TDI Safety @ Work
Division of Workers' Compensation

Chemical Safety Fact Sheet

HS04-027C (12-21)

A chemical hazard can be a solid, liquid, or gas that can harm the health of a person who is exposed to it. It can be a pure substance, consisting of one ingredient, or a mixture of substances.

Types of Chemical Hazards

More than 100,000 chemicals are used by Americans, and about 1,000 new chemicals are introduced each year.[1] Exposure to chemicals can cause severe and long-term health problems. The types of chemical hazards include:

- **Skin Irritants**
  Different chemicals can irritate the skin. Some chemicals remove fats and oils from the skin. When this occurs, the skin becomes cracked and dry. Irritants can also cause severe burns. Other irritants can cause oils and waxes to plug hair follicles and sweat ducts. That can cause dermatitis (inflamed skin) and acne. Examples of skin irritants are:
  - strong acids found in fertilizers, dyes, paint pigments, battery acid, and metalworking;
  - strong caustics (chemicals that burn or corrode tissue) found in some cleaning products, adhesives, paint remover, disinfectants, and sterilizing agents; and
  - strong solvents found in alcohol and some paint removers.
- **Carcinogens**
  Chemicals that can cause cancer are known as carcinogens. When a person comes in contact with a carcinogen, it does not mean they will get cancer. It depends on what they were exposed to, how often they were exposed to it, and how much they were exposed to, among other factors. Several agencies have determined the cancer-causing potential of different substances. The National Toxicology Program includes a list of 248 agents, substances, mixtures, and exposures that are known or believed to cause cancer in humans. A few well-known carcinogens are asbestos, formaldehyde, nickel, cadmium, radon, vinyl chloride, benzidine, and benzene.
- **Respiratory Sensitizers**
  A respiratory sensitizer is a substance that if inhaled can trigger a permanent allergic reaction in the respiratory system. Once this reaction takes place, further exposure to the substance, even the tiniest trace, may produce symptoms. Breathing in these substances may irritate and cause damage to the nose, throat, and lungs.

Some of the substances known as respiratory sensitizers are mineral oils, wood dust, some glues and resins, rosin solder flux, and latex.

- **Chemical Explosions and Fire**
  Working with flammable liquids, dust, gases, and solids is hazardous because of the risk of fire and explosion. Common chemicals that burn easily include carbon black, lamp black, sulfide, sulfur, and organic peroxides.

- **Corrosion**
  Corrosives are materials that can attack and chemically destroy exposed body tissue. Corrosives can also damage or even destroy metal. They begin to cause damage as soon as they touch the skin, eyes, respiratory tract, digestive tract, or metal. Most corrosives are either acids or bases. Common acids include hydrochloric acid, sulfuric acid, nitric acid, chromic acid, acetic acid, and hydrofluoric acid. Common bases are ammonium hydroxide, potassium hydroxide (caustic potash), and sodium hydroxide (caustic soda).

- **Chemical Reactions**
  Reactivity is the potential of a material to explode or react violently with air, water, or other substances upon contact.

Cleaning Chemicals & Your Health

Working with cleaning chemicals can cause:

- coughing;
- wheezing;
- red, itchy eyes;
- skin rashes;
- skin and eye burns;
- shortness of breath;
- sore throat;
- headaches;
- dizziness;
- nosebleeds; and
- asthma.

If you have health problems that you think are caused by using cleaning chemicals, tell your supervisor and ask to see a doctor.

What you need to know

Do not mix cleaning products that contain bleach and ammonia. Dangerous gases can be released and can cause severe lung damage.

Your employer is required to provide a safe workplace that includes:

- sufficient ventilation (airflow) when using cleaning chemicals;
- protective clothing, gloves, and safety goggles, when needed;
- labels on containers of cleaning chemicals; and
- training on the hazards of cleaning chemicals you are using and safe work practices.

