good practices for employees

YOUR HEALTH AND SAFETY ARE IN YOUR HANDS

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
National Institute for Occupational Safety and Health
4676 Columbia Parkway
Cincinnati, Ohio 45226

SPRAY PAINTING — GOOD PRACTICES FOR EMPLOYEES

YOUR HEALTH AND SAFETY ARE IN YOUR HANDS

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The spray application of paint and other coatings involves the use of many materials. Some may be health hazards, others are potential fire or explosion hazards, and some involve both health and fire or explosion hazards. Your best protection is a knowledge of the hazards of the materials you handle and the precautions you should take.

This book is to help you, a spray painter, avoid illness and injury because of your job. If you have any questions concerning your work practices after reading this booklet, ask your supervisor to answer them for you. Only your interest and active cooperation with management will help achieve safety for you and your fellow workers. It's up to you . . .

Everyone must participate in an effective health and safety program to achieve the goal — a safe and healthful workplace.

What Management can do:

- Recognize the necessity for eliminating hazards by organizing and participating in health and safety programs.
- Assign responsibility for safety and health programs.
- Initiate a self-inspection program for all processes and personal protective equipment.
- Ensure that employees are trained in the proper (safe) working procedures, equipment operation, and use of personal protective equipment.
- Maintain injury and illness records and follow up on these and near-miss accidents.
- Ensure that all new construction and operations are designed with health and safety "built in."
- Have at least one person trained in first aid at each location.
- Ensure proper inspection, maintenance, and repair of facilities and equipment.

What your supervisor can do:

- Explain to you the work practices that will eliminate or minimize unsafe or unhealthful conditions and give the reasons why.
- Inform appropriate authorities promptly of any operation or condition that appears to present a hazard to employees.
- Enforce the wearing of personal protective equipment.
- Make sure health and safety rules are followed.
- Establish priorities for eliminating hazards.

What YOU can do:

- Wear your approved respirator, safety glasses, and other protective equipment required for the job. To be effective, protective equipment must fit properly and be used.
- Take good care of your personal protective equipment, keep it clean, store it properly, inspect it frequently, and replace or repair if necessary.

- Know the location of safety and first aid supplies.
- Know your fire extinguishers: their location, type, and use.
- Know what to do in case of a fire. Remember that life safety always comes first.
- Report all unsafe conditions, accidents, and near-accidents you observe.
- Obey all NO SMOKING rules and any other warning or caution signs.
- Store and dispense bulk flammable or combustible materials in designated areas, apart from the spraying operations. Electrically bond and ground the containers before pouring solvents from one container to another.
- Keep containers of coating materials and solvents tightly closed when not in use.
- Promptly clean up all spills of coating materials and thinners.
- Dispose of all waste material only in the special containers provided for such material.
- Carefully check the condition of all equipment before its use each day.
- Report all damage to and malfunctions of spraying equipment. Stop spraying operations as soon as any potentially hazardous condition arises.
- Be alert — check for adequate ventilation in spray booths or when spraying operations are conducted indoors or in confined spaces.
- Before operating electrostatic and airless painting equipment, ground the spray gun and the object to be painted.
- Make sure that the pressure has been released from the hose before disconnecting the gun of the airless spray equipment.
- Always follow the manufacturer's recommendations when cleaning spraying equipment.
- Never point a spray gun at any part of your body or at anyone else.

It should be obvious that your safety and health are largely in your hands.

OPERATIONS AND PROCESSES

There are three spraying methods used for applying paint coatings:

