HAZWOPER Refresher

Student Resource Packet

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HAZWOPER Refresher

29 CFR 1910.120 & 8 CCR 5192

Emergency Action Plan

Emergency Action Plan

- Fire
  - Exits, fire extinguishers
- Earthquake
  - "Duck, cover, and hold"
- Medical emergency
  - 911
- Active shooter
  - "Run, hide, fight"

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Course Objectives

- This course will provide employees, managers, and supervisors identified in California Code of Regulations, Title 8, §5192 (8 CCR 5192) with annual refresher training covering specifically required health and safety elements
- Refresher training may also include:
  - Critique of incidents that have occurred in the past year that can serve as training examples of related work
  - Other relevant topics

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Course Outline

- Federal and State Laws & Regulations
- Chemical Hazards
- Toxicology
- Physical Hazards
- Special Hazards
- Biological Hazards
- Personal Protective Equipment
- Respiratory Protection
- Protection from Wildfire Smoke
- Air Monitoring
- Hazard Assessment
- Site Control
- Decontamination

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ENVIRONMENTAL HEALTH & SAFETY SOLUTIONS

Section 1:

Federal and State Laws & Regulations

U.S. EPA

- The United States Environmental Protection Agency (U.S. EPA) was established on December 2, 1970
  - Consolidated federal research, monitoring, standard-setting, and enforcement into one agency
  - U.S. EPA's goal is to create a cleaner and healthier environment

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RCRA

The Resource Conservation and Recovery Act (RCRA) protects communities and promotes resource conservation.

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RCRA

- Within RCRA, U.S. EPA:
  - Manages 2.5 billion tons of solid, industrial, and hazardous waste
  - Oversees 6,600 facilities
  - Working to address more than 3,700 existing contaminated facilities and review as many as 2,000 possible facilities
- U.S. EPA has largely focused on building hazardous and municipal solid waste programs

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RCRA

- The RCRA program has evolved in response to changes in waste generation and management and is needed to address continuing challenges, including:
  - Highly toxic waste
  - Wastes from increasingly efficient air and water pollution control devices
  - Larger demands on natural resources due to population growth
  - Long-term stewardship of facilities that closed with waste in place

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CERCLA

- The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) is also known as the "Superfund" Act
- Since 1980, U.S. EPA's Superfund program has managed the cleanup of the nation's worst hazardous waste sites and responded to locally and nationally significant environmental emergencies

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CERCLA

- The Superfund cleanup process begins with site discovery or notification of a release or potential release into the environment
- U.S. EPA may be notified of hazardous waste activity by citizens, states, tribes, or various environmental programs

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CERCLA Remediation: Short-Term

- Short-term removals and remediations are used for sites when threatened releases require a prompt response
- Short-term removals may involve:
  - Installing security fences
  - Providing alternate water supplies
  - Relocating communities

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CERCLA Remediation: Long-Term

- Long-term remedial response actions reduce the dangers associated with releases of hazardous substances that are serious but not immediately life-threatening
- These sites, if qualified, will be listed on U.S. EPA's National Priorities List (NPL)

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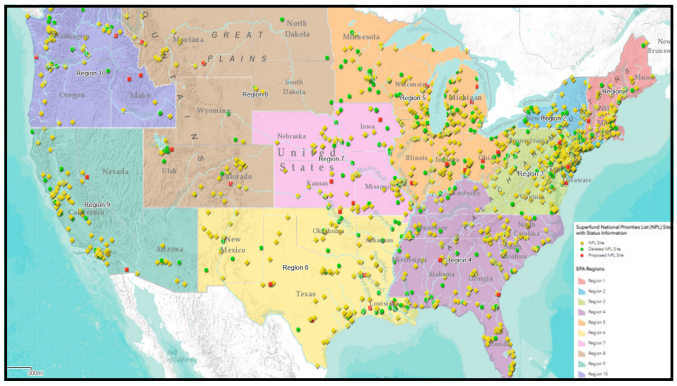

SARA

- The Superfund Amendments and Reauthorization Act (SARA) amended CERCLA on October 17, 1986
- SARA made several important changes and additions to the program:
  - Stressed importance of permanent remedies and innovative treatment technologies in cleaning up hazardous waste sites
  - Required Superfund actions to consider standards and requirements found in other state and federal environmental laws and regulations
  - *[Continued…]*

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SARA Changes

- Provided new enforcement authorities and settlement tools
- Increased state involvement in every phase of the Superfund program
- Increased the focus on human health problems posed by hazardous waste sites
- Encouraged greater citizen participation in making decisions on how sites should be cleaned up
- Increased the size of the trust fund to $8.5 billion

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EPCRA

- The Emergency Planning & Community Right-to-Know Act (EPCRA) was enacted by Congress as the national legislation on community safety
- To implement EPCRA, Congress requires each state to appoint a State Emergency Response Commission (SERC)
  - SERCs are required to divide their states into Emergency Planning Districts and to name a Local Emergency Planning Committee (LEPC) for each district

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TSCA

- The Toxic Substances Control Act (TSCA) of 1976 provides U.S. EPA with the authority to require reporting, recordkeeping, and testing requirements and restrictions
- Certain substances are generally excluded from TSCA, including food, drugs, cosmetics, and pesticides

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TSCA

- TSCA addresses the production, importation, use, and disposal of specific chemicals, including:
  - Polychlorinated biphenyls (PCBs)
  - Asbestos
  - Radon
  - Lead-based paint
  - "New chemical" review

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DOT

- The Department of Transportation (DOT) was established by an act of Congress on October 15, 1966
- DOT regulates the transportation of hazardous materials and hazardous waste

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HMT-USA

The Hazardous Materials Transportation Uniform Safety Act (HMT-USA) requires the Secretary of Transportation to promulgate regulations for the safe transport of hazardous materials in intrastate, interstate, and foreign commerce.

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HMT-USA

- HMT-USA includes provisions to:
  - Encourage uniformity among different state and local highway routing regulations
  - Develop criteria for the issuance of federal permits to motor carriers of hazardous materials
  - Regulate the transport of radioactive materials

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HMT-USA

- Enforcement of HMT-USA is shared by each of the following administrations under delegations from DOT:
  - Pipeline and Hazardous Materials Safety Administration (PHMSA)
  - Federal Highway Administration (FHA)
  - Federal Railroad Administration (FRA)
  - Federal Aviation Administration (FAA)
  - Coast Guard (all waterways)

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OSHA General Duty Clause

- The OSHA general duty clause requires that:
  - Employers:
    - Provide a place of employment free from recognized hazards
    - Comply with occupational safety and health standards
  - Employees:
    - Comply with occupational safety and health standards and all rules, regulations, and orders

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HAZWOPER Standard

- The hazardous waste operations and emergency response (HAZWOPER) standard covers a range of operations
  - Unless the employer can demonstrate that an operation does not involve employee exposure, or the reasonable possibility for employee exposure, to safety or health hazards

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HAZWOPER Standard

- The HAZWOPER standard applies to the following operations:
  - Cleanup operations and hazardous substance removal work required by a governmental body
  - Corrective actions involving hazardous waste cleanup operations at RCRA sites
  - *[Continued…]*

