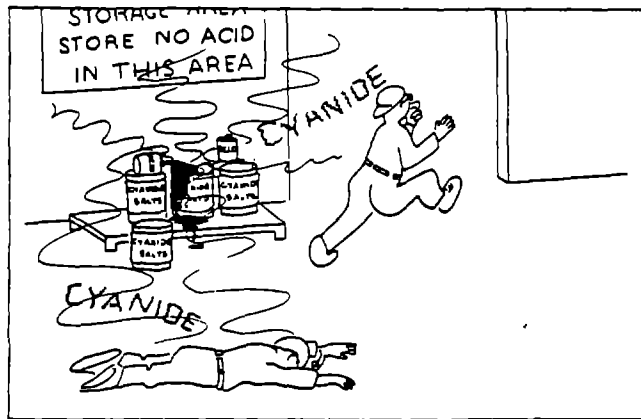


Cyanide salts are only a few of the many chemicals that can be absorbed by the skin.

Storage of Cyanide Salts — The storage of cyanide salts must be carefully supervised and controlled. **Cyanide salts must be stored away from acids. The combination of cyanide salts and acids produces deadly hydrogen cyanide gas.**



Cyanide salts should be stored ABOVE THE FLOOR and AWAY FROM ACIDS—or else.



A deadly CYANIDE GAS may be the result!

Because of this, cyanide containers must be elevated a short distance above the floor to prevent spilled acids from reacting with cyanide salts — assuming acid tanks or carboys are located anywhere near the cyanide storage area. In addition, reserve cyanide salts should be stored in lockers or cabinets.

Ventilation of Plating Solutions Containing Cyanide — The liberation of deadly hydrogen cyanide gas is the result of mixing acid with cyanide salts. This gas can be formed in plating tanks whenever a tank containing traces of acid precedes a tank containing cyanide, or the reverse. If the rinse tank precedes the cyanide tank, the cyanide tank should be ventilated. If the cyanide tank precedes the rinse tank, the rinse tank should be ventilated.

Ventilation is also required on large, heated tanks containing cyanide solutions that are not in continuous use throughout the day. Idle tanks, especially if heated, can give off cyanide gas in sizeable quantities.

Chrome Plating

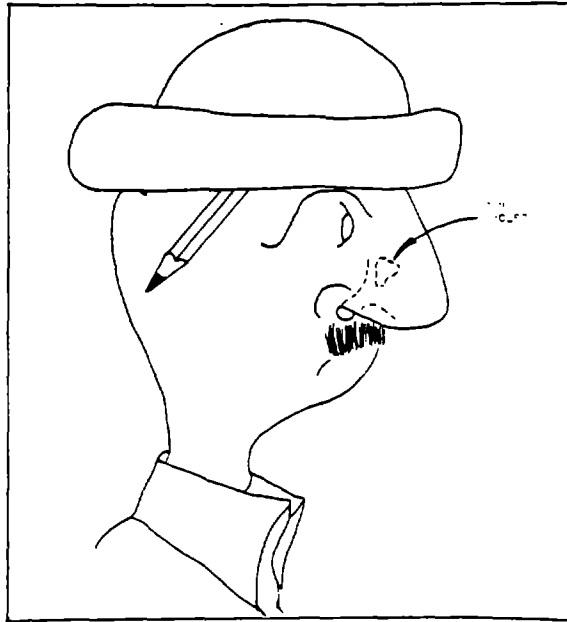
Industrial chrome plating is applied to metallic surfaces to produce a wear resistant finish, or for decorative purposes. Although preparation schemes and plating techniques vary according to the type of plating job desired, the chemicals involved are generally the same.

The main chemicals involved in chrome plating are:

- chromic acid
- sulfuric acid

A third chemical, boric acid, is sometimes added to the bath in small quantities; but because of its limited hazard potential it will not be considered in detail here.

Hazards of Chromic Acid — There are several very real hazards involved with chrome plating. No doubt you have heard stories from veteran platers about old-timers who developed holes in their noses from prolonged exposure to chromic acid mist.

