

Toolbox Talks

Hazardous Chemical Awareness Part 1

Chemical Safety Tips:

Chemicals that you use at home include gasoline, paints, fertilizers, lawn chemicals, bug spray, paint strippers, kerosene, bleach, & other household cleaners. However, chemicals you may use at work are facility-specific solvents, laboratory chemicals, fuels, paint, office copier chemicals, correction fluid, lubricants, & corrosives.

You could be exposed to chemicals in the following ways:

- **Inhalation:** Breathing in dusts, mists, & vapors
→Example: Working with bags of concrete at home without a respirator
- **Ingestion:** Eating contaminated food
→Example: Having lunch in the work area where there are airborne contaminants
- **Absorption:** Skin contact with a chemical
→Example: Contact dermatitis or an eye irritation
- **Injection:** Forcing an agent into the body through a needle or a high-pressure device
→Example: Needle stick or misuse of a high-pressure washer

You can protect yourself against chemical hazards by:

- Reading container labels, MSDS, & safe-work instructions before you handle a chemical
- Always add acids to water to prevent boiling over or splashing
- Using specified PPE that may include chemical-splash goggles, a respirator, safety gloves, apron, steel-toed shoes, safety glasses with side shields, etc. Ensure the PPE fits properly & you are trained in its use
- Never put your bare hands into any chemical; use the proper glove
- Inspecting all PPE before you use them. Look for defects in the equipment such as cracks, missing parts, rips, etc. Ensure your respirator has the proper chemical cartridge for the particular chemical hazard. Change cartridges when it is necessary
- Knowing the location of safety showers and eyewash stations and how to use them
- Washing your hands before eating, especially after handling chemicals
- Leaving your contaminated clothing at work. If you wear the clothes home, you can expose your family to the hazards

Chemical Safety at Home:

With Spring here, many of us will start to utilize fertilizers & other chemicals to help take care of our lawns & gardens. This is a good time to evaluate your chemical storage at home to protect your children or grandchildren. Poison control centers across the country get more than 2 million calls a year about potential exposure to poisons. Almost all of these exposures occur in the home, & 80% of all poisonings are in children between the ages of 1 & 4.

Follow these guidelines to prevent poisoning in the home:

- Install safety locks/childproof latches on all cabinets to restrict access to children.
- Store potential poisons, including detergents, medications, cosmetics, perfumes, & chemical products (like pesticides & drain cleaners) out of reach & out of sight of children inside the house as well as in the garage or shed.
- Store potential poisons in their original containers. Do not transfer them to food containers like milk jugs or coffee cans.
- Keep food & potential poisons separate; store them in different cabinets. Children can mistake the identity of products that look alike to them.

- Return all products to storage immediately after use. Keep the products & your children in sight during use.
- Safely discard into a sealed, outdoor trash receptacle all household products & medications that are old or aren't used regularly.
- Never mix products; dangerous fumes could result.
- Make sure medications are in child-resistant containers. Vitamins & supplements also should be out of reach of children. Remember that child-resistant is not child-proof.
- Keep indoor plants out of reach; some may be poisonous.
- Stay away from areas that have been sprayed recently with pesticides or fertilizer

Hazardous Materials Identification System (HMIS):

The warning labels used to identify hazardous materials have a universal color & numbering system. They also utilize a letter designating what type of personal protective equipment is needed. This makes it easier for you to tell what type & level of hazard you are dealing with. Colors are used to show the specific kind of hazard, & numbers within the colors are used to let you know what the potential hazard is, mild through severe.

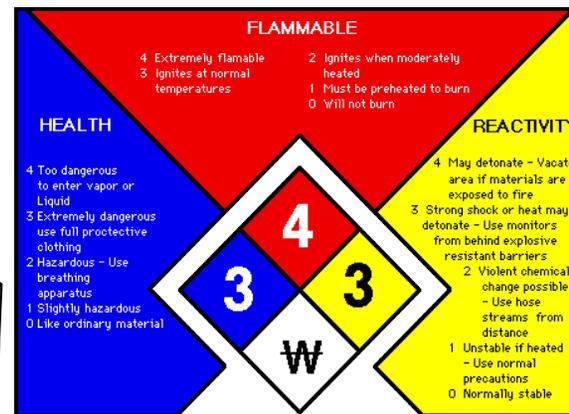
NFPA Chemical Hazard Color Codes:

The National Fire Protection Association developed a standard label to display chemical hazard ratings (seen below). The NFPA label is required by many institutions, industries, & municipalities, & is found on most new chemical reagent containers.