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HAZWOPER Standard

- Voluntary cleanup operations at sites recognized by federal, state, local, or other governmental bodies as uncontrolled hazardous waste sites
- Operations involving hazardous wastes that are conducted at treatment, storage, and disposal facilities (TSDFs)
- Emergency response operations for releases of, or substantial threats of releases of, hazardous substances without regard to the location of the hazard

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HASP

- Employers of employees involved in hazardous waste operations must develop and implement a written Health and Safety Program (HASP) designed to:
  - Identify, evaluate, and control safety and health hazards
  - Provide for emergency response for hazardous waste operations

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State Regulatory Requirements

- After identifying hazards, employers are required to establish control measures to protect workers:
  - Engineering controls:
    - Physical changes that eliminate or reduce workplace hazards
  - Administrative controls:
    - Processes or procedures developed to eliminate or reduce exposure to hazards
  - Personal protective equipment (PPE)

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Medical Screening & Surveillance

- Medical screening and medical surveillance are two fundamental strategies for optimizing employee health
  - Medical screenings
    - Clinical focus on early diagnosis and treatment of the individual
  - Medical surveillance
    - Prevention focus to detect and eliminate underlying causes such as hazards or exposures to any discovered trends

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Medical Surveillance Program

- Medical exams are to be conducted:
  - Prior to assignment: "**B**aseline"
  - At development of signs and symptoms of "**E**xposure"
  - Once every 12 months: "**A**nnually"
    - Not to exceed two years
  - At "**T**ermination" of employment
  - If physician determines it is medically necessary

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Section 2:

Chemical Hazards

Chemical & Physical Properties

Knowing the chemical and physical properties of the materials at your workplace helps to determine the appropriate response and handling techniques.

Solid

Liquid

Gas

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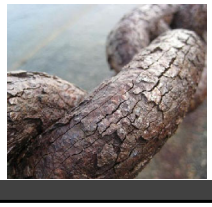
Chemical & Physical Properties

- Chemical property is a characteristic of a substance that is observed during a reaction in which the chemical or identity of the substance is changed
  - Examples:
    - Reactivity
    - Flammability
    - Oxidation
      - » Formation of Rust



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Chemical & Physical Properties

- A physical property is an aspect of matter that can be observed or measured without changing the identity of the material
  - Examples:
    - Color
    - Density
    - Melting Point

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Boiling Point

- Boiling point is the temperature at which a liquid changes to a gas/vapor
- Q: Which is more hazardous, a high or a low boiling point?

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Melting Point / Freezing Point

- Melting point is the temperature at which a solid changes to liquid
- Freezing point is the temperature at which a liquid changes to a solid
  - Same temperature as melting point

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Solubility

Solubility is the ability of one substance to blend, mix, or combine uniformly with another substance.

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Flash Point

- Flash point is the temperature at which a liquid or particular organic compound will give off sufficient vapors to form an ignitable mixture in air
- The lower the flash point, the more volatile a substance is considered

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Chemical Name	Flash Point (°F)
Gasoline	-45
Acetone	0
Methyl ethyl ketone (MEK)	16
Toluene	40
Ethyl alcohol (95%)	41
Diesel fuel no. 2	125
Antifreeze (undiluted)	232
Motor oil	401

Flammable Range

- Flammable range is the concentration range of gas/vapor that will burn or explode if an ignition source is introduced
  - Difference between LEL and UEL is the flammable range
  - The lower the LEL, the lower the vapor to air ratio needed to support combustion

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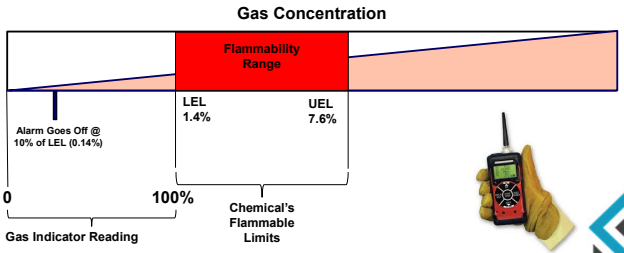
Chemical Name	LEL (%)	UEL (%)	Flammable Range
Acetone	2.5	12.8	10.3
Acetylene	2.5	100	97.5
Anhydrous ammonia	15	28	13
Diesel	0.6	7.5	6.9
Gasoline	1.4	7.6	6.3
Hydrogen	4	74	70
Methyl ethyl ketone (MEK)	1.4	11.4	10
Propane	2.1	9.5	7.4

Combustible Gas/Vapor Indicator



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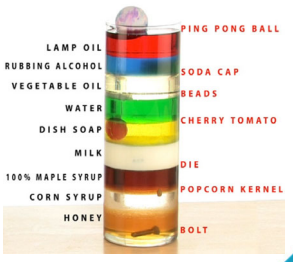
Specific Gravity

- Specific gravity is the ratio of the density of a solid or liquid compared to another reference material
- Reference material is usually water, where water = 1
  - < 1 = less dense than water (floats)
  - > 1 = more dense than water (sinks)



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Chemical Name	Specific Gravity
Gasoline	0.74
Diesel fuel no. 2	0.81
Motor oil	0.86
Toluene	0.87
PCBs (aroclor 54)	1.38
TCE (trichloroethylene)	1.46
Chloroform	1.48
Bromine	3.12
Mercury	13.6

Vapor Density

- Vapor density is the ratio of the density of air compared to another material
- Air = 1
  - < 1 = lighter than air (floats)
  - > 1 = heavier than air (sinks)

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Chemical Name	Vapor Density
Hydrogen	0.07
Helium	0.14
Acetylene	0.91
Hydrogen sulfide	1.19
Argon	1.38
Oxygen	1.43
Propane	1.55
Chlorine	2.47
Gasoline	3 to 4

Liquids

Gasoline
Diesel
Motor oil

WATER
(Specific gravity)

FLOATS

.7
.8
.9
1
2
3

SINKS

AIR
(Vapor density)

Vapor/Gas

Propane
Gasoline
Diesel

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Vapor Pressure

- Vapor pressure (VP) is the pressure exerted by a chemical vapor, in air, at a given temperature and pressure
- VP is commonly measured using "mmHg" or "atm" (atmosphere)
  - 1 atm = 760 mmHg
- Vapor pressure also corresponds to how fast a substance (liquid or solid) will evaporate (change from a liquid to a gas) once released to the atmosphere

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Chemical Name	Vapor Pressure (mmHg)
Propane	7,000
Ethyl ether	440
Methylene chloride	350
Acetone	180
Methanol	96
Methyl ethyl ketone	78
Benzene	75
Water	17.5
Ethylene glycol	0.06

Corrosiveness

Corrosiveness is a substance's ability to corrode metal or deteriorate skin tissue.