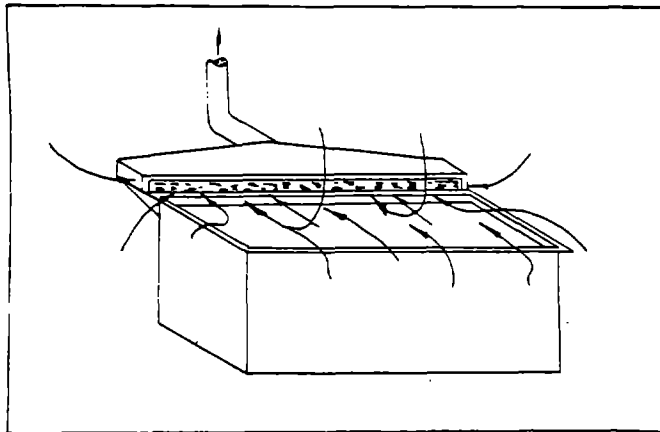


A "Chrome Hole" inside your nose can occur after working only two weeks at chrome plating.

These stories are true. There are many cases on record of workers who have developed holes in their nasal septa (the dividing wall between the right and left sides of the nose) after breathing chromic acid mist daily. This can happen after only a few weeks of plating. Early signs of this problem include nasal dryness, nose bleeds, and scabbing.

The most common malady suffered by chrome platers, however, is skin dermatitis. This usually occurs on the hands and arms of workers who come in contact with chromic acid mist or the actual plating solutions. Dermatitis is characterized by wet or dry eruptions of the skin which normally take a very long time to heal. Chrome ulcers may form where breaks in the skin occur. These ulcers produce "chrome holes" and can leave unsightly scars on the skin surfaces.

Prevention of Chromic Acid Related Injury — Most injuries caused by chromic acid are avoidable. Local ventilation should be employed on all tanks containing chromic acid. Slot hoods are valuable because they draw fumes from the tank surface before the fumes have a chance to rise and become part of the plant atmosphere.



Hoods on tanks are valuable because they prevent fume escape into the plant air.

Another method of preventing mist escape is to cover the open tank with chemical foams, plastic beads, or chips. These tend to prevent the accumulation of gas bubbles on the liquid surface of the tank. Because they are not totally adequate for prevention of mist escape, they should be used in conjunction with slot hoods for proper control.

Personal protection is the key to safety. Rubber gauntlet gloves are indispensable when handling plated objects directly from the bath or when cleaning chromic acid tanks. It is advisable to coat your hands and forearms with a substance such as lanolin (barrier creams) before putting on rubber gloves. People who spend the entire day working with the plating operation (e.g., platers, rackers, and those who unrack the finished pieces) should wear rubber aprons and boots. Persons who are exposed to irritating chemicals or fumes should wear face shields or goggles to protect their eyes.

Because many workers unavoidably get their clothes contaminated with plating or cleaning solutions in the course of a day, it is advisable to shower and change clothes at the end of each work day. Your clothes can act like a blotter and retain these dangerous chemicals all the while you are at work. So be sure to have at least one additional set of work clothes available in your locker. Don't wear clothing saturated with plating solutions or you will eventually develop a skin rash, or worse.

Zinc Plating

Zinc plating may involve either acid or alkaline solutions. The cyanide zinc operation is very popular and is used for the rust protection of steel parts. Most zinc plating operations involve the chemicals listed:

zinc cyanide	sodium hydroxide
sodium cyanide	sodium carbonate

Precautions — Large quantities of sodium hydroxide should not be added to the bath at one time. The heat generated by the solution may cause a **flash steam explosion**.

When zinc cyanide is being dissolved in the tank, the operator should wear a respirator to protect himself from the fine, **poisonous zinc cyanide powder** which is readily inhaled.

