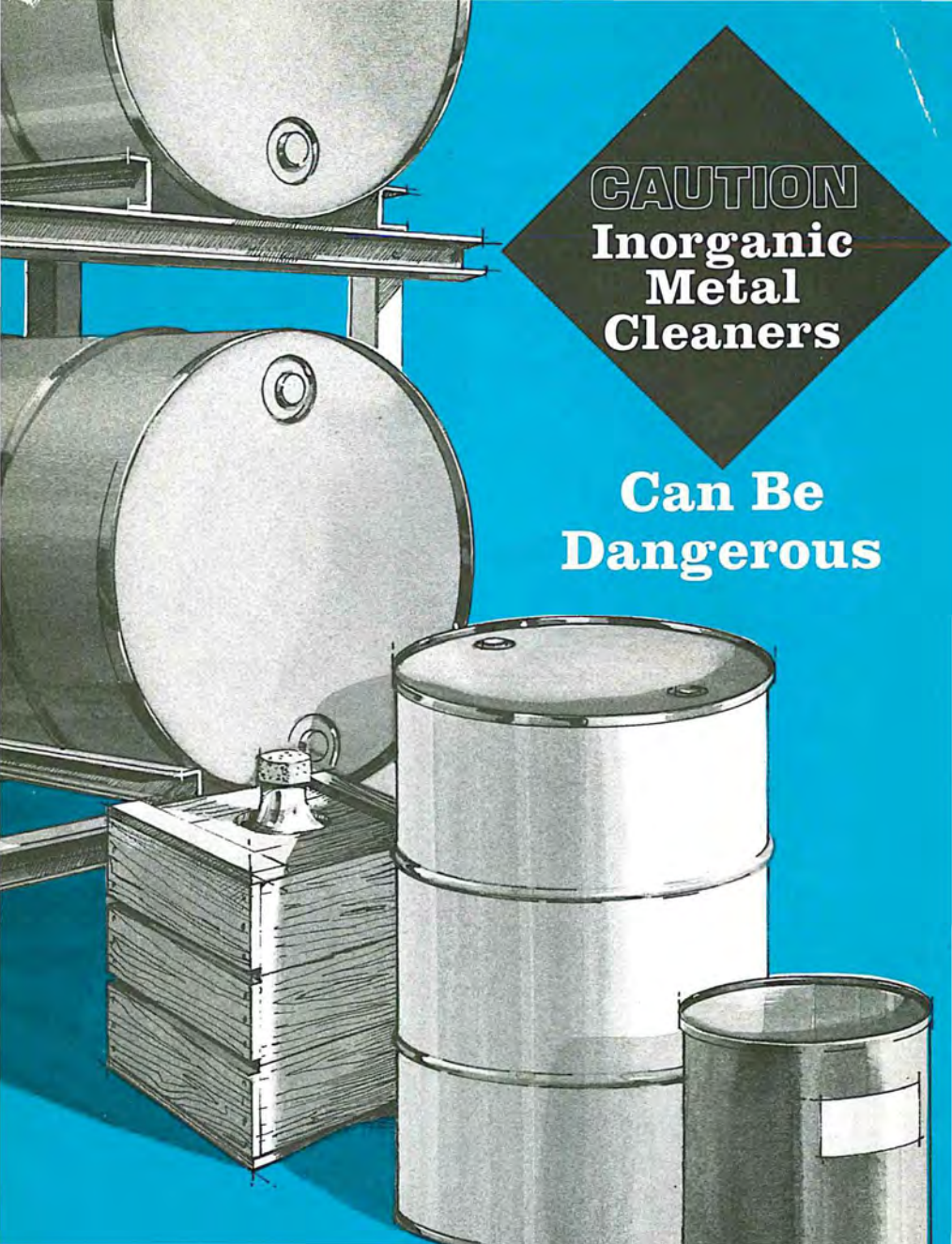

CAUTION
Inorganic
Metal
Cleaners
Can Be
Dangerous

What You Should Know About Inorganic Metal Cleaners...

For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402

1. What they are...

INORGANIC ACIDS AND CAUSTICS...

They are found in both the LIQUID and DRY form. ACIDS are most often found as liquids and CAUSTICS are usually found as a dry powder, flake, pellet, or as concentrated liquid solutions.

COMMON ACIDS include: Sulfuric, Hydrochloric (Muriatic), Nitric, Chromic, Hydrofluoric, and Perchloric.