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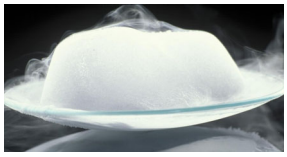
Concentration of Hydrogen ions compared to distilled water	1/10,000,000	14	Liquid drain cleaner, Caustic soda	Examples of solutions and their respective pH
	1/1,000,000	13	bleaches, oven cleaner	
	1/100,000	12	Soapy water	
	1/10,000	11	Household Ammonia (11.9)	
	1/1,000	10	Milk of magnesium (10.5)	
	1/100	9	Toothpaste (9.9)	
	1/10	8	Baking soda (8.4), Seawater, Eggs	
	0	7	"Pure" water (7)	
	10	6	Urine (6) Milk (6.6)	
	100	5	Acid rain (5.6) Black coffee (5)	
	1,000	4	Tomato juice (4.1)	
	10,000	3	Grapefruit & Orange juice, Soft drink	
	100,000	2	Lemon juice (2.3) Vinegar (2.9)	
	1,000,000	1	Hydrochloric acid secreted from the stomach lining (1)	
	10,000,000	0	Battery Acid	

Sublimation

Sublimation is the passing of a solid material directly to the vapor state without first melting.

Iodine Crystals



Dry Ice

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Incompatibility

Incompatibility refers to how substances adversely interact with other materials.

Organics

Fuels
Flammable liquids
Oils
Paints
Solvents

Oxidizers

Bromates
Nitrates
Perchlorates
Peroxides
Persulfates

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Incompatibility

- Workers must also be aware of materials that chemicals react with:
  - Ammonia: copper, brass, zinc, galvanized metals
  - Oxidizers (including concentrated sulfuric acid): rubber
  - Hydrogen peroxide: aluminum fittings
  - Hydrofluoric acid: glass
  - Water-reactive materials: vermiculite

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Resources for Determining Compatibility

- NIOSH Pocket Guide to Chemical Hazards
- Emergency Response Guidebook
- Chemical Reactivity Worksheet
- Safety Data Sheets (SDSs)
- WISER database
- CAMEO

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Section 3:
Toxicology

Toxicology

Toxicology is the study of the adverse health effects of chemicals on living systems, whether they be human, animal, plant, or microbe.

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Routes of Entry

Inhalation: the major route of entry for most chemicals in the form of vapors, gases, mists, or particulates

Absorption: (via skin, eye/mucous membrane) many chemicals can cross the skin barrier and be absorbed into the blood system

Ingestion: chemicals may inadvertently get into the mouth and be swallowed

Injection: substances may enter the body if the skin is penetrated or punctured by contaminated objects

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Degree of Exposure

- The degree of exposure is dependent on:
  - Route of exposure
  - Properties of the chemical
  - Dose
    - Chemical + concentration + time = dose
  - Frequency

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Degree of Exposure

- Other factors of exposure include:
  - Genetics
  - Sex (male/female)
  - Health
  - Age (newborn, child, adult, elderly)
  - Environment (day, night, temperature)
  - Pregnancy

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Acute vs. Chronic Exposure

Acute Exposure

- Short duration
- Often involves high concentration
- One-time, limited, or short-term exposure
- Effects are typically immediate
- Usually reversible

Chronic Exposure

- Extended time with low concentration
- Continuous, repeated, or long-term
- Often irreversible damage

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Measurements of Toxicity

- Dose-response is a comparison of an organism's response to a given material at a specific dose
- Dose-response curve
  - Toxic material normally thought of as harmless may induce a toxic response if taken into the body in sufficient amounts

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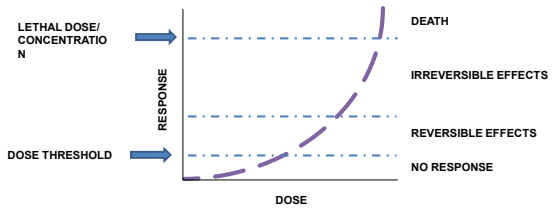
Measurements of Toxicity

Dose-Response Relationship



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Measurements of Toxicity

- LD_{50} is the amount of a material, given all at once, that causes the death of 50% of a group of test animals
  - LD_{50} is one way to measure the short-term poisoning potential (acute toxicity) of a material

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Measurements of Toxicity

Lethal Dose

- LD_{50}
- Only deaths measured
- Expressed in mg/kg
- Routes of entry:
  - Absorption
  - Ingestion

Lethal Concentration

- LC_{50}
- Only deaths measured
- Expressed in ppm or mg/m³
- Route of entry:
  - Inhalation

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Exposure Limits

- Permissible exposure limit (PEL)
  - Legal limit set by OSHA
  - Based on a time-weighted average (TWA) 8-hour day
- Ceiling limit is the threshold above which an employee's exposure to any OSHA-listed substance is not permitted
  - Exposure limit preceded by "C"

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NIOSH – REL

- Recommended exposure limit (REL)
  - TWA up to a 10-hour workday / 40-hour workweek
  - "C" – ceiling concentrations
  - "ST" – STEL
  - "Ca" – potential occupational carcinogen

CDC
CENTERS FOR DISEASE CONTROL AND PREVENTION

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NIOSH – IDLH

- Immediately dangerous to life or health (IDLH) refers to an airborne concentration that:
  - Poses an immediate threat to life and health;
  - Causes irreversible or delayed adverse health effects; AND/OR
  - Inhibits egress efforts from a dangerous atmosphere

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ACGIH – TLV-TWA

- The American Conference of Governmental Industrial Hygienists (ACGIH) creates exposure limits based on current research and information
- Threshold limit value – TWA (TLV-TWA)
  - Based on 8-hour workday / 40-hour workweek
  - Upper limit of a toxic material to which a person can be repeatedly exposed based on IH guidelines
  - Typically, stricter than PELs and RELs

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ACGIH-STEL

- TLV-STEL
  - 15-minute TWA exposure that should not be exceeded at any time during a workday
  - Should be less than 15 minutes
  - Should occur no more than four times per day
  - Should be at least 60 minutes between successive exposures in this range

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Kinetics

- Kinetics refers to the distribution of a chemical throughout the body
  - Blood system: arteries, capillaries, veins
  - Lymphatic system: completely separate circulation system
  - Mucous membranes

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Biotransformation

- Biotransformation is the process by which a chemical is transformed to another chemical within the body
- Elimination is removal of a substance (by metabolism or detoxification) via any of several different pathways:
  - Perspiration (sweating)
  - Exhalation (breathing)
  - Excretion (urination/defecation)
  - Expulsion (vomiting)

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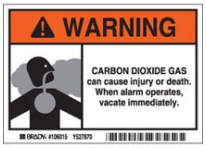
Toxic Respiratory Hazards: Asphyxiants

- Simple asphyxiants are gases that displace air at high concentrations
  - E.g., nitrogen
- Chemical asphyxiants are gases that prevent tissue from getting enough oxygen
  - E.g., carbon monoxide



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Toxic Respiratory Hazards: Irritants

- Irritants are chemicals that aggravate the air passages, causing constriction of the pathways
  - Can also cause fluid buildup in the lungs (pulmonary edema) and/or infection

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Upper Respiratory Irritants

- Upper respiratory irritants are substances that affect the upper respiratory tract (nose, mouth, trachea, lungs)
  - Usually water-soluble
  - Examples: anhydrous ammonia, bromine, hydrogen chloride

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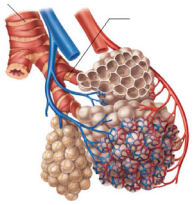
Lower Respiratory Irritants