Compressed Air
Airless or High Pressure
Electrostatic

COMPRESSED AIR METHOD

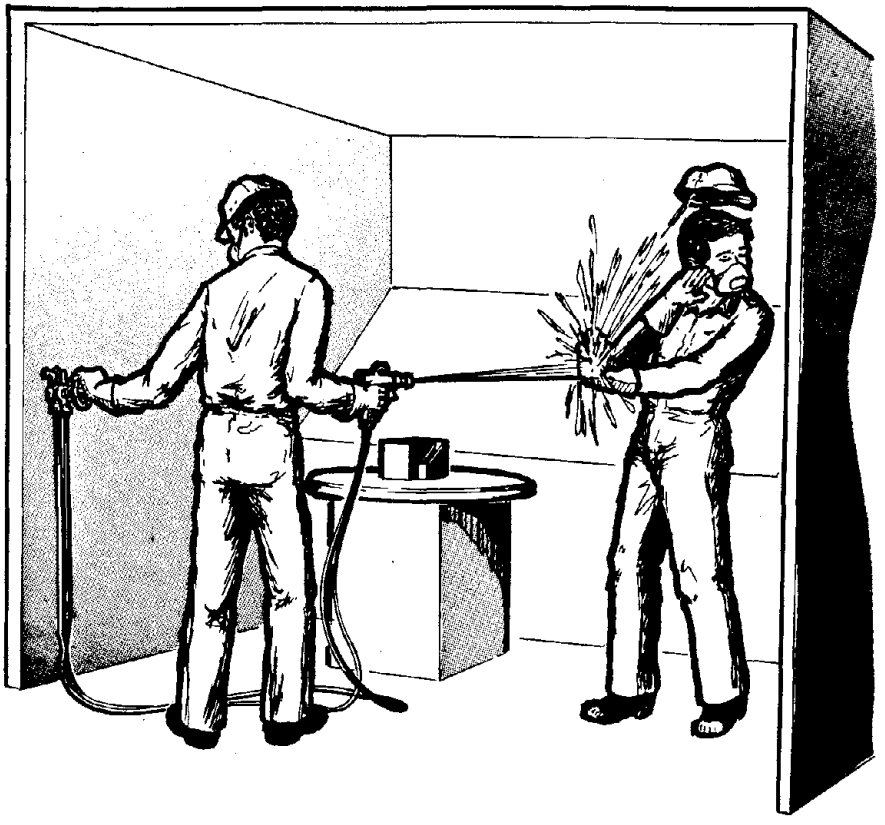
Paint and air are combined in the spray gun. The air pressure forces the paint into a fine spray which is directed onto the surface to be coated. The paint applied in this method may be applied "hot," at a fairly high temperature or "cold," at room temperature. Cold spraying is the most common method used for production painting. You should wear protective gloves when hot spraying to prevent burns. Certain spraying operations may require that you wear a respirator. The wearing of respirators is covered in another section of this book.

AIRLESS METHOD

Paint is forced through small holes in the head of the spray gun at very high pressure, breaking it into small particles. This type of spraying is used for projects which do not need a fine finish. This method produces little overspray because the paint particles have just enough speed to carry to the surface being painted, but not enough to rebound. The smaller amounts of solvent used and mists produced in this process reduce health and fire hazards.

The type of gun used is similar to compressed air guns, but has several safety features:

A complete trigger guard to prevent accidental discharge if the gun is dropped, and a safety lock for when the gun is not in use.

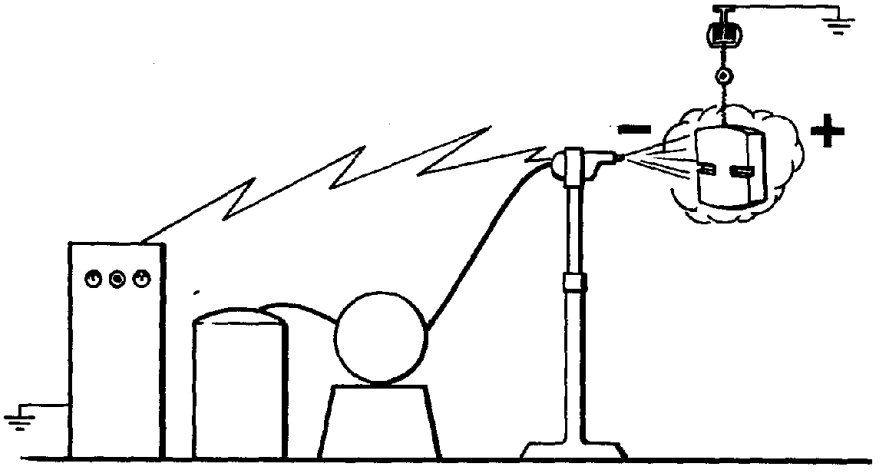


The spray gun must be handled with care to avoid injuring yourself or your fellow workers. **Never point an airless gun at any part of your body or at anyone else.** The high pressure causes the paint to be discharged in a powerful stream which carries some distance. The paint stream presents the hazard of hypodermic injection of paint into persons who accidentally may contact the spray. The paint spreads under the skin through a tiny skin wound and requires immediate medical attention.

ELECTROSTATIC APPLICATION

This method uses the electrical principle that unlike charges attract. Paint particles passing through the gun nozzle are negatively charged and are attracted to the article to be painted which is positively charged.

Electrostatic spraying is done with a hand-held gun or a fixed sprayer head.



HEALTH AND SAFETY ASPECTS OF PAINTING

Your job can make you ill . . . if you do not follow the proper safety procedures and use your personal protective equipment.

Chemicals affect your health when you breathe their vapors, get them on your skin, or ingest (eat) them. The breathing of excessive amounts of chemicals such as acetone, amyl acetate, alcohols, trichloroethylene, ketone, turpentine, etc. may produce effects such as drowsiness and lack of coordination. Other effects may include irritation of the eyes, nose, and throat, or damage to the blood, lungs, liver, and kidneys.

Skin contact with these chemicals may produce irritation, rashes, and allergic reactions.