Iron Plating

Iron plating may involve chloride, sulfate, fluoroborate baths, or a mixed sulfate-chloride solution. Most of the iron plating in recent years has involved acid chloride baths. The chemicals involved in the iron plating process are listed below:

ferrous chloride	metallic iron
calcium chloride	hydrochloric acid
ferrous sulfate	manganese chloride
ferrous ammonium sulfate	zinc chloride
iron fluoroborate	ammonium chloride

Warning — Calcium hydroxide (slaked lime) should be added only as a dilute slurry in order to keep bubbling to a minimum.

Lead Plating

Most lead plating today involves a fluoroborate solution. This operation is needed for refrigeration brine tanks, linings for chemical apparatus, pipes, etc. Lead plating involves one or more of the chemicals listed below:

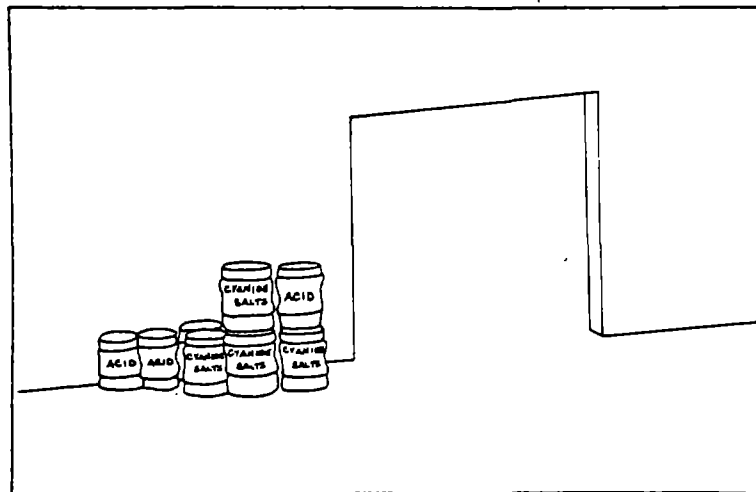
lead fluoroborate	fluorosilicic acid
fluoroboric acid	lead acetate
lead fluorosilicate	sodium hydroxide

Each of the chemicals used in the lead plating is potentially dangerous and should be used with care. Fluoroboric acid is very corrosive to the skin. Lead is an accumulative poison and some compounds can be absorbed through the skin. All lead compounds are hazardous.

MINIMIZE ACCIDENT POSSIBILITY

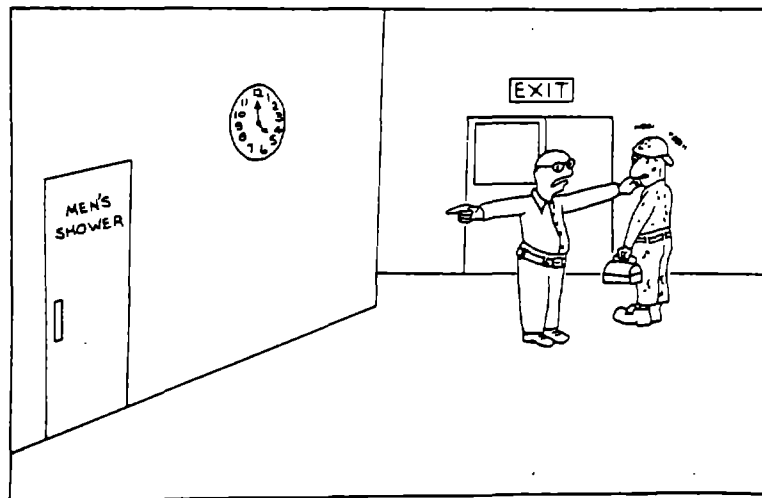
WHAT ARE SOME OF THE QUESTIONS YOU SHOULD BE ASKING YOURSELF TO PREVENT AN ACCIDENT INVOLVING YOU?

- Are chemicals stored properly in a safe place?