- Lower respiratory irritants are substances that affect the part of the lungs where oxygen exchanges with cells
  - Usually not water-soluble
  - Examples: acrolein, nitrogen dioxide, phosphine



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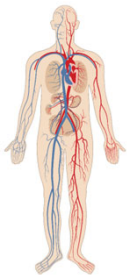
Systemic Toxins

- Systemic toxins are chemicals that target specific organs or systems throughout the body and will affect:
  - Central nervous system
  - Circulatory system
  - Liver (hepato-toxic agents)
  - Kidney (nephro-toxic agents)
  - Spleen
  - Reproductive organs



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External Toxins

- Skin – largest organ of the human body
  - Solvents, oils, metals, corrosives
- Eyes – most commonly affected organ
  - Caustics, acids, solvents, oils, lachrymators

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Special Toxins: Carcinogens

- Carcinogens are materials that cause uncontrolled cell growth
- Unlike other toxins
  - Very small amounts over extended periods
  - Effects usually not evident for years
  - More likely to occur after chronic exposure

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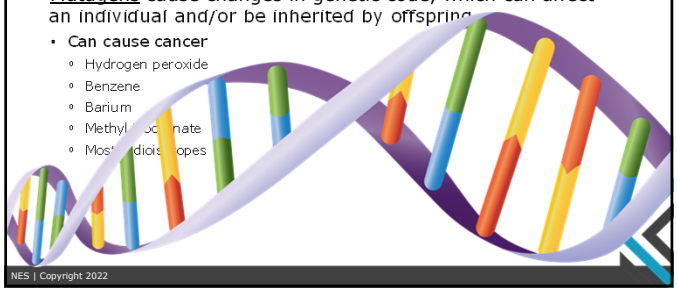
Special Toxins: Mutagens

- Mutagens cause changes in genetic code, which can affect an individual and/or be inherited by offspring
  - Can cause cancer
    - Hydrogen peroxide
    - Benzene
    - Barium
    - Methyl iodoacetate
    - Most radioisotopes



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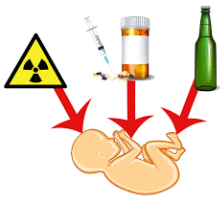
Special Toxins: Teratogens

- Teratogens are agents causing non-lethal congenital malformations
  - A baby will usually be born with birth defects
  - Examples:
    - Lead
    - Mercury compounds
    - Retinol
    - Thalidomide
    - Warfarin



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Section 4:

Physical Hazards

Physical Hazards

Hazardous waste operations often involve potential exposure to a wide range of physical hazards.

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Physical Hazard Definitions

- An accident is an undesired event that results in personal injury or property damage
- An incident is an unplanned, undesired event that adversely affects completion of a task
- A near miss is an incident in which no property was damaged and no personal injury was sustained, but damage and/or injury easily could have occurred given a slight shift in time or position

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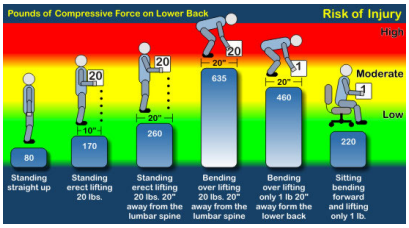
Back Injuries

- Improper lifting
- Slips, trips, falls
- Poor posture
- Poor ergonomics



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Proper Lifting Techniques

- Get a good footing
- Bend knees and use legs as lifting force to pick up and set down the load
- Keep your back straight
- If object is too heavy, use alternative lifting techniques (buddy, mechanical)

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Compressed Gas Cylinders

- All compressed gas cylinders pose a hazard that can cause injury or death
  - High pressure
  - Leaks
  - Corrosion
  - Other damage
- Each employer must determine that compressed gas cylinders are in a safe condition (to the extent that this can be determined by visual inspection)

NES | Copyright 2022 49 CFR 1910.101(a)

Cylinder Storage

- Cylinders are to be stored:
  - In a well-protected, well-ventilated, dry location at least 20 feet from highly combustible materials or incompatibles; OR
  - Separated by a noncombustible barrier at least 5 feet high or a minimum of 18 inches above tallest cylinder having a fire resistance rating of at least one hour

NES | Copyright 2022 8 CCR 4650(d)

Compressed Cylinder Storage

Single-chain storage (at least) is required

Double-chain storage often recommended

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Heat Illness Prevention

- The employer must develop, put in writing, and implement a Heat Illness Prevention Plan that includes the following:
  - Procedures for providing sufficient water
  - Procedures for providing access to shade (cool-down breaks)
  - High-heat procedures
  - Emergency response procedures
  - Acclimatization methods and procedures

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Heat Stress

- Hyperthermia is defined as the state in which an individual's body temperature is elevated above his/her normal range
- Workers need to be able to identify the symptoms of early heat stress to prevent heat-related disorders or conditions and possible death to themselves and their fellow workers

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Types of Heat Stress

- Heat rash is caused by continuous exposure to heat or humid air
- Heat cramps result from heavy sweating and inadequate electrolyte replacement
- Heat exhaustion is caused by inadequate blood circulation due to cardiovascular insufficiency or dehydration
- Heat stroke is a medical emergency in which temperature regulation fails and body temperature rises to critical levels

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Cold Stress

Hypothermia is defined as the state in which an individual's body temperature reaches or falls below 95°F.

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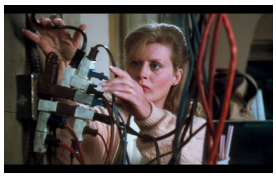
Electrical Hazards

- Electrical hazards can exist at any site
  - Exposed wires
  - Improper use of electrical tools
  - Underground electrical services
  - Overhead electrical services



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Hearing Conservation Program

- The employer shall administer a continuing, effective hearing conservation program
  - Employee exposures equal or exceed 8-hour TWA of 85 decibels

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Hearing Conservation

- A decibel (dB) is a unit of measurement of sound level
- The action level is:
  - An 8-hour time-weighted average of 85 decibels measured on the A scale (slow response); OR
  - A dose of 50%, at which action to protect employees must be taken by the employer

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Hearing Conservation Definitions

- Noise hazards are operations/equipment resulting in sound levels that exceed the action level
- Permissible exposure limit (PEL) is the maximum legal noise exposure, set by Cal/OSHA, at an 8-hour TWA of 90 dBA

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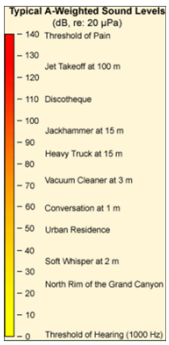
Noise Levels

- Measured in decibels (dB)
  - Whisper: 10 – 20 dB
  - Speech: 60 dB
  - Noisy office: 80 dB
  - Lawnmower: 95 dB
  - Passing truck: 100 dB
  - Jet engine: 150 dB



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Hearing Protection Devices

- Ear plugs – preferred (NRR 20 – 30 dB)
- Ear muffs – 2nd choice (NRR 15 – 30 dB)
- Double hearing protection (plugs and muffs) is used when a single device cannot reduce the noise level below the PEL

