


hesperian
health guides
*Knowledge for action.
Action for health.*

1919 Addison Street, suite 304
Berkeley, CA 94704
phone 1(510)845-1447 • fax 1(510)845-9141
hesperian@hesperian.org • www.hesperian.org

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We are excited to share a short sample from the Common Chemicals and Materials charts which will be part of Hesperian Health Guides *A Workers' Guide to Health and Safety*.

A Workers' Guide will offer tools to empower workers and their supporters to take action to improve health at work. We developed the Common Chemicals and Materials charts because worker educators and organizers around the world expressed their frustrations with the lack of information about chemicals in a form that was easy-to-understand, simple yet contentful, and that could help connect what people know about a chemical (characteristics and acute symptoms) with information about long-term effects, safer substitutes, and what kind of protective equipment can be used when other controls fail.

Did we succeed in fulfilling their requests? We hope you will find these charts useful. But we also hope that they will inspire you and the people you work with to be critical of the information you receive about chemicals, to continue researching those chemicals, and to add to, modify or make new charts that reflect the needs and realities of your workplace.

These charts need you!

All Hesperian materials are built upon the feedback, knowledge, and experience of people who believe in constructing materials that empower communities from the ground up. Since Hesperian materials are always available online for free and in multiple languages, your contribution in improving them will have a great impact.

We are seeking individuals and organizations interested in reviewing this material for language, accuracy, usability, and applicability in different settings. Community review is a rewarding experience for those who participate, and anyone committed to worker health can lead a review process. Hesperian can provide you with resources and technical support, and will credit you and your group in the published book. If you are interested, please email us at workersbook@hesperian.org or connect with us during the ANROEV meeting.

Thanks!

Miriam Lara-Meloy and Todd Jailer

APPENDIX A

Common chemicals and materials

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Toxic chemicals and materials

Many workers do not know the name of all the chemicals they come in contact with. Sometimes chemicals are put into small containers without labels. Other times employers hide the chemical information or call the chemical by other names and not its chemical name. Also, most factories do not track how chemicals applied earlier in the process can affect workers down the line or how much and what kind of byproducts are produced when a chemical is used. But all these chemicals can affect your health and you have a right to know about them.

The charts in this section will help you use the information you know about a chemical to identify it or learn more about its effects.

- **What are they?** will tell you what it looks, smells, or tastes like.
- **Do you work with them?** gives information about its uses in garment, shoes, or electronics factories.
- **When they come in contact with your body** gives information about how a chemical can hurt your eyes, skin, nose/lungs and mouth/belly.
- **When you are exposed over time** includes how it can hurt your body long-term, if it causes sexual and reproductive health problems or cancers.

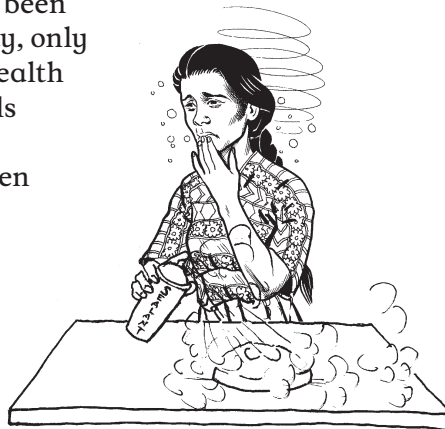
The charts include **what kind of protective equipment** you should wear if your factory does not have good ventilation, if the controls do not work well, or if you are concerned that they are not protecting you. The only real solution to chemical hazards is to not use chemicals that can harm people, but in the meantime it is important that people have some tools to protect themselves. If you are concerned about the ventilation in your factory or work station, see page xx to learn how good ventilation keeps chemicals out of the air. If you are concerned about a chemical touching your skin or eyes, see Personal Protective Equipment on page xx.



Use these charts to talk with other workers about the health hazards they are experiencing or fear they will. The charts can help you organize to demand better protection from the chemicals you are using and to demand that the worst chemicals be banned and removed from your factory.

Too many chemicals, too little information

Coming in contact with chemicals makes it more likely that you will have health problems. However there is too little information about how chemicals hurt people because they have not been studied. Of the 90,000 chemicals in use today, only a few thousand have been studied for **some** health effects! And although we know that chemicals are more harmful in combination with other chemicals than they are alone, there have been even fewer studies of how multiple chemicals affect us.



