Module 2: Workplace Safety

Terms and Definitions

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- Carbon monoxide is a colorless, odorless, poisonous gas formed by incomplete combustion.
- Combustible is to be capable of bursting into flames at temperatures above 100°F.
- Conductor is a material that allows the transmission of electricity; some examples are metals, carbon, and water.
- Corrosive/caustic is something that is capable of dissolving metals and/or burning skin and eyes; an example is battery acid.
- Electricity is a fundamental entity of nature usually used as an electrical current.
- Environmental Protection Agency (EPA) is a federal agency designed to protect our natural resources (air, water, soil, plants, animals, etc.) from contamination due to hazardous or toxic substances.
- Exposure is any unprotected contact with a harmful substance.
- Exposure limit is the level of material you can be exposed to each day with no adverse effects. Examples of exposure limit are the threshold limit value (TLV) and permissible exposure limit (PEL).
- Flammable means to be capable of being easily ignited and burning quickly at temperatures below 100°F.
- Flash point is the temperature at which a substance can catch fire.
- Grounded means that there is an electrical connection to an object that conducts electrical current to the earth.
- Hazardous material is any substance that could cause injury or death to a person or damage to the environment.
- Hazardous waste is an unwanted byproduct that is ignitable, corrosive, reactive, or toxic.
- An insulator is a material that does not allow the transmission of electricity. Some examples include: glass, rubber, and plastic.
- Material Safety Data Sheet (MSDS) is a form that explains the hazardous material that an employee works with, so the employee can safely use the material and respond to emergency.
- Occupational Safety and Health Act (OSHA) is a federal legislation designed to ensure safe and healthful working conditions for employees.
- Reactive means that it is capable of burning, exploding, or giving off harmful vapors if mixed with air, water, heat, or other materials. Some examples include: explosives, oxidizers, and unstable elements.

  Note: Reactives should be handled with extreme caution. They can explode under what seem to be safe conditions, such as when hot or when being moved.
- Solvent is a chemical that dissolves another substance. Examples include degreaser, paint thinner, and industrial cleaner.
- Toxic is something capable of causing illness or death after exposure, even at very low levels.
- Volatile means to be readily vaporized at a relatively low temperature.

  Note: Many petroleum products are volatile, and their fumes (vapors) should be avoided.

Federal Agencies

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- Occupational Safety and Health Administration (OSHA) regulates hazards in the workplace, including worker exposure to hazardous materials. Regulations are found in the Code of Federal Regulations (CFR) 29.
- Department of Transportation (DOT) regulates the transportation of hazardous materials, including the packaging, labeling, placarding, and transporting (for use or disposal). Regulations are found in CFR 49.
- Environmental Protection Agency (EPA) regulates the disposal of hazardous waste. Regulations are found in CFR 40.

OSHA's Role

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- The Occupational Safety and Health Act was signed on December 29, 1970.
- The U.S. Department of Labor created the Occupational Safety and Health Administration (OSHA) to oversee the Act.
- OSHA issues standards and rules for safe and healthful working conditions, tools, equipment, facilities, and processes.
- OSHA also conducts workplace inspections to assure that standards are followed. Penalties may be levied for noncompliance.
- OSHA sets two major requirements for employers:
  - To provide work and a workplace free from recognized hazards.
  - To comply with OSHA regulations.
- OSHA set one major requirement for employees:
  - To comply with all occupational safety and health standards and all rules, regulations, and orders issued under the Act.
- The Act and the standards issued by OSHA apply to every private employer with one or more employees, except those covered by other federal legislation such as the Atomic Energy Act and the Coal Mine Safety Act.

Hazard Communication

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- OSHA established the Hazard Communication Standard (HCS or HazCom) to protect the health and safety of employees, which states that employees:
  - Have the need and a "right to know" the hazards and the identities of the chemicals they are exposed to when working.
  - Have the need to know what protective measures are available to prevent adverse effects from occurring.
- OSHA requires employers to develop a written HazCom program including:
  - Warning labels on containers.
  - MSDS that are readily available to employees.
  - Employee training on the proper handling, usage, storage, and transportation of chemicals.