COMMON CAUSTICS include: Sodium Hydroxide, Soda Ash, Trisodium Phosphate, Sodium Pyrophosphate, and Sodium Resinates.

2. Why they are used...

They are used to clean metals before coatings or finishes can be applied.

INORGANIC ACIDS are generally used to remove scale and rust from metal parts.

CAUSTICS are used for removing drawing compounds, oils, rust preventatives, buffing and polishing materials.

The type of cleaner will depend on the type of dirt to be removed and how clean the surface needs to be.

3. Where they are used...

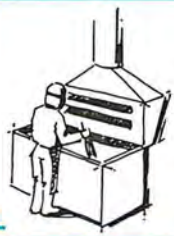
1. SURFACE PREPARATION – PRIOR TO:

- PAINTING
- PLATING
- ASSEMBLY
- ANODIZING

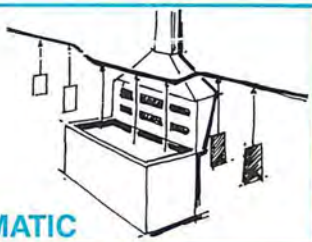
2. CLEANING

4. How they are used...

1. DIP



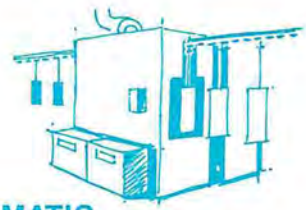
MANUAL



AUTOMATIC

2. SPRAY

MANUAL



AUTOMATIC

3. ELECTRO–CLEAN

MANUAL

AUTOMATIC

4. HAND

- BRUSH & WIPE

5. ULTRASONIC

Ultrasonic cleaning uses sound waves in conjunction with cleaning liquids. When inorganic metal cleaners are used the same precautions as stated for acids & caustics should be followed.

5. How they may injure you...

SPLASHES

Common Causes:

1. Dropping bottles or containers of acids & caustics.
2. Dropping objects into acid & caustic containers.
3. Pouring water into a strong acid.
4. Improper mixing of acids & caustics.
5. Handling without use of protective equipment.
6. Lifting parts from tanks without allowing proper drainage.

SPILLS

Common Causes:

1. Improper storing.
2. Improper handling.
3. Leaking tanks and corroded drip trays.
4. Defective pumps and damaged hoses.
5. Bad seals and packing of valves.
6. Handling without use of protective equipment.

SPRAYS
MISTS

Common Causes:

1. Using excessive spray pressures.
2. Boiling and overheating solutions.
3. Inadequate ventilation.
4. Defective valves, pipes and hoses.
5. Mechanical or air agitation.
6. Handling without use of protective equipment.
7. Improper operation.

GAS

Common Causes:

1. Strong fuming chemicals – nitric, sulfuric, hydrochloric acids.
2. Chemical reaction–nitrogen dioxide from bright dips. Hydrogen cyanide from acids & cyanide salts.
3. Pressure build-up in containers.
4. Chlorine gas.
5. Inadequate ventilation.

DUST

Common Causes:

1. Transferring dry chemicals.
2. Inadequate ventilation.
3. Handling without use of protective equipment.
4. Handling damaged containers.
5. Improper use of comfort fans.

SWALLOWING

Common Causes:

1. Eating in areas where toxic materials are handled.
2. Failing to wash hands before eating.
3. Improperly labeled containers.
4. Starting siphons with mouth.
5. Smoking in areas where toxic materials are handled.
6. Putting pipettes in the mouth.

5. How they may injure you...

ACIDS and CAUSTICS cause:

IRRITATION of the:

- eyes
- lungs
- nose
- mouth
- throat

BREATHING DIFFICULTIES:

- coughing
- chest pains
- choking
- collapse

SKIN BURN:

- redness
- cracking
- blisters
- rashes

SOME SPECIAL SIGNS and SYMPTOMS:

AMMONIA—very characteristic odor, inflames and tears eyes, causes headaches, nausea, and vomiting.

CYANIDES—hydrocyanic acid has a slight smell of bitter almonds, causes headaches, weakness, nausea, vomiting, and possibly convulsions and unconsciousness.

CHROMIC ACID—may cause skin rashes and "chrome holes" (skin ulcers, most commonly on hands at base of nails and over knuckles), turns skin brown; causes inflammation of eyes; chest pains; attacks the membranes of the nose.