Your employer must train you to:

- know the hazards of cleaning chemicals BEFORE using them;
- know how to use and store cleaning chemicals safely;
- know how and when to dilute cleaning chemicals you are using;
- know what to do if there is a spill or other emergency;
- know how to obtain and use hazard information on labels and Safety Data Sheets; and
- know how and when to use protective clothing, gloves, and safety goggles.

Routes of Exposure

In the workplace, exposure to chemical hazards is a type of occupational hazard. Long-term exposure to chemical hazards such as lead, hydrocarbons, perfluorooctanoic acid (PFOA), and some solvents (among many others) have been shown to increase the risk of heart disease, stroke, and high blood pressure. Reading the Safety Data Sheet for all chemicals in the workplace and understanding the hazards is an important step in prevention. (See DWC's Safety Data Sheets Safety Training Program for more information.)

Exposure to chemicals may occur by the following routes:

- **Inhalation (breathing)**
  Breathing of contaminated air is the most common way that workplace chemicals enter the body. Gas, vapors, mist, dust, fumes, and smoke can all be inhaled.
- **Ingestion (swallowing)**
  Workplace chemicals may be swallowed accidentally if food, hands, or cigarettes are contaminated. For this reason, workers should not drink, eat, or smoke in areas where they may be exposed to chemicals.
- **Contact with skin and eyes**
  Some chemicals, when contacted, can pass through the skin into the blood-stream. The eyes may also be a route of entry. Usually, however, only very small quantities of chemicals in the workplace enter the body through the eyes.
- **Injection**
  While uncommon in most workplaces, injection can occur when a sharp object, such as a needle, punctures the skin and inserts a chemical (or virus) directly into the bloodstream.

Regardless of the route of exposure, any chemical that enters the body eventually enters the bloodstream. Once it is in the bloodstream, the chemical may harm organs that are far away from the original point where the chemical entered the body.

Symbols of Chemical Hazards

Hazard pictographs are a type of labeling system that alerts people at a glance that there are hazardous chemicals present. The symbols help identify whether the chemicals may potentially cause physical or environmental harm. The symbols are distinctive, as they are shaped like diamonds with red borders. These signs can be divided into:

- **Flammable** (Symbol: open flame);
- **Oxidizing** (Symbol: open flame over a circle);
- **Corrosive** (Symbol: corrosion on hand and surface);
- **Gas under pressure** (Symbol: gas cylinder);
- **Toxic** (Symbol: skull and crossbones);
- **Serious health hazard** (Symbol: internal damage on a human silhouette);
- **Health hazard/hazardous to the ozone layer** (Symbol: exclamation mark);
- **Hazardous to the environment** (Symbol: dead tree and fish); and
- **Explosives** (Symbol: exploding bomb).