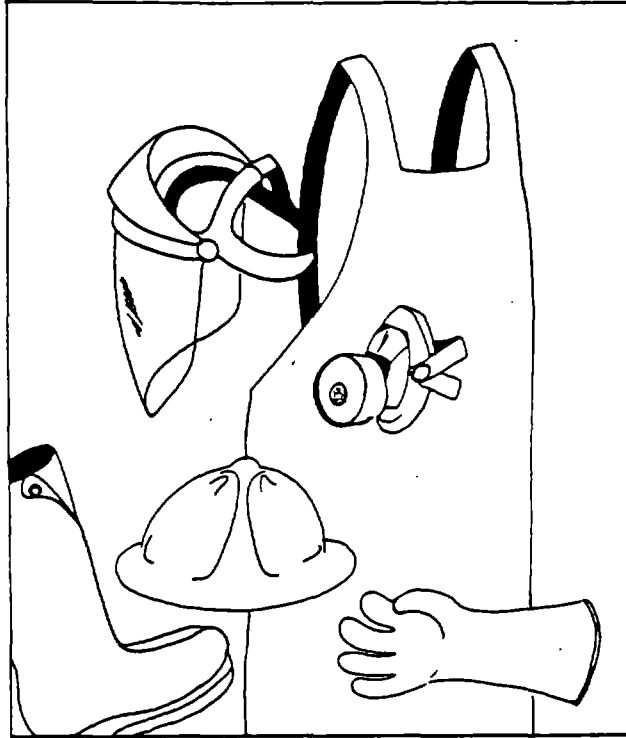
Are these chemicals stored properly?

- Are vapors or mists detectable in your workplace?
- Are the ventilation fans and exhaust hoods working?
- Are the floors dry, or are they wet and slippery?
- Do you and your fellow workers complain of skin rashes, itching, or eye irritation?
- Are you supplied with and are you wearing rubber gloves, aprons, and boots whenever there is possible contact with plating solutions?
- Do you shower before leaving work and change your clothes?



Do you shower and change your work clothes before you leave work?

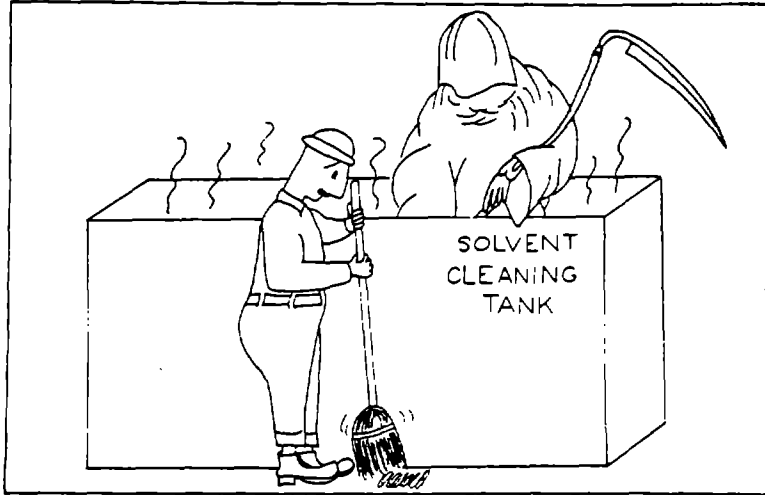
- Do you know what protective equipment should be worn on your job?



Do you know when to wear the proper protective equipment?

- Do you take the trouble to use barrier creams?
- Have you been instructed with regard to what may happen if a respirator is not used, or if the wrong type of respirator is used?
- Have the respirator's capabilities and limitations been explained to you?
- Have you been instructed as to the care and maintenance (e.g., cleaning and disinfecting) of the respirators you use?

- Do you understand the importance of keeping chemicals off your skin and of not inhaling toxic vapors?



Do you know the importance of keeping toxic materials off your skin and out of your lungs?



Is your health worth wearing this equipment?