The effect chemicals may have on your body depends on the type of chemical, how it is used, and the amount of time you are exposed. Know the materials you are using and the precautions you should take to avoid contact with them.

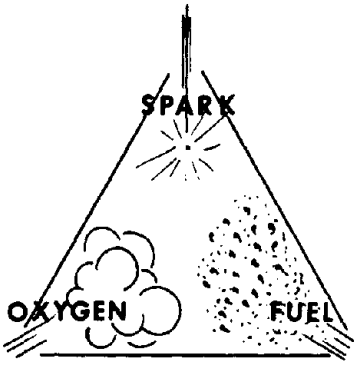
OTHER HAZARDS OF SPRAY PAINTING OPERATIONS

In addition to the health hazards presented by chemicals, you should be aware of these hazards:

FIRE and EXPLOSION

Most solvents such as alcohols, acetone, methyl ethyl ketone, and thinners are a fire hazard. If flammable solvents such as these are used, proper precautions must be taken to eliminate all sources of ignition, for example: smoking, open flames, cutting or welding, or electrical, mechanical, static, or friction sparks.

In all spraying operations, there is a danger of spontaneous combustion. This can occur if the residues from two or more types of coatings are permitted to accumulate one on top of the other in the spray booth, exhaust duct, and filters. An example of a dangerous combination is a lacquer containing nitrocellulose with a finish containing drying oils (varnishes, oil-based stains, air-drying enamels, and primers).



When the spraying operation involves the use of different coating materials which might combine to ignite spontaneously, all deposits of the first material must be removed with non-spark tools from the spray area, exhaust ducts, and filters prior to using the second material.

USING PORTABLE FIREFIGHTING EQUIPMENT

All fires are not the same. Using water on an electrical fire can give you a shock that can kill. Fires have been divided into classes; each requires different equipment. All fire extinguishers are marked with the symbol of the type of fire for which they are suitable. Using the wrong equipment can spread the fire or injure you. Use only the proper type of extinguisher.

CLASS	TYPE OF FIRE	TYPE OF EXTINGUISHER	SYMBOL
A	Wood, paper, rubbish	Water or dry chemical	
B	Oils, grease, solvents	Dry chemical, carbon dioxide foam, water fog	
C	Electrical	**NEVER** use foam or water, use dry or chemical type	

Portable fire extinguishers of the carbon dioxide, dry chemical, or foam types must be located so that you can easily reach them when needed. You should know the types of fire extinguishers, their location, and how to use them.

ELECTRICAL

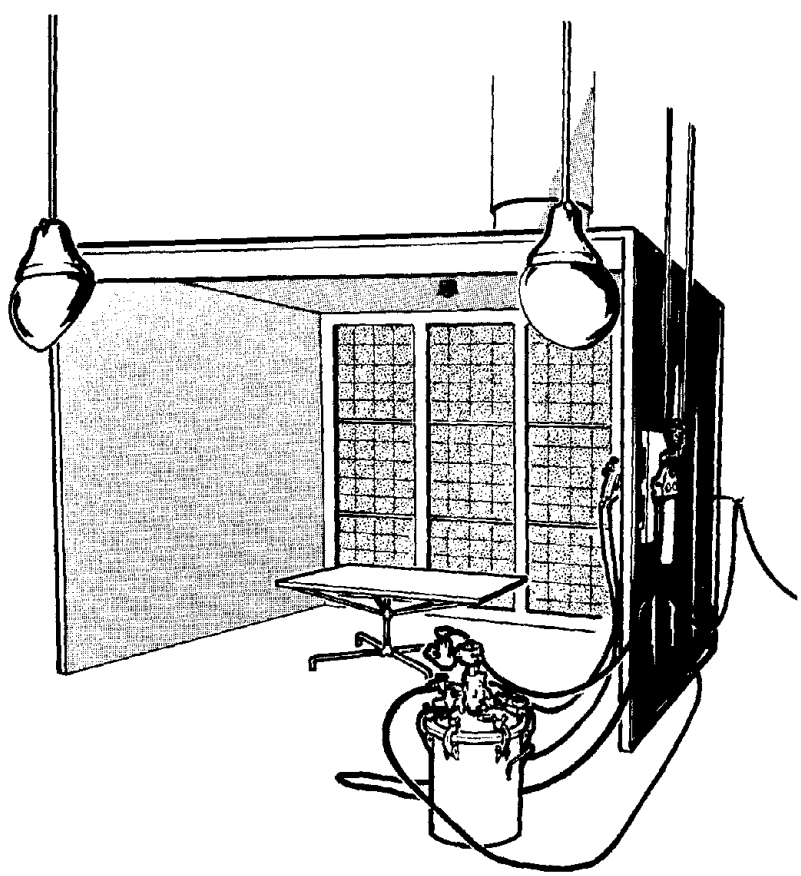
Electrostatic spraying with a hand-held gun requires extra care. The gun, the piece to be sprayed, and all conductive equipment must be grounded to prevent sparking. While you are spraying, the gun must be held twice the sparking distance or at least 12 inches from the work and other conductive surfaces.