Until a chemical is studied for health effects (acute and chronic), how it affects the environment, and how it interacts with other chemicals, we should consider it dangerous. Many people believe that it is not *fair to chemicals* to say they are dangerous until proven safe. But we say it is *not fair to people*, to workers and their families, to work with chemicals not proven absolutely safe. If you cannot find information about a chemical, treat it as dangerous and protect yourself from coming in contact with it (see Chemical Hazards on page xx, Ventilation on page xx and Personal Protective Equipment on page xx).

These charts do not include information about how chemicals pollute the environment and harm people's health outside the factory. Often we are exposed two times to dangerous chemicals: inside the factory, and then again through polluted air, water, and soil in our communities. If you cannot find out if chemical wastes are being disposed of safely, assume that they are not. See page xx for more information about what good disposal is and page xx for how to organize against factory pollution.

These charts contain only about 100 common chemicals used in shoe, garment, and electronics factories. There are just too many in use to list them all. We did not include chemical mixes since mixes often change, are different from factory to factory and brand to brand, and their ingredients are often kept secret. To find out about a chemical not included in these charts or other information, see How to find information about a chemical on page xx or see the Resources page for other print and web resources that can help you. You may know the same chemical by a different name; see the Index on page xx.

Find a chemical in the charts

The chemicals and materials in this resource are grouped in families. These families show you how similar chemicals relate to each other. If your boss adds or replaces a chemical with an unknown new one, look at what category it belongs to and see if the new chemical has any of the characteristics of other chemicals on the chart.

The chemical families appear in the order of the alphabet. The chemicals inside each family are also listed in the order of the alphabet. Chemicals that start with a number come first:

Numbers A B C D E F G H I J K L M N O P Q R S T U V W X Y Z

Sometimes chemical names are very similar. The difference may be only a few letters or a number. Because of this, each chemical also has a unique number called a CAS number. The chart shows the CAS number for each chemical. A few chemicals in this list do not have CAS numbers because they represent a category of chemicals. There are many azo dyes, for example, and each one has a CAS number but azo dyes do not have a CAS number as a category so we did not include it.

If the chemical name you want to look up is not in the chart, use the Index on page xx to see if it has a different name in the chart. For example, the chemical “chlorine bleach,” used to acid-wash jeans, is sometimes called “Clorox” and sometimes called “sodium hypochlorite.”

We have listed this chemical as “chlorine bleach” in the chart. If you look for “Clorox” in the Index you will find this:

Clorox..... see Chlorine bleach..... page xx

If you look for “sodium hypochlorite” in the Index, you will find this:

Sodium hypochlorite..... see Chlorine bleach..... page xx

If you cannot find a chemical, see How to find information about a chemical on page xx.

What the symbols mean

The symbols below appear next to the chemical name at the top of the chart. They tell you which chemicals are more dangerous (more and darker symbols mean more danger). But even if a chemical does not have symbols it does not mean it is safe.



This symbol means that the chemical or material has been banned or is soon to be banned because it is harmful to people's health and the environment. If it is banned in one country, it should be banned in all.



This symbol means that the chemical or material is likely to catch on fire or explode. Pay attention to chemicals or materials it might react with, and keep it away from heat or a possible spark.

These 2 symbols mean that the chemical may or can cause reproductive health problems:



The man and woman with a **white background and a question mark** means that there is a possibility it may cause reproductive health problems.



The man and woman with a **black background** means that this chemical has been proven to cause reproductive health problems.

The chart text explains *what kind* of reproductive health problem it can cause, such as reduced fertility in men, women or both, miscarriages, and damage to a baby inside the womb. For more information about reproductive health problems, see page xx in Chemical Hazards and pages xx to xx in Sexual and Reproductive Health.

These 2 symbols mean that the chemical may or can cause cancer:



The person in bed with a **white background and a question mark** means that there is a possibility it may cause cancer.



The person in bed with a **black background** means that this chemical has been proved to cause cancer.

The chart text explains what kinds of cancers it may or can cause, if that is known.



This symbol means that the chemical can cause immediate death if you are exposed to it. Although most of the chemicals can cause death if you are exposed to high doses or for a long time, we used this symbol only for the ones that would kill you immediately.