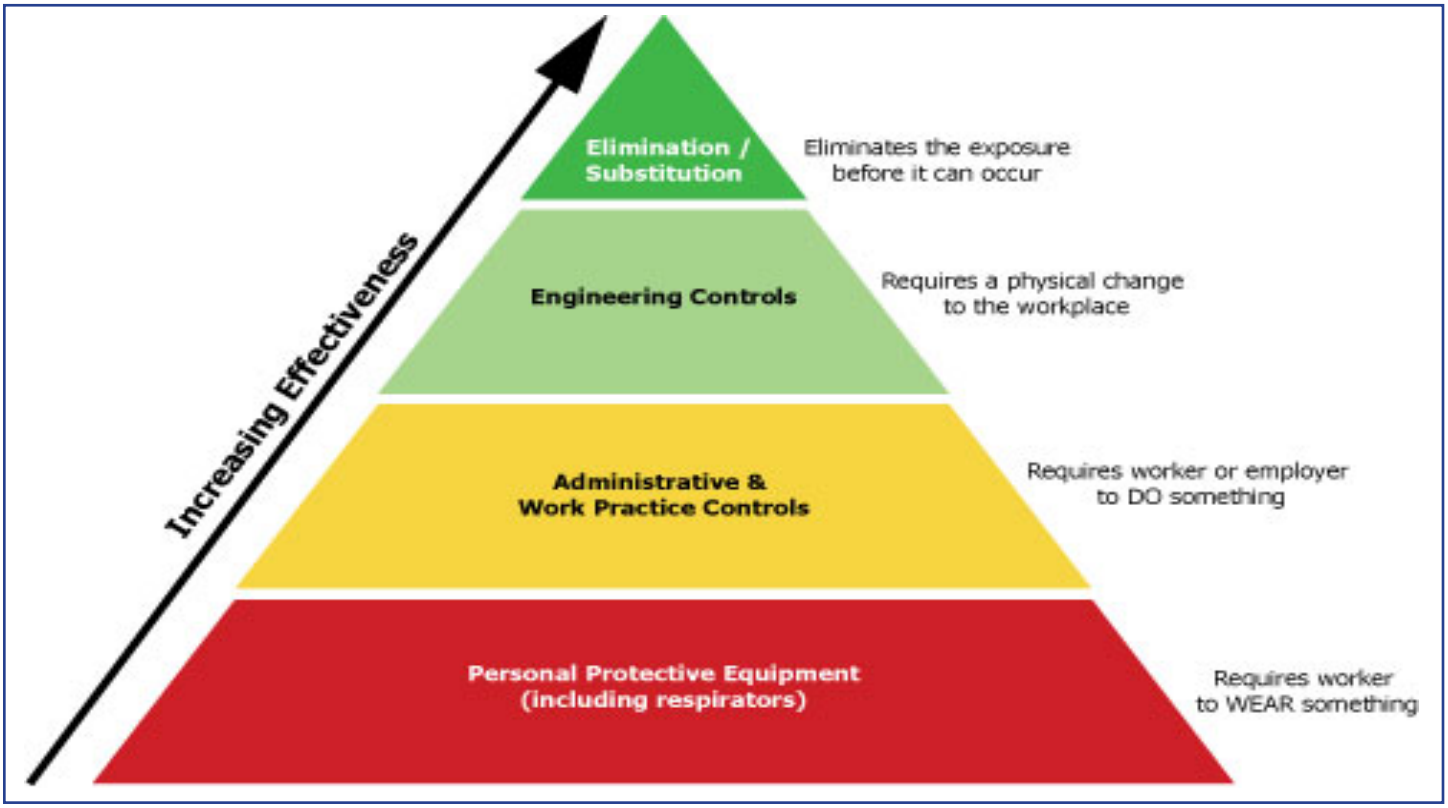
These pictographs are also subdivided into classes and categories for each classification. The assignment for each chemical depends on its type and severity.

Controlling Chemical Exposure

Controlling exposures to chemical hazards and toxic substances is the primary method of protecting workers. OSHA has established a hierarchy of controls (below) to reduce employee exposure.

- **Elimination and Substitution**
  Chemical exposure is estimated to cause approximately 190,000 illnesses and 50,000 deaths of workers annually. The best method of controlling chemical exposure within the workplace is through the elimination or the substitution of all chemicals that are thought or known to cause illness or death. (See OSHA's Transitioning to Safer Chemicals: A Toolkit for Employers and Workers.)

- **Engineering Controls**
  When chemical exposure cannot be eliminated or substituted, engineering controls should be implemented by making physical changes to the workplace, the job, or the task. Examples of engineering controls to reduce or eliminate chemical hazards may include:
  - using fume hoods;
  - providing dilution ventilation systems (supplying clean air that mixes with the air in the workplace to dilute the concentration of the chemical);
  - using wet methods to reduce dust or other particles;
  - isolating or enclosing the job or task; or
  - changing the process to minimize contact with hazardous chemicals.



- **Administrative and Work Practices Controls** If the process that creates the chemical hazard cannot be enclosed or isolated through engineering controls, the next best method is to establish administrative and work practices to make the processes and procedures more efficient. These controls are designed to reduce the amount of time and frequency workers are exposed to a chemical hazard. Examples may include:
  - rotating job assignments and
  - adjusting work schedules so workers are not overexposed to a hazardous chemical.
- **Personal Protective Equipment (PPE)** The proper use of PPE can reduce the risk of damage from contact with hazardous materials. Employers should provide PPE at no cost to their employees to protect them from chemicals used in the workplace. The use of PPE helps prevent exposure to chemicals through inhalation, absorption, ingestion, and injection. PPE may include:
  - chemical protective clothing;
  - respiratory protection;
  - gloves; and
  - eye protection.