All electrical equipment must be in another room or well away from the spraying area (at least 20 feet) or it must be of the type approved for hazardous locations and explosive areas.

CONTROLS OF HAZARDS

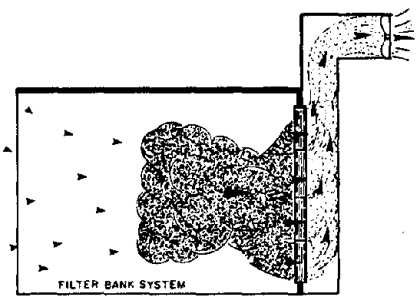
Ventilation

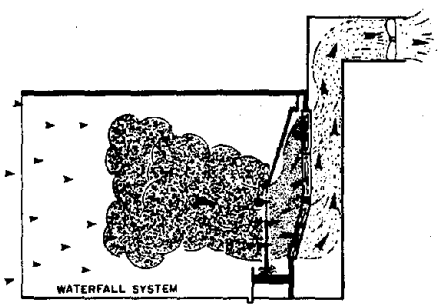
Adequate ventilation controls health, fire, and explosion hazards when you spray. The mists and vapors are collected from the spraying area by a local exhaust system. The spray must not be exhausted through your breathing zone. Spray booths or rooms equipped with exhaust ventilation are required for all spray painting operations except for the occasional touch-up or the infrequent painting of small objects. Booths or rooms are required for all production spray finishing.



Spray Booths and Spray Rooms

A spray booth is an enclosure with an open front or face and with mechanical exhaust designed to keep vapors, solid particles, or other toxic materials away from you, and to remove them from the spray booth. A spray room is used for the spray finishing of large objects such as automobiles, boats, and the like. Employees work inside the room and it is usually an enclosed area, equipped with a mechanical exhaust system.

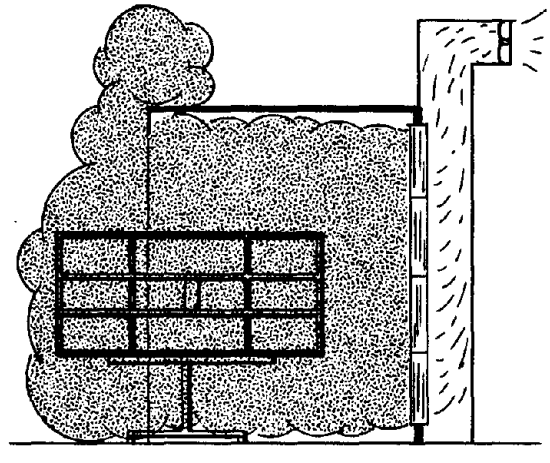




The mechanical exhaust system in a spray booth or a spray room is designed to draw the overspray toward a collection system which may be wet (waterfall type) or dry (filter bank). The exhaust and collection system must be in operation during all spraying and drying operations, including clean up of the spray area, to remove fumes.

Here are several common spray booth or spray room problems you can look for and possible solutions:

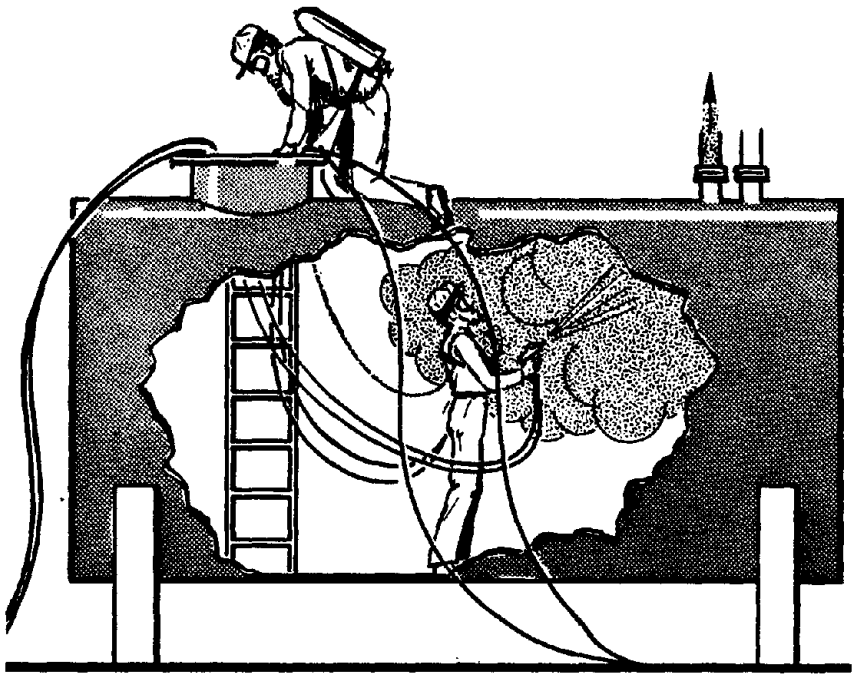
Low air velocity — When the air velocity through the spray booth or room is too low, the air flow may not draw away the contaminated air. This condition is usually caused by paint residue clogging the exhaust system. The entire exhaust system (fan blades, filters, and ducts) must be cleaned regularly to maintain enough air flow within the spray area. If the air flow drops to below 100 feet per minute, there must be a gauge or an alarm system to warn you of this hazardous condition. The best insurance for effective and safe removal of contaminated air within the spray booth is proper and frequent maintenance of the entire ventilation system: changing filters, checking to see if belts on drive motors are tight, and regular cleaning of fan blades and exhaust ducts. Cross drafts across the face of open face booths may cut down on the efficiency of the exhaust system. Blocked inlet filters to a spray room and inlet louvers which are not functioning will also cut down on the efficiency of the exhaust in a spray room.