SUMMARY OF CHEMICAL HAZARDS IN THE ELECTROPLATING INDUSTRY

OPERATION	POSSIBLE HAZARD	SYMPTOMS	PRECAUTIONS	COMMENTS
— Chemical				
PRECLEANING Trichloroethylene Perchloroethylene	Skin irritation. Relatively toxic by inhalation of vapors.	Skin rash. Light-headed feeling, sleepiness, headache.	Local exhaust ventilation, appropriate respirators, and proper protective equipment.	May react with caustic soda to form explosive mixture.
CAUSTIC CLEANING Caustic Soda	Skin irritation. Severe burns. Explosion.	Varying skin sensations (tingling to pain).	Keep caustics off skin; wash quickly and thoroughly if exposure occurs. Add cleaner to large amounts of cold water slowly while mixing completely.	An explosion may occur if precautions are not followed.
ELECTROCLEANING Caustic Soda	Skin irritation. Severe burns. Explosion.	Varying skin sensations (tingling to pain)	Do not mix caustic soda with any acid solutions. Use a respirator when recharging tanks.	Never store alkali drums near acid carboys
PICKLING Acid	Skin irritation. Severe burns	Varying skin sensations (tingling to pain)	Always add acid to water. Wear protective clothing.	Acid carry-over to a cyanide solution produces deadly gas
PLATING Nickel	Skin irritation ("nickel itch").	Itching.	Wear protective clothing. Shower and change clothes when splashed and after work.	Ulcers may also develop on skin surface if left untreated.

SUMMARY OF CHEMICAL HAZARDS IN THE ELECTROPLATING INDUSTRY

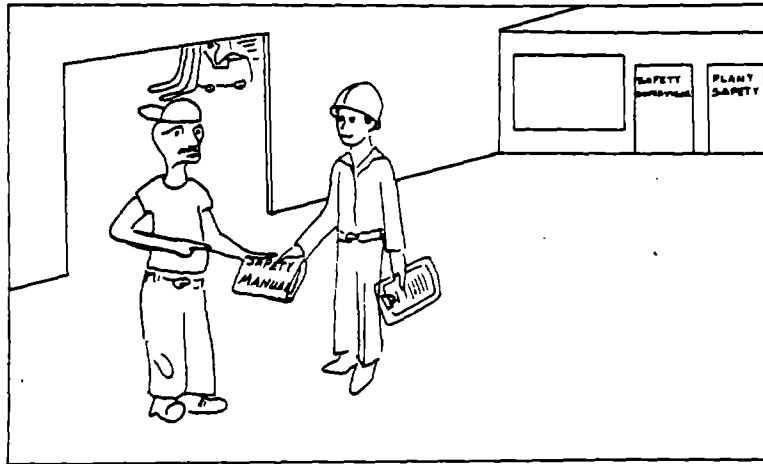
OPERATION — Chemical	POSSIBLE HAZARD	SYMPTOMS	PRECAUTIONS	COMMENTS
PLATING Cadmium	Hazardous by inhalation. Exposure might involve sodium cyanide, which can be fatal.	Coughing, shivering, and nausea. Possible tissue damage.	Wear a respirator if ventilation is inadequate. Wear protective equipment. Utilize exhaust ventilation.	Acute symptoms by inhalation, skin absorption, and ingestion can be present if sodium cyanide is involved.
Chromium	Skin dermatitis. Skin ulcers.	Early signs include nose bleeds, wet and dry skin eruptions. Hole in the nose ("chrome hole").	Wear protective equipment. Utilize exhaust ventilation. Shower and change clothes at end of every work day.	It is advisable to coat hands and forearms with lanolin (barrier cream) before putting on rubber gloves.
Cyanides	Extremely toxic as salts or solutions, but the greater hazard is the formation of deadly hydrogen cyanide gas by contact of the cyanide salt or solution with acids. Cyanide solutions on the skin can be absorbed in toxic amounts and cause death.	Skin contact with powdered salts or solutions may cause dermatitis; nasal congestion, irritation, or bleeding; and gastrointestinal distress. Inhalation of cyanide gas (or prolonged skin contact) may cause giddiness, headache, flushed (reddened) complexion, unconsciousness, convulsions, and death.	Do not allow skin contact. Wear protective clothing and a respirator. Utilize exhaust ventilation.	Store cyanides and acids apart so that they can never come in contact.