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Fall Protection

- The standards for fall protection are industry- and operation-specific
  - Regulated trigger heights range from 4 to 30 feet
- OSHA requires that fall protection be provided when working over dangerous equipment and machinery, regardless of the fall distance

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Section 5:

Special Hazards

Confined Spaces

- Causes of fatalities in confined spaces:
  - Failure to recognize a confined space
  - Failure to test the atmosphere prior to and/or during entry
  - Failure to ventilate prior to and/or during entry
  - Failure to eliminate physical hazards from the confined space
- 60% of all confined space fatalities are would-be rescuers

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Confined Spaces

- A confined space is a space that:
  - Is large enough and so configured that an employee can enter and perform work
  - Has limited or restricted means of entry or exit
  - Is not designed for continuous human occupancy

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Non-Permit Confined Space

- A confined space with the following characteristics can be classified as a non-permit confined space:
  - Does not contain, or, with respect to atmospheric hazards, have the potential to contain, any hazard capable of causing death or serious physical harm
  - Acceptable O_2 level of 19.5% – 23.5%
  - Flammable atmosphere of ≤ 10% of the LEL
  - Toxicity ≤ published PEL

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Permit-Required Confined Space

- A permit-required confined space is a confined space having one or more of the following characteristics:
  - Contains, or has the potential to contain, a hazardous atmosphere;
  - Contains a material that has the potential for engulfing an entrant;
  - Has an internal configuration such that an entrant could become trapped or asphyxiated; AND/OR
  - Contains any other serious safety or health hazard

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Alternate Procedures

- Alternate entry procedures apply when an employer temporarily reclassifies a space by demonstrating that:
  - The only hazard posed by the permit space is an actual or potential hazardous atmosphere
  - Continuous forced air ventilation alone is sufficient to maintain the permit space as safe for entry
- Must develop air monitoring and inspection data that support the demonstrations required by OSHA
  - If an initial entry of the permit space is necessary to obtain the data required, follow confined space permit guidelines

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Entry

- Entry is the act by which a person intentionally passes through an opening into a permit-required confined space
  - Any part of the body passing through the opening is considered entry
  - Even reaching in to test the atmosphere can be considered entry

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Entrant

Authorized entrant means an employee who is authorized by the employer to enter a permit space.

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Attendant

- An individual stationed outside one or more permit spaces who monitors the authorized entrants and who performs all attendant's duties assigned in the employer's permit space program

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Entry Supervisor

- The entry supervisor is the person (such as the employer, foreman, or crew chief) responsible for:
  - Determining if acceptable entry conditions are present at a permit space where entry is planned
  - Authorizing entry
  - Overseeing entry operations
  - Terminating entry (as required by regulations)

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Hazardous Atmospheres

- Oxygen deficiency and enrichment:
  - Oxygen-deficient atmosphere: < 19.5%
  - Oxygen-enriched atmosphere: > 23.5%
- Flammable atmosphere:
  - > 10% of the LEL
- Toxic environment:
  - Toxicity > PEL or any IDLH

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Combustible Dust

When dust becomes airborne, it can reach a concentration in air that becomes flammable or explosive.

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Combustible Dust

- Common materials that can create explosive dust atmospheres:
  - Carbon
  - Grain
  - Cellulose
  - Fibers
  - Plastics
  - Most finely ground materials
  - Certain metals

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Emergency: Hazardous Atmosphere

- Any time a hazardous atmosphere is discovered, no matter what the reason, all personnel must immediately exit the space, and no others may enter until atmospheric conditions are returned to safe levels
- THERE ARE NO EXCEPTIONS TO THIS!

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Rescue Services

- Before entering a confined space, a rescue plan must be in place and everyone needs to understand what to do in the event of an emergency
- All work STOPS in the event of an emergency
- Self-rescue is the preferred method for exiting the space
- Non-entry rescue is the next best method if a person cannot get out of the space under his/her own power

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Entry Rescue

- Entry rescue is when a rescue person enters the space to get a person out
- The employer must ensure that at least one trained standby person is at the site and is immediately available to perform rescue and emergency services
- This person needs to hold a current certification of First Aid/CPR and must be trained in the use of any equipment that would be used in the event of a rescue

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Trenching & Excavation

- Trenching is one of the most hazardous construction operations
- Most accidents occur in trenches 5 – 15 feet deep
- There is usually no warning before a cave-in

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Trenching & Excavation

- A competent person is an employee with:
  - Knowledge of the regulations
  - Knowledge of soil analysis
  - Knowledge of the use of protective systems
  - Authority to take prompt corrective action
  - Ability to recognize and test for a hazardous atmosphere

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Trenching & Excavation

The competent person performs daily inspections.

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29 CFR 1926.651(k)(1)

Trenching & Excavation

- Trench safety overview:
  - Spoil pile needs to be at least 2′ from leading edge
  - When a trench depth reaches 4′, entry/egress needs to be within 25′ laterally
  - When trench depth reaches 4′, air monitoring for actual/potential hazardous atmosphere and rescue equipment are required (SCBA, ventilation, rescue basket)
  - *[Continued…]*

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Trenching & Excavation

- When a trench reaches 5′ or more in depth, protective systems must be used (sloping, benching, shoring, etc.)
- When a trench reaches 20′, all protective systems must be approved by a state-registered Professional Engineer

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Section 6:

Biological Hazards

Biological Hazards

- There are a variety of biological hazards that personnel may be exposed to while performing work
- Every worksite has its own set of hazards

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Domestic Animals

- Dogs
  - All dogs have the potential to bite and cause injuries; dogs can have a bite force of 200 – 600 pounds of pressure
- Cats
  - Bacteria can cause infection of a bite wound and result in painful swelling and tissue damage

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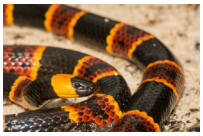
Venomous Snakes

- There are four common venomous snakes in the U.S., which fall into two groups:
  - Coral snakes
  - Pit vipers
    - Rattlesnake
    - Cottonmouth
    - Copperhead



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Hemotoxic Venom

- Hemotoxic venom contains toxins that:
  - Destroy red blood cells;
  - Disrupt blood clotting; AND/OR
  - Cause organ degeneration and generalized tissue damage to both blood and blood-forming organs

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Neurotoxic Venom

Neurotoxic venom is a toxin that acts directly on the tissues of the central nervous system.

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Venomous Snakes: Rattlesnakes

- The rattlesnake is the only venomous snake native to California
- Found in the southwest, south, and eastern U.S.
- Venom can be hemotoxic and neurotoxic
- 16 species of rattlesnake in the U.S.