Chemical Labels

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- Chemical labels should include:
  - Chemical name and ingredients.
  - Name, address, and phone number of the manufacturer or distributor.
  - Procedures for usage, handling, storage, and disposal.
  - How to handle spills and leaks.
  - Signal words identifying chemical as hazardous.
    - Caution—least severe.
    - Warning—very severe.
    - Danger—most severe.
  - Critical first aid instructions and type of fire extinguisher to use.
  - Personal protective equipment to wear when using the chemical.
  - Other information about the chemical:
    - Flammability.
    - Radioactivity.
    - Reactivity—uses words "incompatible," "unstable," and "volatile."
    - Toxicity.

Material Safety Data Sheets

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- The purpose of an MSDS includes the following:
  - To inform the user of the material's physical properties or fast-acting health effects that make it dangerous to handle.
  - To tell the user the level of protective gear needed.
  - To tell the user the first aid treatment necessary if exposed to the product or its hazards.
  - To tell the management and the user the preplanning needed for safely handling spills, fires, and day to day operations with the material.
  - To tell the user how to respond to accidents.

Characteristics of a Hazardous Material

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- Flammable.
- Corrosive.
- Reactive.
- Toxic.

Hazardous Materials and Your Body

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- Ingestion occurs when the material is swallowed.
- Absorption occurs when the material makes contact with the skin or eyes.
- Inhalation occurs when breathing in gases, vapors, fumes, or other airborne forms of a material.

Health Effects from Hazardous Materials

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Note: Effects from exposure to hazardous materials may be delayed without evidence for years, and by then, the damage is done and cannot be reversed. This is why it is extremely important to follow all precautions around hazardous materials.

- Short-term effects result in minor symptoms resulting from a brief encounter with a chemical. Some examples of the effects include, nausea, pain, rash, burning eyes, headache, itching skin, and vomiting.
- Long-term effects result in severe, ongoing illness resulting from repeated or prolonged encounters with a chemical. Some examples of the effects include cancer, asbestosis, emphysema, sterility, and kidney damage.

Classification System

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- Overview.
  - The classification system consists of a large diamond made up of four smaller diamonds.
  - Each diamond represents a different characteristic and is represented by a different color.
- Ratings.
  - Health, fire, and reactivity hazards are rated according to their severity on a scale of 0–4, with 0 meaning "no hazard," and 4 meaning "severe hazard."
- Specific hazards are identified with abbreviations or symbols.
- Example 1.
  - Chemical #1 presents an extreme danger to your health, it will burn below 200°F, and it is unstable if heated.
  - Do not use water on this chemical.
- Example 2.
  - Chemical #2 is a corrosive that is hazardous to your health.
  - It is very flammable, with a flash point below 100°F.
  - It is also capable of a violent chemical change.

Hazardous Materials in the Diesel Technology Shop

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- Chemicals that will be identified as hazardous ingredients on the MSDS for various products.
- Always check the MSDS to be sure about the content of a product. (OSHA 20 CFR Parts 1910 H and Z)

Hazardous Waste in the Diesel Technology Shop

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- Contaminated water.
- Contaminated fuel.
- Waste oil.
- Waste antifreeze.
- Waste solvent.
- Waste caustic/corrosive (some examples of this are acids in hot tanks, like special parts cleaners).

Storing and Disposing Hazardous Materials

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- Storage should have you referring to the MSDS and your school/company policies for specific storage requirements.
  - Store hazardous materials in approver safety containers that should be tightly closed.
  - Store flammable/combustible materials separate from corrosives and reactives.
  - Store flammables in temperature controlled areas away from heat and electronic sources.
  - Store hazardous materials in locked metal cabinets or locked storage areas.
- Disposal of hazardous materials should be according to your MSDS and your school/company policies.
  - Use only approved containers for waste disposal. Different containers are used for different waste products. Some examples of this are waste oil in waste oil cans or tanks, and waste caustics in caustic tanks.
  - Never pour hazardous materials in to the drain, sewer, garbage can, or onto the ground.
  - If your clothing or other materials are contaminated by hazardous materials (such as spilling fuel or oil on your coveralls), remove contaminated clothes immediately. Then follow your school/company policies for disposal or decontamination of the clothing.
  - The federal government through the EPA monitors hazardous waste disposal to make sure that several environmental laws passed by Congress are followed properly. These laws include the Clean Air Act, Clean Water Act, Safe Drinking Water Act, and the resource Conservation and Recovery Act.
  - Most hazardous waste products are sent to recyclers for disposal, and waste water must be pretreated and then sent to a municipal sewer system.
  - The EPA can administer high fines for cleanup costs to businesses that are not disposing their hazardous waste according to current laws.
  - The EPA has also established guidelines to comply with the Clean Air Act for the recovery and recycling of motor vehicle air conditioning refrigerants, and EPA-approved equipment must be used by trained and certified technicians who repair or service motor vehicle air-conditioners.