SUMMARY OF CHEMICAL HAZARDS IN THE ELECTROPLATING INDUSTRY

OPERATION — Chemical	POSSIBLE HAZARD	SYMPTOMS	PRECAUTIONS	COMMENTS
PLATING Copper	Highly toxic by inhalation, skin absorption, and ingestion; can be fatal due to presence of cyanide salts.	See Cyanides above.	Do not allow skin contact. Wear protective clothing and a respirator. Utilize exhaust ventilation.	Store cyanides and acids apart so that they can never come in contact.
Zinc	See Copper above. Hazard may involve cyanide.	See Copper above.	See Copper above.	Large amounts of sodium hydroxide should be added slowly to avoid explosion.
Brass, Bronze, Silver, and Gold	See Copper above. Hazard may involve cyanide.	See Copper above.	See Copper above.	See Copper above.
Iron	Powdered metallic iron is flammable; explosion risk if fine particles form "dust clouds".	Not applicable.	Ventilation.	Not generally hazardous if only small quantities are inhaled or have skin contact.
Lead	Very hazardous via inhalation and ingestion. Skin burns from contact with molten lead	Lead poisoning may cause thirst, metallic taste in mouth, nausea, vomiting, diarrhea or constipation with black stools	Exhaust ventilation. Appropriate respirators. Proper protective equipment.	All lead compounds are hazardous. Lead is an accumulative poison.

WHAT CAN YOU DO TO PREVENT ACCIDENTS?

- Notify your supervisor, union steward, or safety representative when you think that the present working conditions or practices may cause personal injury or damage.



SPEAK UP when you feel that the present working conditions may cause injury!

- Observe all safety rules and use the protective equipment. But remember: protective equipment and clothing are never an adequate substitute for an informed worker, so **ask questions** if you don't understand.
- See the company doctor or nurse about **any rashes or illnesses**.
- Report immediately to your supervisor **any accidental exposures** to harmful chemicals or fumes.

- If your protective equipment is not comfortable, make a request for equipment that is. Statistics indicate that the number of **accidents drop when the equipment is comfortable and worn.**
- Remember that unwashed clothing prolongs the contact with the irritants.
- Develop and practice **good habits of industrial hygiene and housekeeping.** This is the **best accident preventive** measure.

AIDS FOR SAFE WORKING

Know what to wear and when!

- Goggles
- Rubber Gloves
- Boots
- Respirators

Protect yourself in case of accident!

- Know where the eyewash fountains are in the event of splashes of chemicals into the eyes.
- Know where the emergency showers are.
- Know who to call if you should need help.
- Make sure electrical control panel padlocks are employed for electrical lockout.
- Make sure you know where the emergency stop cables are located.

Do you know how to handle materials safely?

- Do you know how to mix chemicals correctly?
- Do you know how to transport bags, drums, and carboys of chemicals?

- How should chemicals be stored to prevent contamination and accidental spills in the work area?
- How should you lift and move heavy loads by hand?

FIRST-AID INSTRUCTIONS

Accidents can happen. If a worker should be exposed to excessive concentrations of gas or should ingest a poisonous chemical, correct and prompt application of first-aid measures can mean the difference between life and death. At least one employee qualified to provide first-aid measures must be on duty whenever plating operations are being performed, and all workers should be familiar with basic first-aid techniques.