Overspray "bounce" into work area — Painting too large a piece in a shallow open face booth can cause overspray to contaminate the work area and expose you and adjacent workers to high vapor concentrations. Too high an air pressure in your spray gun can create a backlash that can carry overspray and vapors into adjacent work areas.

Spraying in confined spaces — Ventilation combining local exhaust and dilution is used in spraying in confined spaces such as the interior of tanks. When spraying in such places, you must wear a supplied-air respirator and a lifeline. There must be a stand-by man equipped with protective equipment in case he has to go into the tank to rescue you. The primary purpose of ventilation in these situations is to reduce the fire and explosion hazards by eliminating the accumulation of vapors. If portable lights are used, they must be of the explosion proof type.

In the case of spray-coating exterior surfaces where ventilation can't be used, you must wear respiratory protective equipment, preferably the supplied air type.

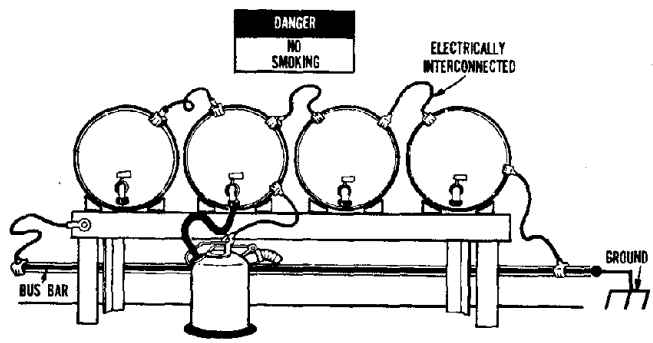


FIRE PREVENTION

The potential danger of fire and explosion when using flammable or combustible liquids can be eliminated or minimized by following some basic rules:

Quantity Control — The quantity of flammable liquids kept in the vicinity of spraying operations should not exceed the supply required for one shift.

Electrical — Keep all electrical equipment not approved for locations containing flammable vapors or materials (explosion proof) away from all spray operations.



Bonding and Grounding — Electrostatic and airless paint spraying operations generate static electricity. All electrostatic spraying equipment and conductive objects in the spraying area must be grounded. Transferring a liquid from one container to another can also result in static sparks capable of igniting vapors. Therefore, it is important that flammable liquid dispensing and receiving containers be bonded (electrically connected) together before pouring, siphoning, or pumping. Containers must be connected to an electrical ground when used as dispensing or receiving vessels.

Waste Disposal — Cloth, paper, and other solid wastes that have been soaked with flammable liquids must be placed in a suitable container for disposal. These containers must be made of metal and fitted with covers. They must be properly labeled as to the type of wastes they are to receive and must be emptied at least once a day.