First Aid

In case of emergency, it is recommended to understand first aid procedures to minimize any damage. Different types of chemicals can cause a variety of damage. Most sources agree that it is best to rinse any contacted skin or eye with water immediately for at least 15 minutes. Longer times may be warranted for exposure to penetrating, corrosive materials.

Transporting the affected person to a health care facility may be important, depending on the condition. In the case that the victim needs to be transported before the recommended flush time, then flushing should be done during the transportation process. Some chemical manufacturers may state the specific type of cleansing agent that is recommended. (For more information see DWC's Eyewash and Emergency Shower Safety Workplace Program.)

For additional resources on chemical or hazard communications safety, download or stream any of DWC's free publications or workplace safety videos.

To report an oil spill or other hazardous substance, contact the Texas Emergency Oil Spill and Hazardous Substance 24-Hour Reporting Service at **800-832-8224**. This phone number is supported by several Texas emergency reporting agencies including the Texas General Land Office, Texas Commission on Environmental Quality, and Railroad Commission of Texas.

Chemical Safety Checklist

- **Read labels**
  Before using a product, always read the label. Follow all label warnings and instructions.
- **Use Safety Data Sheets**
  All chemical products have a Safety Data Sheet that lists the product's specific hazards. Contact a supervisor to review the sheets and learn the hazards of the chemical.
- **Wear PPE**
  Always wear approved PPE such as gloves, goggles, mask, respirator, or other protective clothing when using chemicals. The Safety Data Sheet tells what PPE is required.
- **Never mix chemicals**
  Never create an additional hazard by mixing products. For example, never mix bleach with ammonia.
- **Learn chemical first aid**
  Train all employees on emergency procedures in case they or others are exposed to a chemical splash or fumes. These procedures are found on the Safety Data Sheets.
- **Keep containers closed**
  When not in use, always store chemicals in their original closed container in a cool, dry place.
- **Use in well-ventilated areas**
  Only use chemicals in locations that have good air distribution or exhaust systems.
- **Use proper chemical labels**
  Make sure chemical containers are labeled properly. If an appropriate label is not available, ask a supervisor.
- **Dilute chemicals properly**
  Do not exceed the dilution ratio for concentrated chemicals. For instance, if the label calls for one ounce of a chemical to be mixed with one gallon of water, do not double the ounces.

References

[1] Ohio Department of Health, "Chemicals and Cancer: Answers to Frequently Asked Questions," Sept. 2017, https://odh.ohio.gov/wps/wcm/connect/gov/708d12ff-4c9d-4c8a-b5c3-fcc1f2893048/Chemicals-and-Cancer-Fact-Sheet_Sept2017.pdf?MOD=AJPERES&CONVERT_TO=url&CACHEID=ROOTWORKSPACE.Z18_M1HGGIK0N0JO00QO9DDDDM3000-708d12ff-4c9d-4c8a-b5c3-fcc1f2893048-mEhzCHh#:~:text=Certain%20chemicals%2C%20including%20benzene%2C%20beryllium,to%20cause%20cancer%20in%20humans.&text=Chloroform%2C%20DDT%20and%20polychlorinated%20biphenyls,examples%20of%20possible%20human%20carcinogens. Accessed December 15, 2021.

[2] University of Cambridge, Occupational Health: Respiratory Sensitizers, https://www.oh.admin.cam.ac.uk/services/health-surveillance/respiratory-sensitisers. Accessed December 15, 2021.

[3] Occupational Safety and Health Administration, "Transitioning to Safer Chemicals: A Toolkit for Employers and Workers," https://www.osha.gov/safer-chemicals#note1. Accessed December 16, 2021.

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