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Snake Bites – Do

- For a snake bite:
  - Calm the victim
  - Gently wash area with soap and water
  - Remove any jewelry or clothing that may constrict swelling
  - Apply a cold, wet cloth over the area
  - Get medical attention

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Snake Bites – Don’t

- Don’t apply a tourniquet
- Don’t pack the bite area in ice
- Don’t cut the wound with a knife or razor
- Don’t suck out the venom by mouth
- Don’t let the victim drink alcohol

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Flying Insects

- Insect stings can produce different reactions, ranging from temporary pain and discomfort to a severe allergic reaction
- Anaphylaxis is a serious allergic response that often involves swelling, hives, lowered blood pressure, and, in severe cases, shock
  - Anaphylactic shock can be fatal if not treated immediately

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Scorpions

- Scorpion stings may require medical attention
- Venom may produce severe pain, swelling, and numbness
  - Stings are usually not life-threatening

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Spiders

- Common venomous spiders are the black widow and the brown recluse
- Bites from the brown recluse usually cause skin necrosis

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Scorpion & Spider Treatment

- Scorpion stings and spider bites may require medical attention for small children, immunocompromised individuals, or those who have a severe allergic reaction
- Minimal first aid is usually acceptable:
  - Remove constricting materials (clothes, jewelry)
  - Wash the site
  - Apply a cold compress
  - Administer pain relievers
  - Provide general first aid to the affected site

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Poison Oak

- Poison oak can be poisonous to humans
- These plants produce skin irritation, blisters, and, potentially, a life-threatening reaction that can lead to death

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Poison Oak Treatment

- Wash the exposed area with soap and water
- Remove contaminated clothing
- Ease itching and discomfort (OTC medications, prescriptions)
- See a doctor if symptoms become more severe
- Call 911 if experiencing trouble swallowing or breathing or if there is swelling near the eyes or face

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Hantavirus Pulmonary Syndrome

- First recognized in 1993, hantavirus pulmonary syndrome (HPS) is a potentially severe viral disease of the lungs that is carried by wild mice and shed in their feces, urine, and saliva
- HPS is a rare but often fatal disease

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Lyme Disease

Lyme disease is transmitted to humans by the bite of infected blacklegged ticks (deer ticks), which begin to transmit the disease an average of 36 to 48 hours after attachment.

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Lyme Disease

- Typical symptoms include:
  - Fever
  - Headache
  - Fatigue
  - Chills & sweats
  - Joint pain
  - Skin rash
- Lyme rash (bull's-eye-shaped rash) will form in 30% – 80% of cases

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Mosquito-Borne Diseases

- Mosquito-borne diseases are spread by the bite of an infected mosquito and include:
  - Zika virus
  - West Nile virus
  - Chikungunya virus
  - Dengue
  - Malaria
- Severe cases can cause death
- Employers must adequately protect employees

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Bloodborne Pathogens

- Using universal precautions is an approach to infection control:
  - All human blood and certain human body fluids are treated as if known to be infectious for HIV, HPV, HCV, and other bloodborne pathogens

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Bloodborne Pathogens

- Risk of infection depends on several factors:
  - Pathogen involved
  - Type/route of exposure
  - Amount of virus in the infected blood at the time of exposure
  - Amount of infected blood involved in the exposure
  - Whether post-exposure treatment was taken
  - Specific immune response of the infected individual

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Bloodborne Pathogens

- Hepatitis
  - Several different variations of hepatitis (A-E, G)
  - Hepatitis B and C most common
    - HBV can live outside of the body for up to one month
  - Passed by contact with infected blood or blood-contaminated products
  - No known cure for hepatitis B or C, but both can be treated
  - No vaccine for hepatitis C

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Bloodborne Pathogens

- Human immunodeficiency virus (HIV)
  - Only lives in blood and body fluids
    - Can survive outside the body for approximately two minutes
  - No known cure, but is treatable
  - Antiretroviral medication therapy can slow disease progress

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Cal/OSHA Emergency COVID-19 Regulations

Emergency Standards

- Cal/OSHA Emergency Temporary Standards were approved on November 30, 2020
- Amended June 17, 2021
- Applies to most workers not covered by 8 CCR 5199, Aerosol Transmissible Diseases Standard (health care facilities)

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Definitions

- COVID-19 is a coronavirus disease caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2)
- COVID-19 case:
  - Has a positive test
  - Subject to isolate by health official
  - Died due to COVID-19
- Person is no longer a "case" if a licensed healthcare professional determines as such

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COVID-19 Symptoms

- Fever of 100.4°F or higher
- Chills
- Cough
- Shortness of breath or difficulty breathing
- Fatigue
- Muscle or body aches
- Headache
- New loss of taste or smell
- Sore throat
- Congestion or runny nose
- Nausea or vomiting
- Diarrhea

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Definitions

- Close Contact means being within six feet of a COVID-19 case for a cumulative total of 15 minutes or greater in any 24-hour period
- A COVID-19 hazard creates exposure to the virus that causes COVID-19 (SARS-CoV-2)
- A COVID-19 test is an FDA-approved viral test for SARS-CoV-2

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Definitions

- An exposed group means all employees at a work location, working area, or a common area at work, where an employee COVID-19 case was present at any time during the high-risk exposure period.
- A high-risk exposure period is two days before first developed symptoms until 10 days after symptoms first appeared, and 24 hours have passed with no fever

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Written Program

- Employers must establish, implement, and maintain an effective written COVID-19 Prevention Program
- May be integrated into employer's Injury Illness Prevention Program, or IIPP
  - 8 CCR 3203

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Written Program

1. System for Communication

- Establish system for communication
  - Employee reporting to employer – possible exposures
  - Descriptive procedures for accommodating employees with conditions that put them at increased risk
  - Access to COVID-19 testing
  - Hazards of COVID-19 within the workplace

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2. Identification and Evaluation

- Identification and evaluation of COVID-19 hazards
  - Must allow for employee participation in identification and evaluation of COVID-19 hazards
  - Process for screening employees and response
  - Policies and procedures to respond to a COVID-19 case

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3. Investigating and Responding

- Investigating and responding to COVID-19 cases
  - Determine date and time the employee first had symptoms
  - Determine who may have had close contact.
  - Give written notice to all employees without identifying personal information
  - Offer testing at no cost during work hours to all employees potentially exposed
  - Investigate any conditions that could have contributed and determine how to reduce hazards

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4. Correction

- Correction of COVID-19 hazards
  - Employers must implement effective policies and/or procedures for correcting unsafe or unhealthy conditions

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5. Training and Instruction

- The employer must provide effective training and instruction to protect employees from COVID-19 hazards
  - Policies and procedures (COVID-19 Prevention Program)
  - Information regarding COVID-19-related benefits to which the employee may be entitled
  - How COVID-19 is transmitted

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6. Face Coverings

- Employers must:
  - For all employees who are not fully vaccinated, employers shall provide face coverings and ensure they are worn when indoors or in vehicle
  - Employers shall ensure that required face coverings are clean and undamaged, and that they are worn over the nose and mouth

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7. Control Methods

- Engineering controls, administrative controls, and PPE
- Where it is not possible to maintain the physical distancing requirement at all times, the employer must install cleanable solid partitions
- Must maximize the quantity of outside air provided to the extent feasible

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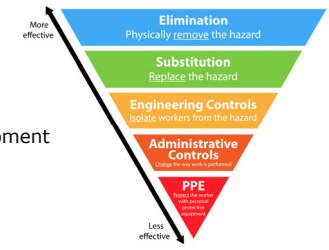
Hierarchy of Controls

- Elimination
- Substitution
- Engineering
- Administrative
- Personal protective equipment



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8. Reporting, Recordkeeping, and Access

- Report cases to local health department when required
- Report to Cal/OSHA any COVID-19 related serious illnesses or deaths
- Maintain records of the steps taken to implement written program
- Make written program available to employees
- 300 Log

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9. Exclusion and Close Contact

- Ensure that COVID-19 cases are excluded from the workplace
- Exceptions:
  - Employees who were fully vaccinated before the close contact and who do not develop COVID-19 symptoms
  - COVID-19 cases who returned to work and have remained free of COVID-19 symptoms, for 90 days after the initial onset of COVID-19 symptoms or, for COVID-19 cases who never developed COVID-19 symptoms, for 90 days after the first positive test.