Flammable Materials and Toxic Substances Guidelines

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- If your hair or clothing catches fire, do NOT run—Stop, Drop, and Roll to smother the fire, using a blanket if available.
- Carefully read and follow container label directions before using any flammable liquids or toxic substances. Refer to the MSDS for more detailed information.
- Wear personal protective equipment (PPE) as specified on the MSDS to prevent eye and skin contact with flammable and toxic substances. Some examples of protective equipment to wear are chemical splash goggles, respirators, safety gloves, splash aprons, and corrosive-resistant boots.
- Use flammable and toxic chemicals in well ventilated areas. Use fans, exhaust hood, and approved ventilation systems.
- Avoid breathing toxic fumes or gases. The gaseous vapors from flammable and toxic substances such as solvents and corrosives can cause serious internal damage if you inhale them.

- Know the location of the right type of fire extinguisher for the chemical you are using. The wrong extinguisher can spread a fire.
- Know the location of the eyewash station, safety showers, spill control stations, and fresh air supply in case of contamination. Please remember that these are for first aid. Contamination victims will also need medical care because their injuries can be very serious, even deadly.
- Take special care to handle, store, and dispose of flammable and toxic chemicals properly. Refer to the MSDS for detailed information.
- Use flammable and toxic substances only for their intended purposes. For example, don't use gasoline or diesel fuel as a cleaner.
- Keep flammables, corrosives, and reactives away from fire and sparks. Never smoke, cut, or weld around them.

Equipment and Tools Guidelines

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- Always wear eye protection while performing the following operations:
  - Grinding, chipping, or drilling.
  - Welding.
  - Working under equipment.
  - Operating abrasive discs.
  - Charging batteries.
  - Using caustic cleaning compounds.
- Remove rings and other jewelry when operating power equipment.
- Secure long hair and loose clothing such as ties, scarves, or wide sleeves when working around power equipment.
- Obey all safety rules and operating instructions provided by the equipment manufacturer, plus any additional ones used by your shop.
- Keep tools and equipment clean and in safe working order.
- Properly store tools and equipment when not in use.
- Keep guards and safety devices in place on all equipment.
- Tag and report to the supervisor/instructor any defective tools, machines, or equipment.
- Turn off power equipment when not in use.
- Operate equipment only after receiving training on how to use it properly and safely.
- Use the correct tools for the job.
- NEVER use compressed air to clean yourself or your clothing. Do not direct compressed air toward another person.
- Practice this tool motto: "Get, use, and put away."

Electrical Safety Guidelines

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- Do not use any electrical appliance or equipment while you are touching metal or water.
- Before performing any maintenance task such as oiling or cleaning any electrical equipment, disconnect (unplug) the power from energized tools and tag or lockout machine tools (if trained).
- Keep electrical equipment and work areas clean to prevent electrical fires. Electrical sparks could ignite any flammable material nearby.
- Keep access to electrical panels and junction boxes clear.
- Keep flammable materials away from electrical heat sources, including lights.
- Know the location of fuses and circuit breakers.
- Make sure all electrical equipment is properly grounded. Remember that properly grounded equipment provides a pathway for stray current that may otherwise go through your body!
- Plug power tools into grounded outlets installed with ground fault circuit interrupters (GFCIs).
- Never use water on electrical fires.
- Report any of the following unsafe conditions to your instructor or supervisor immediately and do not use:
  - Defective, frayed, or damaged cords.
  - Shocking, sparking, overheating, or smoking equipment.
  - Corroded or broken switches or outlets.
  - Extension cords in permanent use.