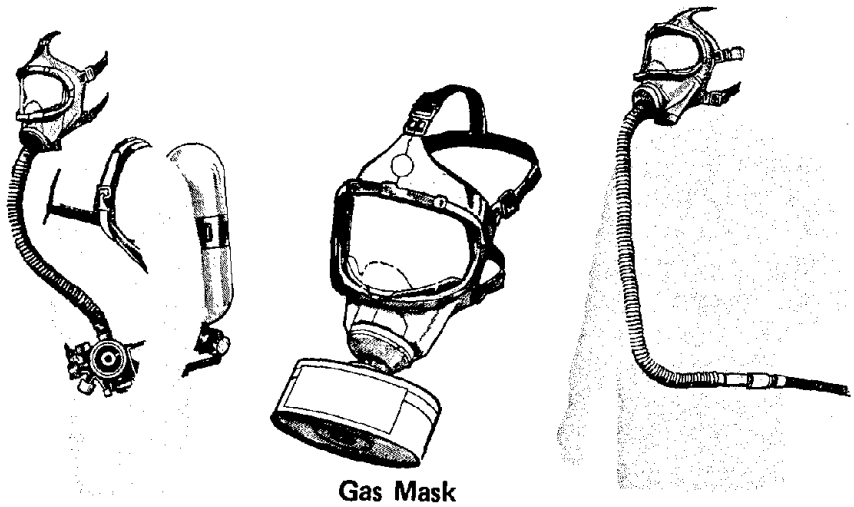
Never pour combustible or flammable liquid waste into sinks or floor drains that go to sanitary or sewer facilities.

Scheduled cleaning of spray booths — Flammable materials, when allowed to accumulate, increase fire risks. The interior of a spray booth, including the exhaust system components and sprinkler system heads, must be regularly cleaned of paint residue. If paper bags or covers are used to keep sprinkler heads clean, they must also be changed when they become coated with overspray — daily if necessary.

Low flash point solvents must not be used for cleaning. Dry filter type booths must be equipped with a gauge or alarm to indicate airflow drop and the need to replace clogged filters.

Posting — "No Smoking" and "No Welding" signs must be conspicuously posted at all spraying areas and flammable storage rooms. These rules must also be obeyed.

OPERATOR PROTECTION



Self-Contained

Gas Mask

Airline

Respiratory Protective Devices

A respirator is a necessary piece of personal protective equipment for your good health. Many paints, thinners, and cleaning solutions you use are toxic (poisonous) and you can get sick unless you take adequate precautions to avoid breathing the vapors. Some spray painters neglect to wear proper respiratory protective equipment because they have never noticed immediate bad effects from exposure to vapors which they have been told are harmful. This practice could permanently damage health before the effects become noticeable, and then it is too late.

To get full protection, you must use the proper type respirator for the job you are doing and the chemicals you handle.

The general types of respiratory protective devices used in spray painting operations are the supplied air respirator and the chemical cartridge respirator.

Supplied air respirators may be needed when you are working in confined spaces.

Chemical cartridge respirators are used only for exposure to specific chemicals which are indicated on the cartridge and for limited time periods in atmospheres that contain sufficient oxygen. Filters must be replaced when you can smell vapors in the mask, when breathing becomes difficult, or when the respirator has been used for the specified lifetime of the cartridge.

If you work only with water-based paints, a disposable face mask may be all the protection you require. Make sure the paint does not contain toxic substances which may require the use of other types of respirators. Always read the label on paint containers for information on the chemicals the paint contains and for any precautions you may need to take.

A general rule to remember — the respirator must fit properly if it is to do the job of protecting you.

There must be a maintenance schedule for respirators based on working conditions and the hazards involved. It should include the following basic services:

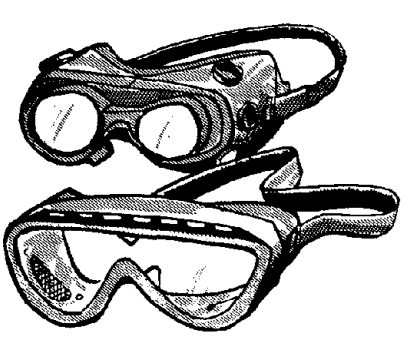
. . . Inspection for leaks
. . . . . Cleaning and disinfecting
. . . . . Repair
. . . . . Storage.

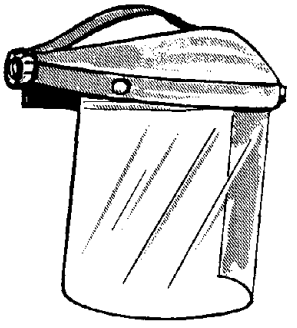
You must inspect your respirator before and after each use. Check the condition of the face piece, valves, and connecting tubes. Rubber or neoprene parts should be checked for pliability and signs of deterioration. You can check fit by covering intake holes with your hands and breathing in. The sides of the respirator should collapse. Replace parts only with those designed for that respirator. Do not attempt to replace parts or to make repairs not recommended by the manufacturer.

Keep your respirator in good condition by cleaning and sanitizing it often and storing it properly. Your supervisor must explain how to do this.

Do not use another worker's respirator or allow someone else to use yours, unless it has been sanitized.

EYE PROTECTION





Paint and solvent splashes can harm your eyes. Keep them out by wearing splash-proof safety goggles. You should know the location of the emergency eye wash fountain or other source of running water for flushing the eyes in case of chemical splashes. When handling solvents, it's also a good idea to wear a face shield for protection from splashes.