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10. Returning to Work

- Returning to work
  - At least 24 hours since fever resolved without medication
  - Symptoms have improved AND 10 days have passed since symptoms first appeared
  - Negative test not required

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Cal/OSHA Model Program

Model COVID-19 Prevention Program (CPP)

With some exceptions, all employers and places of employment are required to establish and implement an effective written COVID-19 Prevention Program (CPP) pursuant to an Emergency Temporary Standard in place for COVID-19 (California Code of Regulations (CCR), Title 8, section 3205(c)). Cal/OSHA has developed this model program to assist employers with creating their own unique CPP tailored to their workplace.

Employers are not required to use this program. Employers may create their own program or use another CCP template. Employers can also create a written CCP by incorporating elements of this program into their existing Injury and Illness Prevention Program (IIPP). If desired, Cal/OHA encourages employers to engage with employees in the design, implementation and evolution of their COVID-19 Prevention Program.

Using this model alone does not ensure compliance with the emergency temporary standard. To use this model program effectively, the person(s) responsible for implementing the CPP should carefully review:

- All of the elements that may be required in the following CCR, Title 8 sections:
  - 3205, COVID-19 Prevention
  - 3205.1, Multiple COVID-19 Infection and COVID-19 Outbreaks
  - 3205.2, Major COVID-19 Outbreaks
  - 3205.3, Employer Notification of Exposed Employees
  - 3205.4, COVID-19 Prevention in Employer-Provided Transportation to and from Work
  - The four **Additional Considerations** provided at the end of this program to see if they are applicable to your workplace.
- The additional guidance materials available at www.dir.ca.gov/dosh/coronavirus/

November 2020

COVID-19 Prevention Program (CPP) for [Name of Company, or name of the workplace if it's for a fixed location.]

This CPP is designed to control exposures to the SARS-CoV-2 virus that may occur in our workplace.

Date: [type date of last review]

Authority and Responsibility

[Enter name or job title of the person(s)] has overall authority and responsibility for implementing the provisions of this CPP in our workplace. In addition, all managers and supervisors are responsible for implementing and maintaining the CPP in their assigned work areas and for ensuring employees receive answers to questions about the program in a language they understand.

All employees are responsible for using safe work practices, following all directives, policies and procedures, and assisting in maintaining a safe work environment.

Identification and Evaluation of COVID-19 Hazards

We will implement the following in our workplace:

- Conduct workplace-specific evaluations using the **Appendix A: Identification of COVID-19 Hazards** form.
- Evaluate employees' potential workplace exposures to all persons at, or who may enter, our workplace.
- Review applicable orders and general and industry-specific guidance from the State of California, Cal/OSHA and the local health department related to COVID-19 hazards and prevention.
- Evaluate existing COVID-19 prevention controls in our workplace and the need for different or additional controls.
- Conduct periodic inspections using the **Appendix B: COVID-19 Inspections form** as needed to identify unhealthy conditions, work practices, and work procedures related to COVID-19 and to ensure compliance with our COVID-19 policies and procedures.
- **[Enter other identification and evaluation measures you take in your workplace].**

Employee participation

Employees and their authorized employees' representatives are encouraged to participate in the identification and evaluation of COVID-19 hazards by **[describe how employees and their representatives, if any, may participate in COVID-19 hazard identification and evaluation.]**

Employee screening

We screen our employees by: **[describe how this will be accomplished – i.e., directly screen employees when they come to work, or having them self-screen according to CDPH guidelines. Ensure that face coverings are used during screening by both screeners and employees and, if temperatures are measured, that non-contact thermometers are used.]**

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Section 7:
Personal Protective Equipment

PPE

- The employer must assess the workplace to determine if hazards are present, or are likely to be present, that necessitate the use of personal protective equipment
- If potential hazards exist, the employer must:
  - Select, and have each affected employee use, the types of PPE that will protect the affected employee from the hazards identified in the hazard assessment
  - Communicate selection decisions to each affected employee
  - Select PPE that properly fits each affected employee

NES | Copyright 2022 8 CCR 3380

PPE

- Protective clothing is for chemical exposure hazards
- Protective equipment is for chemical and/or physical hazards

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Tychem® PPE

Tychem® 2000 | Tychem ® 4000 | Tychem ® 6000 | Tychem ® 6000FR | Tychem ® 10000

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Level A

- Fully encapsulated suit (Tychem® 10,000) and SCBA
  - Maximum respiratory, skin, and eye protection
  - Will a level A suit always provide protection from all hazards for the full duration of a job?

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Level B

- Full-body chemical suit and SCBA or airline respirator
  - Maximum respiratory and moderate skin protection

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Level C

- Protective suit & air-purifying respirator (APR)
  - Moderate respiratory and skin protection

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Modified Level D

- Chemical protective suit for nuisance chemical exposure
- No respiratory protection

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Level D

- Work uniform
- High-visibility safety vest
- Eye, head, foot, and hand protection

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PPE Materials

- Neoprene
  - Acids, caustics, solvents
- Nomex®
  - Flame protection
- Kevlar®
  - Cut protection

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Selection Criteria: Hazard Assessment

- Type of hazard
  - Chemical properties, physical properties
- Degree of hazard
  - Severity, concentration of chemical
- Duration of exposure
  - Time
- Nature of activity
  - Incidental contact vs. engulfment

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Selection Criteria: Hazard Assessment

- PPE strength & resistance
  - Chemical contaminants
  - Resistance to tears and punctures
- PPE flexibility
  - Freedom of movement
- PPE temperature limits
  - Temperature range
- Durability of PPE
  - Resistance to abrasion, fatigue, wearing
- Ability to clean the PPE
  - Ability to decon, wash, reuse

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Chemical Exposure Considerations

- Degradation
  - Chemical attack on the item
- Permeation (chemical permeation data tables)
  - Chemical movement via concentration gradient
- Penetration
  - Chemical movement through physical opening such as zippers, seams, improper placement of exhaust valves
    - Suit interface (glove & sleeve, boot & leg, hood & respirator)

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Clothing Types

- Disposable
  - Remove and dispose of after each use
- Reusable
  - Must be cleaned and inspected after each use

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Clothing Types

- Boots and booties
  - Material composition
  - Steel toed
  - Type of sole
- Suits
  - One-, two-, and three-piece outfits
- Gloves
  - Material composition
  - Inner and outer

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PPE Standards

- ASTM International (formerly known as American Society for Testing and Materials)
- NFPA (National Fire Protection Association)
  - Chemical protective suits
- ANSI (American National Standards Institute)
  - Safety glasses
  - Footwear