NITRIC ACID—may emit red brown fumes which are deceptive. Dangerous amounts of fumes may be breathed before discomfort is noticed, symptoms of tightness and burning of the chest, shortness of breath, and sleeplessness may not develop until 6 to 24 hours after exposure; may turn skin, hair and teeth yellow.

SODIUM HYDROXIDE—(caustic soda and other caustics in the presence of moisture)—makes the skin feel soapy due to the reaction with natural skin oils to form soaps, dermatitis may follow after the removal of the oils.

6. How To Prevent Injury...

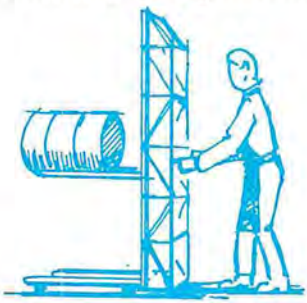
PROPER HANDLING (TRANSPORTATION)

1. Before handling, inspect all containers for damage, leaks, bulging and loose plugs.

   NOTE: Extra care and possibly special handling may be required if containers are damaged. Your supervisor should be contacted for special handling instructions.

2. Always wear protective equipment when handling containers of acids & caustics.

3. Use special handling devices for transporting acids & caustics.



4. Never walk a carboy on its bottom edges.

5. Never carry a bottle by its neck—Always hold one hand under the bottle to keep it from slipping.

12 RULES FOR DISPENSING AND MIXING

1. Always stand in such a position so as to keep your face and hands to one side when opening containers of acid, or mixing acids or caustics with water.

2. Always open all acid containers slowly and cautiously because of possible pressure build-up within the container.

3. Always use non-sparking tools as flammable gases may be ignited.

4. Always replace stoppers and lids.

5. Always label all containers into which chemicals are transferred.

6. Always transfer dry chemicals with care to prevent them from becoming airborne or spilled.

7. Never use air pressure to expel the contents of acids or caustics from containers.

8. Never add acids to cyanides.

9. Never add water to acid–Always add acid to water. Remember "AAA"–Always Add Acid.

6. How To Prevent Injury...

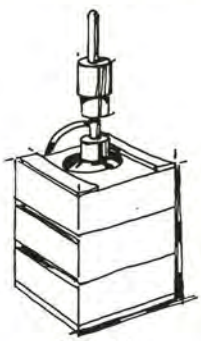
PROPER HANDLING

10. Always add chemicals slowly–never rapidly.

11. Always wear safety equipment when handling acids and caustics. (NEVER wear contact lenses when handling chemicals.)

12. Always use specially designed equipment to dispense liquids from containers.

AIR OPERATED PUMP

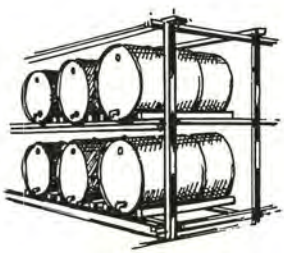


SIPHON

HAND PUMP

BULK STORAGE

TILTER



RACK

PROPER STORAGE

ACID CONTAINERS (i.e., steel drums or glass carboys) should always be stored in a cool dry place away from the direct rays of the sun and from heat sources.

CARBOYS—carboys should always be elevated from floors to keep the bottom of the crates dry, to prevent rotting. SHOULD it be necessary to store carboys in tiers—they should not be over two (2) high with care taken to insure that the bottom of the upper row does not touch the glass necks below.

DRUMS–All drums should be stored on individual racks or securely blocked on skids, with closure plugs up to prevent leakage.

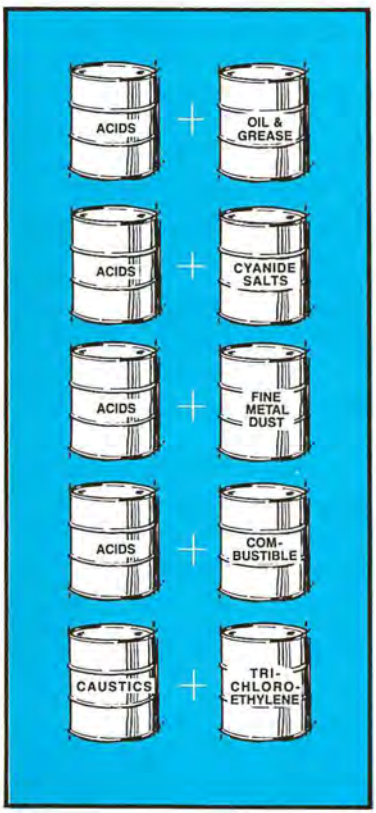
ALL CARBOYS AND DRUMS of liquid acids should be vented when received and at least weekly thereafter, to relieve internal pressure.
Aisleways should be clean. Storage area should be ventilated.