- The **left diamond** is printed in **blue** & indicates toxicity (health hazard)
- The **top diamond** is printed in **red** & indicates flammability
- The **right diamond** is printed in **yellow** & indicates reactivity
- The **bottom diamond** is printed in **white** & is reserved for special warnings such as reactivity with water.
 - On National Fire Protection Association labels, white shows special information such as acid, corrosive, radioactive, etc.
 - On Hazardous Material Identification System (HMIS) labels, the white part tells what kind of PPE to use.

Number Codes:

- **0** means minimal hazard
- **1** means slight hazard
- **2** means moderate hazard
- **3** means serious hazard
- **4** means severe hazard



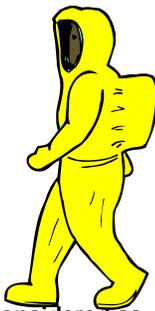
All information gathered from the following sources: toolboxtopics.com, www.csun.edu, & safetytoolboxtalks.com

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Hazardous Chemical Awareness Part 2

PPE Indicators:

- A** → safety glasses
- B** → safety glasses, gloves
- C** → safety glasses, gloves, synthetic apron
- D** → face shield, gloves, synthetic apron
- E** → safety glasses, gloves, dust respirator
- F** → safety glasses, gloves, synthetic apron, dust respirator
- G** → safety glasses, gloves, vapor respirator
- H** → splash goggles, gloves, synthetic apron, vapor respirator
- I** → safety glasses, gloves, dust & vapor respirator
- J** → splash goggles, gloves, synthetic apron, dust & vapor respirator
- K** → airline respirator, gloves, full suit, boots
- X** → ask your supervisor for guidance



As a rule of thumb, any category with a "2" or higher should be considered as having the potential to create a dangerous situation. If you are unsure about any aspect of the chemical that you are handling, refer to the MSDS. Remember, at a minimum, always wear the personal protective equipment recommended.

Material Safety Data Sheets (MSDS):

Chemical manufacturers provide material safety data sheets (MSDS) with the chemicals they sell. These sheets include pertinent safety & health information compiled from OSHA, the EPA (Environmental Protection Agency), & the National Library of Medicine. Instructors should keep this information in an appropriate location & should be aware of the possible dangers of the chemicals they use.

Chemical Storage Categories:

Explosions, fires, toxic fumes, & other hazards can arise if incompatible chemicals are accidentally **mixed**. To minimize the potential of such hazards, chemicals should be stored with other compatible chemicals, separated by appropriate distances from incompatible chemicals.

The following is a storage classification system suggested by the California State Department of Education:

- **Metals:** All metals, except mercury, can be stored together. Metals should be stored separate from all oxidizers, halogens, organic compounds, & moisture.
- **Oxidizers** (except ammonium nitrate): Oxidizers include such chemicals as: nitrates, nitrites, permanganates, chromates, dichromates, chlorates, perchlorates, & peroxides. They should be separated from metals, acids, organic materials, & ammonium nitrate. They should be separated from flammable liquids by a one-hour fire wall or a distance of 8 meters.
- **Ammonium nitrate:** Ammonium nitrate should be stored in isolation from all other chemicals.
- **Bases:** All strong bases, such as sodium hydroxide, potassium hydroxide, or ammonium hydroxide, should be stored in a dedicated corrosive chemicals cabinet that is coated with corrosion-resistant material.
- **Flammables:** Flammables should be stored in a dedicated wooden flammable materials cabinet, 8 meters away from all oxidizers. The cabinet should be coated with flame retardant paint & should be appropriately labeled with the notice: **FLAMMABLE LIQUID STORAGE. KEEP FIRE AWAY!**

→ **Acids:** All inorganic acids (except nitric acid) & all regulated organic acids should be stored in a cabinet constructed of corrosion resistant material. Acids may be stored with bases, but fumes from acids & bases may produce an annoying coating of salt crystals on the outside of reagent containers. Nitric acid should be stored separately from acetic acid either in an isolated portion of the acid cabinet or in the Styrofoam container in which it was shipped. Fuming nitric acid should never be used.

→ **Poisons:** Highly toxic substances such as cyanides should never be used. Poisons approved by state & district education boards should be stored in a locked cabinet away from the acids cabinet.