Metals

Metals usually are solids, although mercury is a metal that is a liquid. Larger amounts of metals are harmful. Heavy metals are dangerous at any level of exposure because they accumulate in your body. Even though you might be exposed to only small amounts each day, it adds up over time to dangerous levels.

Toxic exposure to metals occurs primarily through inhaling metal dust and fumes when metals are heated, soldered or cut. Particles of metal or metal dust on your fingers and hands after working with them may also rub off onto food or drop into water and get into your body. Metals are most heavily used in the electronics industry in batteries, welding, recycling and coatings. In the garment and shoe industries, metals are used in dyeing fabrics and tanning leather.

The charts include only some of the metals that exist. See *How to Find Information About a Chemical* on page xx for how to find information about other metals. See the *Index* on page xx to find alternative names to the chemicals listed.

How to prevent or at least reduce exposure?

- Have a ventilation systems that extract dust, fumes, and dilute the air (see *Ventilation* on page xx.)
- Enclose operations where possible.
- Wear metal-working gloves when working with metals. Use a face shield when heating, soldering or cutting metals. Wear correct respirators that fit you, especially when heating metals. All protective clothing should be clean, available each day, put on before work and left at work. See *Protective Equipment* on page xx.
- Have an emergency plan for spills, splashes and accidental exposures that include first-aid treatment and protective equipment. Keep necessary supplies at the worksite, well stocked, and accessible to workers.
- Wash your hands and face carefully before eating, drinking or smoking.

Metals

⊘ Cadmium (Cd) – CAS No. 7440-43-9



Copper (Cu) – CAS No. 7440-50-8



⊘ Lead (Pb) – CAS No. 7439-92-1



⊘ Mercury (Hg) – CAS No. 7439-97-6



Nickel (Ni) – CAS No. 7440-02-0



Tin (Sn) – CAS No. 7440-31-5

What are they?

Metals are usually solids of various colors and without odors. But some metals, such as **mercury**, are liquid. **Cadmium** is blue-tinged and shiny. **Copper** is red-orange and turns a dull, brown color when exposed to air. **Lead** is blue-white and turns a gray color when exposed to air. **Mercury** is a silver-white, heavy and odorless liquid. **Nickel** is a shiny silver metal. **Tin** is a silvery-white solid or a grey-green powder.

Do you work with them?

Metals are used in electronic, garment and shoe industries. **Cadmium, copper, and lead** are used in electronics and in dyes in garment and shoes. **Mercury, nickel and tin** are used in electronics. **Nickel** is also used in metal buttons on jeans, buckles, zippers, and clasps.

When they come in contact with your body:

Skin: They can irritate your skin. **Copper, mercury and nickel** cause rashes and itching. **Mercury** might discolor your skin grey or brown. See First Aid on page xx.

Eyes: They irritate the eyes. See First Aid on page xx.

Nose/Lungs: They can irritate your nose, throat and lungs causing coughing, wheezing and difficulty breathing. Inhaling fumes can cause dizziness and headaches. They can also create a build-up of fluid in the lungs, called lung edema. Inhaling fumes may cause “metal fume fever,” which feels like a flu but these symptoms go away easily. **Lead** can cause severe irritability, chest pain, reduced memory, disturbed sleep, and mood and personality changes. Severe **mercury** poisoning results in shaking, memory loss, difficulty concentrating, weight loss, personality changes and hallucinations. See First Aid on page xx.

Mouth/Belly: They can damage the gastrointestinal tract and stomach. Some signs include loss of appetite, nausea, vomiting, diarrhea and abdominal pain. Increased salivation and metallic taste are also signs of exposure to **metals**. See First Aid on page xx and seek medical attention if you ingest any.

Continued on the next page

Metals *(continued from previous page)***When you are exposed over time:**

All **metals** can harm your liver, kidneys, bones and lungs.

Cadmium and **lead** can cause hypertension (high blood pressure). **Cadmium** can also cause bronchitis, anemia, loss of smell and discolored teeth. It can damage the baby in the womb and damage men and women's reproductive systems. It can cause kidney, prostate, and lung cancer.

Copper can cause discoloration of the skin, hair and teeth, and may reduce fertility in men and women.