ACIDS AND CAUSTICS in the dry form should be stored in airtight containers. Good Housekeeping Should Be Practiced And Frequent Inspection of Containers For Leaks Should Be Made.

6. How To Prevent Injury...

PROPER STORAGE - INCOMPATIBLE MATERIALS

Some materials will combine with each other and give off toxic vapors or cause vigorous spontaneous combustion. Such materials should be stored separately.



DON'T LET THIS HAPPEN!

ACIDS + OIL & GREASE = Possible Fire & Explosion.

ACIDS + CYANIDE SALTS = Deadly Hydrocyanic Acid Gas.

ACIDS + FINE METAL DUST = Hydrogen & Possible Toxic Gas.

ACIDS + COMBUSTIBLE = Possible Fire.

CAUSTICS + TRICHLOROETHYLENE = Explosive Gas.

CHART OF INCOMPATIBLE MATERIALS

Following is a list of chemicals associated with inorganic metal cleaners and substances from which they should be kept separate.

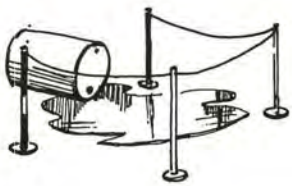
CHEMICALS:	AVOID STORING NEAR THESE:
CHROMIC ACID	Acetic Acid, naphthalene, camphor, glycerine, alcohol, and other flammable liquids.
CYANIDE	Any acids, nitrates or nitrites, molten potassium or sodium salts.
HYDROCHLORIC ACID (MURIATIC ACID)	Nitric acid, chlorates, other oxidizing agents, and common metals.
HYDROFLUORIC	Ammonia/aqueous or anhydrous.

6. How To Prevent Injury...

PROPERLY CLEANING SPILLS

...ACTIONS YOU SHOULD TAKE

1. NEVER leave a chemical spill unattended! If necessary place a barricade around the spill until it can be properly removed.



2. SMALL SPILLS should be handled by flooding with plenty of water.

3. LARGE SPILLS may require special handling—so YOU should contact your supervisor for corrective action.

4. DO NOT attempt to handle a spill without wearing the proper protective clothing and equipment.

ALWAYS KNOW WHERE THE NEAREST EMERGENCY EYE WASH AND SHOWER ARE LOCATED.

USE ADEQUATE VENTILATION

How you can spot a ventilation problem...

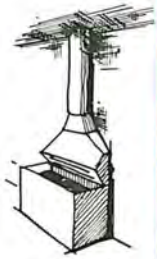
1. Eye and nose irritations or strong odors can indicate a possible need for adequate ventilation.

2. Gases, mists & vapors should be pulled into the ventilation system... and not allowed to escape into the air.

3. Cooling fans & other wind sources may blow gases, mists & vapors away from exhaust and into the breathing zone of the worker.

4. Exhaust stacks may be located such that contaminated air is returned through windows, doors and air make-up units.

5. Corrosion on structural members and equipment indicates a possible need for ventilation!



6. Ventilation may be improperly located such that toxic materials are pulled through the worker's breathing zone.

PERIODIC CHECKS SHOULD BE MADE TO ASSURE THAT VENTILATION IS TURNED ON AND OPERATING PROPERLY!

6. How To Prevent Injury...

PROTECTIVE EQUIPMENT

When handling acids and caustics in operations where spills or splashes are possible, whole body protection (eyes, head, body, hands & feet) may be necessary. Such equipment consists of chemical face shields (or equivalent),*rubber gloves, aprons, coveralls or coats, boots and protective head covering.

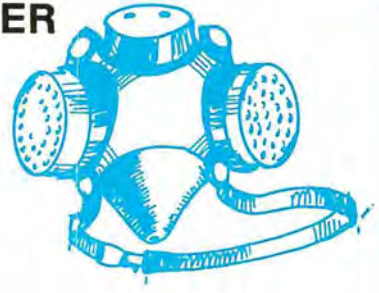
NOTE: ALWAYS WEAR SLEEVES AND PANTS LEGS OUTSIDE OF GLOVES AND BOOTS.

*SAFETY SPECTACLES ARE NOT CONSIDERED ADEQUATE PROTECTION.