→ **Compressed Gases:** Compressed gas cylinders should be strapped to the wall. Oxidizing gases such as oxygen should be stored far away from flammable liquids, gases, & metals. Flammable gases should be separated from oxidizers & oxidizing gases by a one-hour fire wall or a distance of 8 meters.

→ **Low Hazard Chemicals:** Many weak bases, oxides, sulfides, indicators, amino acids, sugars, stains, & carbonates are classified as low-hazard chemicals. These chemicals may be stored on open shelves with bars to prevent accidental spillage.

Storage Codes:

You can use the manufacturers provide color-coded labels to categorize chemicals for storage purposes. Chemicals with a particular storage color may be stored together, except when indicated otherwise. Chemicals with different storage color labels should be stored in different areas.

→ **Red Flammable:** Store in area designated for flammable reagents.

→ **Yellow Reactive & oxidizing:** These chemicals may react violently with air, water, or other substances. They should be stored away from flammable & combustible materials.

→ **Blue Health Hazard:** These chemicals are toxic if inhaled, ingested, or absorbed through the skin. They should be stored in a locked cabinet.

→ **White Corrosive:** These chemicals may harm skin, eyes, & mucous membranes. They should be stored away from red, yellow, & blue-coded reagents.

→ **Gray:** Moderate or minimal hazard. According to current data, these chemicals do not pose more than a moderate hazard in any category.

Prevent mixing of incompatible chemicals:

- Always make sure chemical bottles, including secondary containers such as spray bottles & dispensers, are marked with the chemical contents with a clear & legible label.
- Ensure you use a HMIS, NFPA, or similarly easily identifiable label that clearly denotes any hazards of the product within the container.
- Ensure you know about the various chemicals you utilize & check the original label or MSDS sheet for information of reactivity with other substances.
- Once a secondary container is designated for a certain chemical, never utilize it for a different chemical component.

These rules also apply at home when you're cleaning up around the house:

- Do not mix bleach & ammonia.
 - Do not mix bleach & acids (vinegar, some glass cleaners, some toilet bowl cleaners, lime/calcium/rust removers).
 - Do not use two drain cleaners together or use one right after the other.
- All these combinations have the potential to create very hazardous vapors.

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Hazardous Chemical Awareness Part 3

Safe Transport of Gases

Cylinders are very heavy & will be travelling at the same speed as your vehicle. However, unlike your vehicle, they are not fitted with any brakes, & unless they are adequately secured, they can move forward under braking & cause severe damage.

Some gases such as Propane, Carbon dioxide (CO₂), & Acetylene should not be transported lying down as the gas in these cylinders is in **liquefied** form, or as in the case of Acetylene, **dissolved** in acetone. Consequently, there is a very real risk of an escape from the valve threads & gas then collecting in sufficient quantities to form an explosive or asphyxiant mixture inside the vehicle. So, **make sure that all cylinders are properly secured & incapable of movement.**



You should NOT transport Propane, CO₂, or Acetylene unless you can keep the cylinder upright at all times. Finally, before moving off, always check that the cylinder valve is firmly closed to prevent leakage.

Labels

- Labels state the **dangers of the gas**
- **Never use or transport a gas cylinder that does not have a label**
- The label is the **only way** to positively identify the contents of a cylinder
- **The old color codes are changing**
- Be familiar with labels & handle accordingly.



→Flammable gas

danger of ignition & explosion



→Oxidising gas

increases danger of fire



→Inert gas

danger of death by asphyxiation



→*Toxic gas

danger of death from intoxication or poisoning



→Corrosive gas

danger of death from burns

***Toxic or pyrophoric gases should only be transported in open or dedicated vehicles!**

Simple Safety Rules:

- No smoking
- **Check that cylinder valves are properly closed**
- If the cylinder is designed to have a cylinder valve cap, then one should be fitted
- **Ventilate your vehicle / keep windows open**
- Dismantle equipment such as regulators, hoses, & torches, etc.
- **Ensure all cylinders are properly secured & prevented from moving during your journey**
- Go directly to your destination
- **Do not leave cylinders inside the trunk or in an unventilated place**
- Immediately unload when arriving at destination or stopping for a longer time & store in a ventilated place

Loading & Unloading

Cylinders are heavy; a 50 litre (13.2 gallons) CO₂ cylinder can weigh 90 kilogrammes (198 lbs) or more. **Check that your vehicle is capable of taking the weight without being overloaded or affecting the handling or braking of the vehicle.** Consider how you are going to get the cylinders in & out of your vehicle without injury. Falling cylinders are particularly dangerous; many people are hurt when moving cylinders without considering the manual handling aspects of the task. Only carry the minimum number of cylinders that are required for the job.