Lead may cause birth defects and harm the baby in the womb. It may reduce fertility in men and women. It can cause lung, stomach, brain and kidney cancers.

Mercury causes permanent psychological and neurological problems. It may cause miscarriages, reduce fertility in men and women, and harm the baby in the womb.

Nickel may cause lung cancer.

Tin damages the nervous system, causing shaking and tremors.

If you are at risk of exposure:

Use silver shield or latex inner gloves, and nitrile or neoprene outer gloves with long cuffs (see Gloves on page xx).

Use a respirator that can filter **metal** dust and fumes (see Respirators on page xx).

Phthalates

Phthalates are oily, thick, colorless liquid chemicals. They are called “plasticizers” and added to plastic to shoe soles, rubber material and electronic cables to make them more bendable and soft.

Plastics such as polyvinyl chloride (PVC, see page xx) contain phthalates.

Phthalates get in your body and interfere with hormones. They harm the worker, but the workers’ future children can also be affected by phthalates. Workers’ daughters have an increased chance of developing breast cancer. Your children, both sons and daughters, may develop fertility problems.

The charts include only some of the phthalates that exist. See How to Find Information About a Chemical on page xx for how to find information about other phthalates. See the Index on page xx to find alternative names to the chemicals listed.

How to prevent or at least reduce exposure?

- The most harmful route of exposure is through your mouth. Wash your hands very carefully before eating, drinking and smoking to prevent any ingestion of phthalate particles.
- Phthalates do not evaporate as easily as some other liquid chemicals. But you should still have ventilation systems that extract fumes and dilute the air. See Ventilation on page xx.
- Do not mix or pour phthalates by hand.
- Wear gloves and other protective equipment when handling phthalates (see Protective Equipment on page xx).
- Have an emergency plan for spills, splashes and accidental exposures that includes first-aid treatment and protective equipment. Keep necessary supplies at the worksite, well stocked, and accessible to workers.

Phthalates

Butyl benzyl phthalate (BBP) – CAS No. 85-68-7



Di(2-ethylhexyl)phthalate – CAS No. 117-81-7



Di-butyl phthalate (DBP) – CAS No. 84-74-2



Di-ethyl phthalate (DEP) – CAS No. 84-66-2

Di-methyl phthalate (DMP) – CAS No. 131-11-3



Di-octyl phthalate (DOP) – CAS No. 117-84-0



What are they?

Phthalates are colorless, oily, thick liquids. Some may have a very slight sweet smell. Others have no smell at all.

Do you work with them?

Phthalates are used in the shoe industry to make soles softer and more flexible. **Di-n-octyl phthalate** is used to make rubber. Phthalates are added to glues and, in electronics, the plastic used to cover wires.

When they come in contact with your body:

Skin: They can irritate and burn your skin. See First Aid on page xx.

Eyes: They can irritate your eyes. See First Aid on page xx.

Nose/Lungs: They can irritate your nose, throat and lungs causing coughing, wheezing and shortness of breath. You may also become dizzy and lightheaded. See First Aid on page xx.

Mouth/Belly: If they get into your mouth and belly, they can cause nausea, vomiting and diarrhea. See First Aid on page xx and seek medical help.

When you are exposed over time:

All **phthalates** may harm your kidneys and liver, and can damage the nervous system causing weakness and numbness in the hands and feet.

Butyl benzyl phthalate, di-butyl phthalate, di(2-ethylhexyl)phthalate, and **dimethyl phthalate** may reduce fertility in men and women and may damage the baby in the womb. **Di-octyl phthalate** may damage the baby in the womb.

Butyl benzyl phthalate and **di-butyl phthalate** may cause cancer. **Di(2-ethylhexyl)phthalate** can cause cancer.

Continued on the next page

Phthalates *(continued from previous page)*

If you are at risk of exposure:

Use elbow-length, butyl rubber, nitrile rubber or polyvinyl alcohol gloves and eye/face protection (see Personal Protective Equipment on page xx).

Safer Substitutes:

Some alternative chemicals are **citrate esters**, **adipates** and **phosphates**. But many chemicals in these groups can also cause harm. Despite its misleading name, **dioctyl terephthalate** is a safer, phthalate-free alternative.