RESPIRATORS (Three Types)

1. CARTRIDGE TYPE FILTER

These respirators can be used for protection against acid & caustic sprays and mists.
NOTE: These respirators should not be used in atmospheres that may contain high concentrations of toxic chemicals or not enough oxygen.



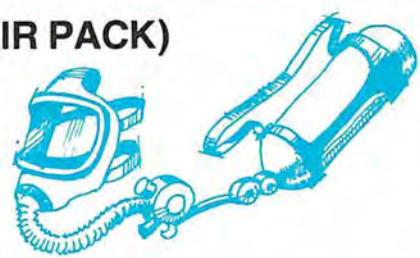
2. CANISTER TYPE

These provide protection against acid & caustic mists & sprays in addition to giving protection against various gases such as chlorine, nitrogen dioxide and hydrogen cyanide.

NOTE: These respirators should not be used in atmospheres that may contain high concentrations of toxic chemicals or not enough oxygen.

3. SELF CONTAINED (AIR PACK)

These respirators are designed to give respiratory protection in any emergency situation where the concentration of toxic chemicals is unknown.



NOTE: Use only NIOSH-approved respirators. A NIOSH certification number must be stamped on the canister and the respirator.

7. Emergency Procedures...

TIME IS THE MOST IMPORTANT FACTOR!!

Know the following before an accident occurs:

1. Know where emergency equipment is located.
2. Know phone number and location of medical help.
3. Be able to tell medical help the specific name of chemical causing the injury.
4. Know the emergency procedures described below.

ACTIONS YOU TAKE IN THE EVENT OF:...

I EYE CONTACT:

1. Get to the nearest source of water as quickly as possible.
2. Flush the eye thoroughly with plain water for a minimum of fifteen (15) minutes.
   NOTE: Remove any contact lenses (you should never wear contact lenses when handling acids & caustics).
3. Hold your eyelids apart and roll the eyeballs around.
4. Do not use neutralizing solutions, boric acid ointments or any other chemicals in the eyes; they may increase the extent of the injury.
5. Seek medical attention from a nurse or physician for further evaluation and treatment.

II SKIN CONTACT:

1. Get to a safety shower or any other source of water as quickly as possible–use a water-hose, or faucet if necessary.
2. Drench clothing and skin thoroughly with plain water–at least 15 minutes.
3. Remove contaminated clothing during drenching, and continue to flush skin thoroughly with water.
4. Get medical assistance immediately.

III SWALLOWING:

1. SPEED is essential!
2. Do not induce vomiting.
3. Dilute the substance by administering drinking water or milk.
4. Get medical assistance immediately.
5. Tell medical personnel what was swallowed.

IV INHALATION: Get to fresh air if:

1. You experience a strong burning or irritation of nose, throat or lungs.
2. You have difficulty in breathing.
3. You experience strong unpleasant odors.

7. Emergency Procedures...

IF YOU FIND SOMEONE UNCONSCIOUS*...

1. Put on a self-contained respirator (Air-Pack) and a lifeline in the hands of another worker, in case you also become unconscious.
2. Remove victim to fresh air.
3. Give artificial respiration.
4. Summon medical assistance.

*UNCONSCIOUS from breathing toxic materials.

8. Who To Contact For Help...

...IF YOU FEEL HAZARDOUS CONDITIONS EXIST IN YOUR PLANT...

FIRST
Report the conditions that you feel are hazardous to your supervisor.

IF
You are unsuccessful in getting the conditions corrected...Contact your union steward (if a union shop).

LAST
If all attempts for corrective action within the organization fail—CONTACT NIOSH or OSHA.

In case of emergency

Fill in the following numbers so that you'll be prepared in case of any emergency.

Plant First Aid_____

Doctor_____ Fire Department_____

Supervisor_____ Police_____

Need more information?

If you want further information, contact the nearest regional office of the National Institute for Occupational Safety and Health.

DHEW, Region I
Government Center (JFK Fed. Bldg.)
Boston, Massachusetts 02203
Tel.: 617/223-5807

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

DHEW, Region III
3525 Market Street P.O. Box 13716
Philadelphia, Pennsylvania 19101
Tel.: 215/597-6716

DHEW, Region IV
50 Seventh Street, N.E.
Atlanta, Georgia 30323
Tel.: 404/526-5474

DHEW, Region V
300 South Wacker Drive
Chicago, Illinois 60607
Tel.: 312/353-1710

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1114 Commerce Street (Rm. 8-C-53)
Dallas, Texas 75202
Tel.: 214/749-2261

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

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