→Once the cylinders are out of the vehicle, follow these simple rules:

- Never turn your back on a free standing cylinder
- **Never try to catch falling cylinders**
- Wear safety boots, gloves, & safety glasses
- **Place cylinders onto firm level ground**
- Use a trolley to move cylinders



Ventilation

While transporting cylinders adequate ventilation is very important, ideally:

- **Use an open vehicle or a vehicle designed for the transportation of gases**
- The vehicle should have a gas tight bulkhead separating the driver from the load

Finally remember that safe transportation is the responsibility of the driver, so never take chances – drive safely & arrive safely.

Emergency Action

The precise actions depend on the type of gas being carried, but if you do discover a leak from a cylinder containing a **flammable gas**:

- **If possible & safe, try to move your vehicle to an isolated place**
- Minimize potential ignition sources
- Ventilate your vehicle, open doors
- Do not try to enter vehicle, or turn on ignition
- If safe, try to close any valves that may be open
- Try to keep members of the public away
- **Call Emergency Services**

→Give them your exact location & the number & type of cylinders involved

NOTE: A leaking non flammable – non toxic gas is best dealt with by allowing the gas to safely vent to atmosphere in a well ventilated area. Leave the vehicle & keep well back.

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Hazardous Chemical Awareness Part 4

Approved Fuel Containers & Drums

The following containers are approved for transporting fuel. These containers must meet the specifications shown in parentheses.

Manufacturers' Original Containers

Manufacturers' containers, such as Coleman fuel cans, may be used to transport their original contents, but shall not be reused.



Safety Transport Cans (UN 3A1 & UN 1A1)

Safety transport cans are containers that meet DOT specifications for transporting fuel & the OSHA requirements for safety cans. Safety transport cans meeting OSHA requirements are exempt from most States' spillproof container regulations. A redesigned jerrican-style safety transport can, the Safety Transport LM can, is available from Safeway Products, Inc.

These cans have the following features:

- A relocated pour handle
- A linkage between the pour handle and the lid on the fill opening that vents the can during pouring and allows fuel to flow faster
- A quick-disconnect flexible pour spout and a clip on the top of the can to store the spout
- A stiffening rib to make the can less prone to damage during temperature changes
- A carrying handle spanning the top of the metal collar



Steel Drums (8 to 55 Gallons)

- Use steel drums without removable heads (UN 1A1) to transport flammable & combustible liquids.
- Use steel drums with removable heads (UN 1A2) or without removable heads (UN 1A1) for aerial ignition.
- Use steel drums with removable heads (UN 1A2) to transport hazardous waste or damaged fuel containers.



Military-Style Metal Jerricans (UN 3A1)

New metal jerricans that meet DOT, OSHA, & spillproof fuel container (CARB-compliant) specifications are commercially available.

Safety Cans (UL or FM)

Safety cans meeting OSHA requirements, such as those listed by UL or FM, are exempt from most States' spillproof container regulations.



Two-Compartment Fuel and Oil Containers (UL)

Two-compartment fuel & oil containers - often called *Dolmars* - may be used to transport fuel.



Plastic Fuel Containers

Three types of plastic fuel containers are now being used: military-style plastic jerricans (UN 3H1), consumer plastic containers (UL), & plastic fuel bottles, such as Nalgene bottles. These plastic fuel containers are being phased out. The purchase of new military-style plastic jerricans, consumer plastic containers, & plastic fuel bottles is prohibited.

Use of all military-style plastic jerricans, consumer plastic fuel containers & plastic fuel bottles shall be discontinued no later than June 2012.

This prohibition does not include plastic two-compartment fuel & oil containers (often called *Dolmars*) that are used for chain saws.



The only exception to the use of plastic jerricans, containers, & fuel bottles after the phaseout period is when fuel must be transported or dispensed in environmental conditions that make the use of a metal container dangerous. An example is when fuel must be transported in a saltwater environment that can cause metal containers to corrode & leak.

Aluminum Fuel Bottles

Aluminum fuel bottles (often called *Sigg* bottles, General Services Administration National Stock Number 7240-01-351-2133) are approved for transporting fuel. **NOTE: Red aluminum fuel bottles must never be used as beverage containers!**