Solvents

Solvents come in liquid form and are used as cleaners, added to glues to make them stronger or quicker to dry, and are part of many mixes of chemicals in shoe, garment, and electronics industries.

Most solvents quickly burn and explode when exposed to heat. They also release more vapors and fumes when heated.













There are many “families” of solvents. Solvents that are similar share many qualities, and are often used in the same processes. In some families, there are several chemicals that are more dangerous than other chemicals in the same family. Some entire families of solvents are dangerous to people’s health, for example, aromatic hydrocarbons (p. xx) and chlorinated hydrocarbons (p.xx). The best way to protect workers who use solvents is to ban the most dangerous solvents and find less hazardous substitute solvents.

The charts include only some of the solvents that exist. See How to Find Information About a Chemical on page xx for how to find information about other solvents. See the Index on page xx to find alternative names to the chemicals listed.

How to prevent or at least reduce exposure?

- Have a ventilation systems that remove fumes and dilute the air (see Ventilation on page xx).
- Enclose operations whenever possible.
- Do not mix or pour solvents by hand.
- Use gloves when workers are handling solvents directly (cleaning). Wear correct respirators that fit you. All protective clothing should be clean, available each day, put on before work, and left at work. See Protective Equipment on page xx.
- Have an emergency plan that includes First Aid treatment and protective equipment for spills, splashes and accidental exposures. Keep necessary supplies at the work site well stocked and accessible to workers.
- Work areas where solvents are used, stored, and mixed need to be controlled for heat and monitored for concentration of fumes and vapors. They should also have alarms, fire extinguishers, and a fire emergency plan. See Fire on page xx.

Aromatic Hydrocarbon Solvents

⊘ Benzene – CAS No. 71-43-2				
⊘ Styrene – CAS No. 100-42-5				
Toluene – CAS No. 108-88-3				
Xylene – CAS No. 1330-20-7				

What are they?

Aromatic hydrocarbon solvents are clear, colorless to light yellow liquids that have sweet odors.

Do you work with them?

Aromatic hydrocarbon solvents are found in garment, shoes, and electronics. **Toluene** is a common additive for glues in shoe factories and **styrene** is found in resins that reinforce plastics in electronics.

When they come in contact with your body:

Skin They irritate your skin and lead to dermatitis, which results in skin rash, dryness, redness and a burning feeling. **Benzene** can cause blisters. See First Aid on page xx.

Eyes: They irritate your eyes. **Benzene** can make you blind. See First Aid on page xx.

Nose/Lungs: The fumes can irritate your nose and throat, causing coughing and wheezing. Breathing the vapors can cause headaches, drowsiness, dizziness, confusion, nausea, weakness, and loss of consciousness. **Benzene** can cause bronchitis, lung edema, and pneumonia. It can cause problems with the heart. Breathing a lot of benzene (20,000 ppm) can kill you in 10 to 15 minutes. **Toluene** affects the nervous system, causing difficulty thinking, slow reflexes, dilated pupils, anxiety, and weakness. See First Aid on page xx.

Mouth/Belly: **Benzene** and **xylene** can cause nausea, vomiting and abdominal pain. **Benzene** can cause rapid heart rate, difficulty breathing, chest tightness, and respiratory failure, all of which can be fatal. See First Aid on page xx and seek medical attention if you ingest it.

When you are exposed over time:

All **aromatic hydrocarbons** can damage your liver, kidneys, brain and the nervous system.

Benzene can cause problems with the blood and destroy blood cells. This can cause aplastic anemia. It may cause birth defects. It can cause leukemia (cancer of the blood).

Styrene may cause birth defects and other reproductive health problems. It may cause lung cancer.

Toluene may cause birth defects.

Xylene may cause birth defects. It may cause cancer. Higher exposures can cause coma.

Continued on the next page

Aromatic Hydrocarbon Solvents *(continued from previous page)***If you are at risk of exposure:**

Use polyvinyl alcohol (PVA), silver shield, or viton gloves. If you work with **aromatic hydrocarbons** as liquids, use indirect vent, impact- and splash-resistant goggles. If you are exposed to fumes, gas or vapor forms of these solvents, use non-vented, impact-resistant goggles (see Protective Equipment on page xx).

Safer substitutes:

Toluene has been used as a safer alternative to benzene. However, **toluene** is still toxic.