PROTECTIVE CLOTHING

Since you use chemicals which can injure or harm the skin, you should wear protective clothing. Clothes and gloves keep the chemicals from touching the skin. Your protective clothing should be laundered frequently to keep it free from deposits of paint solvents and other chemicals.

SKIN PROTECTION

In addition to protective clothing, barrier creams can be helpful in protecting areas not covered by protective clothing such as the face or neck. Be sure to wash the cream from your hands before eating, smoking, or using the toilet. Then remember to reapply the cream before returning to your work station. There are several types of protective creams available, so check with your supervisor or read the label to see that you have the right type for the chemicals you handle.

ACCIDENT PREVENTION INSPECTIONS

Accident prevention inspections of the equipment should include the following:

Inspect all air and fluid hoses attached to spraying equipment for physical damage, wear, and deterioration from chemicals and solvents. The inspection of the fluid hose used with the airless spray should be particularly thorough as it is subjected to very high pressures. The paint in the hose can be shot into your body from tiny hose leaks, just as it can from the tip of the gun.

Check all hose connections for leaks.

The compressor for air supply should be checked to see that it is working properly.

If you are working with airless spray, check to see that the spray gun and the object being coated are both grounded.

To prevent electrical shock when using the electrostatic method check that:

. . . The handle of the spray gun is electrically connected to a ground by a metallic connection.

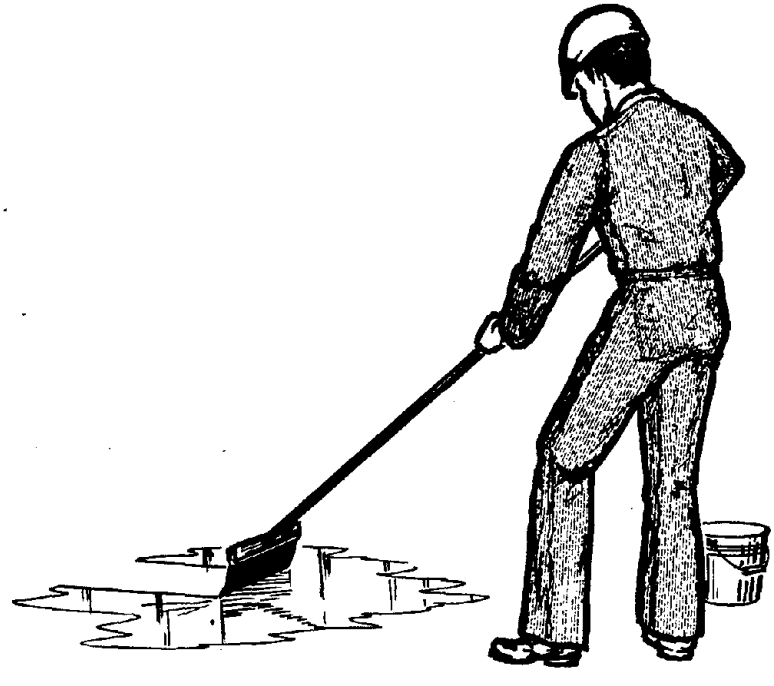
. . . All electrically conductive objects in the spraying area, including the objects being coated, are grounded.

. . . The ventilation system is in operation.

PERSONAL CARE

You should be checked by a physician if you have to wear a respirator or are exposed to lead, mercury, tributyl tin, chromium, or asbestos containing compounds. The frequency of these tests should be determined by a physician. If while wearing a respirator, you should experience difficulty in breathing, you should be reexamined to determine the cause.

Keeping clean is the best way to minimize the many skin problems caused by the thinners and pigments used in the trade. Remove spills and splashes from your skin immediately with soap and water. This may include showering and replacing solvent-soaked clothes with clean, dry clothing. Clean up all spills immediately. Deposit all cleanup material in proper disposal containers. Never use sawdust to absorb a spill — there are special absorbent compounds which may be used on floors.



PROCESS MATERIALS

Beware of the term "Safety Solvents." It is a widely-used term which can be very misleading and result in unsafe practices. Usually these so-called "safety solvents" present both a fire hazard and a health hazard. The hazards are dependent upon the chemicals used, the manner of use, and the evaporation rate. Some of these mixtures are stated to be non-flammable, but they may be flammable. Handle all solvents carefully.

The improper handling or uncontrolled use of the solvents and pigments used in spray finishing operations can pose serious health and fire hazards. No matter what solvents you use, or how you use them, here are some basic rules worth remembering:

1. **Avoid skin contact.** Solvents will remove the oils from the skin and cause irritation, cracking, rashes, and perhaps infection.
2. **Do not breathe the vapors.** Use exhaust ventilation; if this is not practical, use a NIOSH or Bureau of Mines approved respirator.
3. **Guard your eyes.** Always wear safety goggles or safety glasses when pouring solvents. Wear a face shield if there is a chance that the solvent might splash you. If a splash of solvent gets into your eye, flush the eye with running water for at least 15 minutes and seek medical aid.
4. **Be fire conscious.** Take to your work area only the amount of material needed for your shift. Clean up all spills immediately. Ground and bond all containers when transferring flammables from one vessel to another. Return all unused material to the designated storage area at the end of your shift. Always observe "No Smoking" rules.