Federal Safety Color Code

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- Federal Safety Red.
  - Indicates danger.
  - Identifies fire protection equipment and its location.
  - Identifies portable containers of flammable liquids.
  - Identifies emergency stop bars, stop buttons, and electrical stop switched on machinery.
- Federal Safety Yellow.
  - Indicates caution and marks physical hazards. Some examples are low beams, steps, pits, etc.
  - Indicates waste containers for explosive or combustible materials.
  - Indicates equipment that should NOT be started, used, or moved.
  - Identifies the starting point or power source for machinery.
- Federal Safety Orange.
  - Identifies dangerous parts of equipment that could cut, crush, shock, or otherwise injure.
  - Indicates safety starter buttons.
- Federal Safety Purple (or magenta or black on safety yellow) indicates radiation hazards.
- Federal Safety Blue identifies tags that indicate equipment that should NOT be started, used, or moved.
- Federal Safety Black and White.
  - Indicates traffic-flow paths.
  - Indicates storage areas.
  - Identifies housekeeping equipment and its location.
- Federal Safety Green.
  - Identifies safety equipment other that firefighting equipment and its location.
  - Identifies first-aid equipment and its location.

Color Coding of Safety Tags or Signs

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- Do Not Start tag is a white tag; it has white letters on a red square.
- Danger tag is a white tag; it has white letters on a red oval, on a black square.
- Caution tag is a yellow tag; it has yellow letters on a black square.
- Out of Order tag is a blue tag; it has white letters on a black square.

General Safety Guidelines for Working on Vehicles

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- Be sure an appropriate fire extinguisher is nearby when starting or running a vehicle in the shop.
- Be sure the vehicle is out of gear before starting it.
- Use extreme caution when moving a vehicle in the shop. Check around the vehicle and the planned path to make sure there are no obstacles in the way.
- Use a spotter to help you if trying to maneuver or park a vehicle in a close area.
- Do not leave a vehicle running in the shop without adequate exhaust removal equipment in place.
- Be careful about moving parts on the vehicle, such as belts and fans.

  Note: Many vehicles have electrically or air-operated fans that can run at any time the switch is on, even if the engine is not running.
- Be careful about parts that heat up during engine operation. Examples include exhaust pipes, manifolds, and coolant hoses.
- Do not allow tools or other metal objects to contact both battery terminals at the same time.
- Wear safety glasses, gloves, and protective clothing when handling batteries.
- Wear your safety belt whenever you ride in or drive a vehicle, including test drives—no matter how short they are.
- Avoid using remote starts. Start the vehicle with the ignition switch to ensure proper control.
- Warn other workers in the area and clear workers from the engine area when starting a vehicle.

Guidelines for Reducing Asbestos Exposure

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- Asbestos is the name of a class of magnesium-silicate minerals that occur in fibrous form.
- Asbestos is used in the manufacture of heat-resistant clothing, automotive brake and clutch linings, and a variety of building materials including floor tiles, roofing felts, ceiling tiles, fire-resistant drywall, and some insulations.
- Asbestos can cause a disabling respiratory disease called asbestosis and various types of cancer (lung, stomach, colon) if the fibers are inhaled. Symptoms of these diseases generally do not appear for 20 or more years after initial exposure.
- The potential for a product containing asbestos to release fibers depends on its degree of friability. Friable means that the material can be crumbled with hand pressure and is therefore likely to emit fibers.
- The permissible exposure limit (PEL) for asbestos is 0.1 fibers per cubic centimeter of air (0.1 f/cc) averaged over the 8-hour workday.
- OSHA recommends the following practices to reduce asbestos exposure to levels below the PEL:
  - Engineering controls (including approved brake cleaning equipment).
  - Exposure monitoring (to make sure exposure is below the PEL).
  - Respirators and protective clothing (if exposure exceeds PEL).
  - Hygiene facilities (clean change rooms, lockers, and showers for containment and decontamination).
  - Warning signs and labeling (to regulate areas and caution workers about materials containing exposures).
  - Recordkeeping and medical exams (to monitor employee exposure).
- In the diesel technology shop, there are two preferred methods for brake and clutch inspection, disassembly, repair, and assembly.
  - Negative pressure enclosure with HEPA (high efficiency particulate air) vacuum system.
  - Low pressure/wet cleaning brake cleaning equipment (most common).
    Note: Equivalent methods must be proven to OSHA to be just as effective as the preferred methods.
- Every effort should be made in the shop to prevent asbestos fibers from becoming airborne.
  - Do not clean brake drums or clutches with the air blow gun, which could spread particles all over the shop.
  - Use wet rags to wipe off asbestos surfaces to prevent particles from going airborne.