The first-aid principles and treatments of greatest importance to the plating industry are as follows:

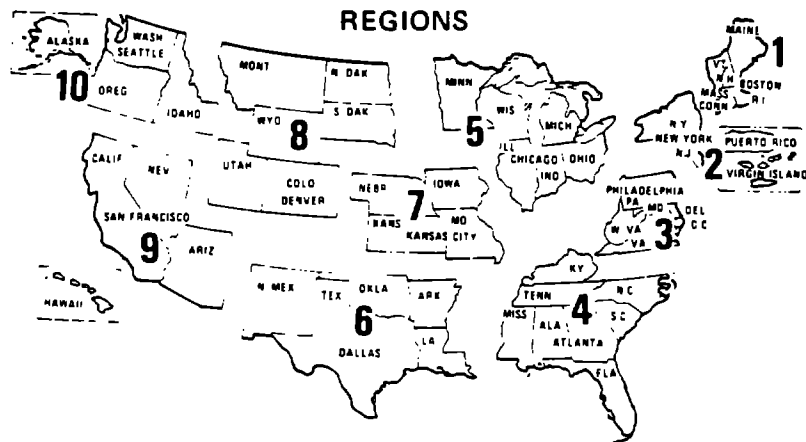
- Act immediately.
- Obtain the services of a physician as quickly as possible.
- Stop bleeding if serious.
- Restore breathing and maintain circulation.
- Never administer liquids to an unconscious person.
- If the eyes are chemically affected, immediately flush eyes with plenty of water for at least 15 minutes.
- If any skin surface is affected, or the person's clothing saturated, get him to a source of running water immediately (emergency shower, water hose). Dilute the chemical with large amounts of water. Flush clothing thoroughly before attempting to remove it.

FIRST-AID INSTRUCTIONS

CLASS OF HAZARD	PRECAUTIONARY MEASURES	INSTRUCTIONS IN CASE OF CONTACT OR EXPOSURE
Systemic injury by swallowing: harmful to fatal.	Wash thoroughly after handling corrosive or toxic substances. Do not eat or drink in areas where corrosive or toxic substances are used or stored.	Call a physician. First-aid: Induce vomiting except when acids, alkalis, or cyanides are involved. Use artificial respiration if breathing has stopped. When the nature of the poison is not known, administer antidote as prescribed by medical authority.
Inhalation: harmful to fatal.	Do not breathe gas, vapor, mist, or dust. Use a respirator when needed. Ensure adequate ventilation when using chemicals	Call a physician. First aid: Remove patient to fresh air. Apply artificial respiration until spontaneous breathing resumes. If breathing is difficult, give oxygen. Keep patient warm.
Injury by contact with or absorption through skin or eyes: harmful to fatal.	Use appropriate protective equipment and safe work practices to keep chemicals off clothing, skin, and eyes. Keep containers closed when not in use.	Call a physician. First-aid: Flush eyes immediately and for at least 15 minutes. Flush whole body with plenty of water; then remove clothing and continue total skin washing with plenty of soap.
Electrical shock: harmful to fatal.	Replace frayed or worn conductors Be sure electrically operated equipment is properly grounded. Use extension cords only for portable tools and appliances; permanent wiring in all other cases. Do not perform electrical work in wet surroundings. Make positive disconnect at circuit breaker before performing electrical work	Call a physician. First-aid: Shut off power or remove patient with insulation, such as a dry stick or a dry towel. If patient is not breathing, start artificial respiration and external heart massage. Efforts should continue until a physician directs otherwise. Keep patient warm.

NIOSH REGIONAL OFFICES

The following pages list NIOSH and OSHA regional offices which can provide information on the OCCUPATIONAL SAFETY AND HEALTH ACT including questions on standards interpretations, voluntary compliance information, copies of the OSHA Standards, OSHA Act, Employee Rights Posting Notice, and publications.