EMERGENCY MEASURES

You should be prepared to take the following emergency actions until medical aid can be given:

CHEMICAL BURNS

. . . Skin

1. Quickly flood the affected area with large amounts of running water.
2. If the victim's clothing is soaked with the chemical, get him under running water, remove the clothing, then wash off the chemical by flushing with large quantities of water.
3. Do not use neutralizing solutions.
4. Send someone for medical help.

Keep eyelids open.

. . . Eyes

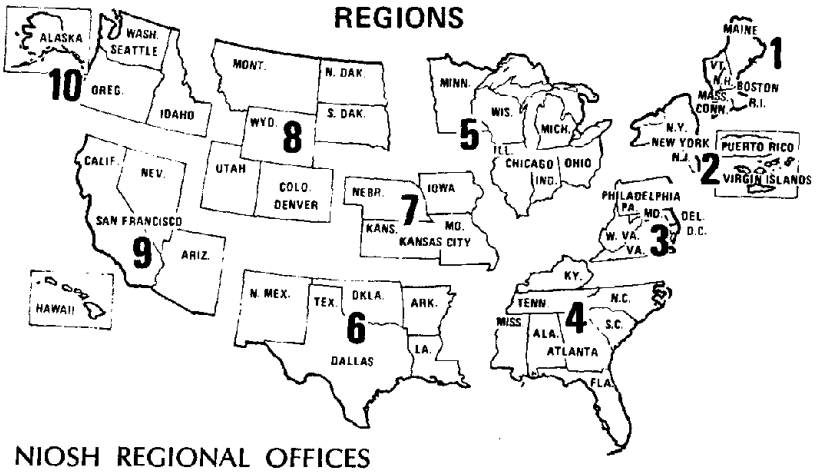
1. Flush the eye immediately with large amounts of running water. Use any available means . . . eye wash fountain, shower bath, hose.
2. Continue the process for at least 15 minutes.
3. DO NOT use boric acid or any other chemical solution or ointment.
4. Send someone for medical help.

VAPOR INHALATION

1. Put on proper breathing protective devices BEFORE you start rescue operations. Don't be a "victim" yourself.
2. Get the victim to fresh air immediately.
3. If the eyes and skin are contaminated, wash with large amounts of running water.
4. Remove contaminated clothing.
5. Send someone for medical help.

NIOSH AND OSHA 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 — Federal Building
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.: 404/526-5474

DHEW, Region V
300 South Wacker Drive
Chicago, Illinois 60607
Tel.: 312/886-3651

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

☆ U. S. GOVERNMENT PRINTING OFFICE : 1976-657-692/1530 Region No. 5-11

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. _____

BIBLIOGRAPHIC DATA SHEET	1. Report No. NIOSH-76-178	2.	3. Recipient's Accession No. PB 266259
4. Title and Subtitle Spray Painting - Good Practices for Employees			5. Report Date April 1976 6.
7. Author(s)			8. Performing Organization Rept. No.
9. Performing Organization Name and Address National Institute for Occupational Safety and Health 4676 Columbia Pkwy. Cincinnati, Ohio 45226			10. Project/Task/Work Unit No. 11. Contract/Grant No.
12. Sponsoring Organization Name and Address Same			13. Type of Report & Period Covered 14.

15. Supplementary Notes

16. Abstracts

The responsibilities for safe working in spray painting operations are outlined for management, supervisory staff and painters. Particular hazards in the compressed air, airless, and electrostatic application processes are described. The hazards of spray painting include chemicals which can be harmful when inhaled, ingested, or absorbed by the skin, and fires and explosions from the solvents involved. Ventilation is the primary means of preventing all types of hazards. Basic rules for fire prevention are given. Respiratory protective equipment, eye and skin protection and protective clothing and their use are described. Accident prevention inspections, personal care and emergency measures conclude the safety measures to be used in spray painting operations.

17. Key Words and Document Analysis. 17a. Descriptors

Hazardous materials
Spray painting
Fires
Ventilation
Accident prevention
Organic solvents
Compressed air
Explosions
Fire prevention
Inspections

17b. Identifiers/Open-Ended Terms

Toxic substances
Painters
Airless process
Electrostatic application processes
Emergency measures

17c. COSATI Field/Group 6J

18. Availability Statement Release Unlimited	19. Security Class (This Report) UNCLASSIFIED	
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