NIOSH REGIONAL OFFICES

DHEW, Region I
Government Center
(JFK Fed. Bldg.)
Boston, Massachusetts 02203
Tel.: 617/223-6668/9

DHEW, Region II
26 Federal Plaza
New York, New York 10007
Tel.: 212/264-2485/8

DHEW, Region III
3525 Market Street,
P.O. Box 13716
Philadelphia, Pennsylvania 19101
Tel.: 215/596-6716

DHEW, Region IV
50 Seventh Street, N.E.
Atlanta, Georgia 30323
Tel.: 404/881-4474

DHEW, Region V
300 South Wacker Drive
Chicago, Illinois 60607
Tel.: 312/886-3881

DHEW, Region VI
1200 Main Tower Building
Room 1700-A
Dallas, Texas 75245
Tel.: 214/655-3081

DHEW, Region VII
601 East 12th Street
Kansas City, Missouri 64106
Tel.: 816/374-5332

DHEW, Region VIII
19th & Stout Streets
9017 Federal Building
Denver, Colorado 80202
Tel.: 303/837-3979

DHEW, Region IX
50 Fulton Street (223 FOB)
San Francisco, California 94102
Tel.: 415/556-3781

DHEW, Region X
1321 Second Avenue
(Arcade Bldg.)
Seattle, Washington 98101
Tel.: 206/442-0530

OSHA REGIONAL OFFICES

NOTE: For an office close to you, check your telephone directory under United States Government or dial 800-555-1212 and ask for the toll-free number of the OSHA office nearest you.

Region I

U.S. Department of Labor
Occupational Safety and Health Administration
JFK Building, Room 1804
Boston, Massachusetts 02203 -----Telephone: 617/223-6712/3

Region II

U.S. Department of Labor
Occupational Safety and Health Administration
1515 Broadway (1 Astor Plaza), Room 3445
New York, New York 10036 -----Telephone: 212/971-5941/2

Region III

U.S. Department of Labor
Occupational Safety and Health Administration
15220 Gateway Center, 3535 Market Street
Philadelphia, Pennsylvania 19104 -----Telephone: 215/596-1201

Region IV

U.S. Department of Labor
Occupational Safety and Health Administration
1375 Peachtree Street, N.E., Suite 587
Atlanta, Georgia 30309 -----Telephone: 404/526-3573/4 or 2281/2

Region V

U.S. Department of Labor
Occupational Safety and Health Administration
230 S. Dearborn, 32nd Floor
Chicago, Illinois 60604 -----Telephone: 312/353-4716/7

Region VI

U.S. Department of Labor
Occupational Safety and Health Administration
555 Griffin Square Building, Room 602
Dallas, Texas 75202 -----Telephone: 214/749-2477/8/9 or 2567

Region VII

U.S. Department of Labor
Occupational Safety and Health Administration
Federal Building, Room 3000, 911 Walnut Street
Kansas City, Missouri 64106 -----Telephone: 816/374-5861

Region VIII

U.S. Department of Labor
Occupational Safety and Health Administration
Federal Building, Room 15010, 1961 Stout Street
Denver, Colorado 80202 -----Telephone: 303/837-3883

Region IX

U.S. Department of Labor
Occupational Safety and Health Administration
9470 Federal Building, 450 Golden Gate Avenue
Post Office Box 36017
San Francisco, California 94102 -----Telephone: 415/556-0584

Region X

U.S. Department of Labor
Occupational Safety and Health Administration
6048 Federal Office Building
909 First Avenue
Seattle, Washington 98174 -----Telephone: 206/442-5930

EMERGENCY INFORMATION

FIRE

Telephone Fire Department _____

Nearest Alarm Box at _____

CRIME

Telephone Police _____

INJURY/ILLNESSES

Avoid infection of minor injuries; always get medical attention or skilled first aid.

Doctor _____

Office _____ Tel. _____

Residence _____ Tel. _____

Hospital _____

Address _____ Tel. _____

Ambulance _____

Address _____ Tel. _____

(In emergencies, get medical attention and transportation elsewhere if necessary.)

In all cases of Fire, Crime, Accident, or Sickness, promptly notify:

1. Name _____ Office Tel. _____

Address _____ Res. Tel. _____

or

2. Name _____ Office Tel. _____

Address _____ Res. Tel. _____