ASTM INTERNATIONAL

ANSI American National Standards Institute

NFPA National Fire Protection Association

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Prior to Use

- Assess hazards and operational requirements
- Properly select equipment
- Plan and prioritize activities
- Anticipate emergencies

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During Use

- Conduct periodic integrity checks
- Monitor for heat stress
- Implement safe work activities
- Avoid false sense of security
- Always use within limits

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After Use

- Visual check
  - Zippers, exhaust valves, seams, and gloves (if attached)
- Pressure check
  - Following manufacturer guidelines
- Store properly
  - Keep in a cool environment

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Head Protection: Hard Hats

- Class G
  - Limited protection (2,200 V)
- Class E
  - High protection (20,000 V)
- Class C
  - No voltage protection

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Eye & Face Protection

- Safety glasses (minimum requirement)
- Goggles
  - Protection from chemicals, splashes, dust, or projectiles
- Face shield
  - Protection from splashes or projectiles
- Chemical splash hood
  - Shoulder-length or longer

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Hand Protection

- Gloves/sleeves
  - General duty
    - Cotton, leather
  - Sharp objects, cuts
    - Leather, Kevlar®
  - Chemical
    - Multiple types

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Foot Protection

- Shoes/boots
  - Steel toe
    - Compression, puncture
  - Composite toe
    - Compression, impact
  - Metatarsal guards
    - Protects top of foot behind toe
  - Chemical resistant
    - Prevents contact with chemicals

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Section 8:

Respiratory Protection

Introduction

- When employees must work in environments with insufficient oxygen or where harmful dusts, fogs, smoke, mists, fumes, gases, vapors, or sprays are present, they need to utilize respiratory protection equipment
- Employees need to wear respirators whenever engineering and work practice control measures are not adequate to prevent atmospheric contamination at the worksite

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OSHA Respiratory Protection Regulations

- A respirator must be provided to each employee when such equipment is necessary to protect the health of the employee
- The employer must provide respirators that are applicable and suitable for the purpose intended
- The respiratory protection program must cover each employee required to use a respirator

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OSHA Respiratory Protection Standard

- 29 CFR 1910.134 (federal)
- 8 CCR 5144 (California)
  - Applies to all respirator use
  - Implemented since mid-1970s
  - Revised in 1998
- The OSHA standard requires that respiratory protection training include covering the standard

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Written Program

- Worksite-specific procedures
- Program/hazard evaluation
- Training
- Medical evaluations
- Fit testing
- Selection & use
- Inspection & maintenance

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Worksite-Specific Procedures

OSHA requires the employer to develop and implement a written respiratory protection program with required worksite-specific procedures and elements for required respirator use.

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Air-Purifying Respirators

- Air-purifying respirator (APR)
  - Particulate filter
  - Gas & vapor filter
  - Combination filter
- Powered air-purifying respirator (PAPR)
  - Belt- or mask-mounted powered filter

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Supplied Air Respirators

- Supplied air respirator (SAR)
  - Airline respirator
  - Self-contained breathing apparatus
  - Combination

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Respirator Limitations

- Filtering, tight-fitting respirators:
  - Limited filter/canister life
  - Does not remove contaminants from the air
  - Can be tiring/uncomfortable to wear
  - Depends on quality of respirator seal
    - Facial hair interferes with the seal of a tight-fitting respirator
      - » Do not wear a tight-fitting respirator if you have facial hair that comes between the respirator seal and the skin

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Seal Checks

- Negative-pressure seal check
  - Cover open end of cartridges with palms
  - Inhale slowly
    - Facepiece should tighten around the face
  - Hold breath briefly to detect any leaks

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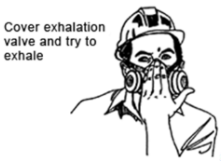
Seal Checks

- Positive-pressure seal check
  - Cover the exhalation valve with palm
  - Gently exhale (do not exhale a large amount of air rapidly)
    - Facepiece should expand around the face
  - Maintain positive pressure briefly to detect any leaks



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Using a Respirator

- Respirators should not be removed inside respirator use areas
- If a respirator malfunctions, you should immediately leave the respirator use area – leave the area if:
  - You detect a vapor or gas breakthrough;
  - There is a change in breathing resistance;
  - To replace the canister, cartridge, or filter; OR
  - To wash face and respirator

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Self-Contained Breathing Apparatuses

- Self-contained breathing apparatus (SCBA) components:
  - Backpack
  - Air cylinder
  - Regulator
  - Facepiece

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Respirator Parameters & Requirements

- Protection factor
- Fit test
- Obstruction to a proper face seal
- Written Respirator Protection Program
- Training
- Medical surveillance
- Hazard evaluation & assessment
- Maintenance, inspection & storage
- NIOSH approval
- Safe work practices

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Assigned Protection Factors (APFs)

Employers must use the assigned protection factors established by NIOSH to select a respirator.

Type of respirator[1], [2]	Quarter Mask	Half Mask	Full Facepiece	Helmet Or Hood	Loose-fitting Facepiece
1. Air-Purifying Respirator	5	[3]10	50	.....	.....
2. Powered Air-Purifying Respirator (PAPR)	.....	50	1,000	[4]25/1,000	25
3. Supplied-Air Respirator (SAR) or Airline Respirator					
• Demand mode	.....	10	50	.....	.....
• Continuous flow mode	.....	50	1,000	[4]25/1,000	25
• Pressure-demand or other positive-pressure mode	.....	50	1,000	.....	.....
4. Self-Contained Breathing Apparatus (SCBA)					
• Demand mode	.....	10	50	50	.....
• Pressure-demand or other positive-pressure mode (e.g., open/closed circuit)	.....	.....	10,000	10,000	.....

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Limitations of Air-Purifying Respirators

- Concentration of contaminant
- Oxygen level (19.5% – 23.5%)
- Cartridge useful life
- Chemical warning properties
- Potential for flash fire
- Duration of work
- Proper training / fit test

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Limitations of Supplied Air Respirators

- Concentration of contaminant
- Must provide "Grade D" air source
- More cumbersome/unwieldy
- Mobility (airline style)
- Length of work time (SCBA style)
- Length of travel distance (300' airline)
- Proper training / fit test

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Section 9:

Protection from Wildfire Smoke

California Wildfire Smoke Emergency Order

- The California Wildfire Smoke Emergency Order is a recent emergency order set forth by the Cal/OSHA Standards Board
  - States that employers must take action to protect workers in the field from wildland fire smoke exposure
- This section is intended to provide guidance for making informed decisions regarding protection from wildfire smoke and establishes the responsibility of employers and their employees to identify and assess hazards in order to most efficiently protect themselves

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Wildfire Smoke Regulation

- How employees can obtain the current AQI for PM2.5
- The health effects of wildfire smoke
- Methods to protect employees from wildfire smoke
- The employer's two-way communication system
- The importance, limitations, and benefits of using a respirator when exposed to wildfire smoke
- Proper respirator use and maintenance

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Appendix B to §5141.1 of the California Wildfire Smoke Emergency Order 2019-0719-04E

Definitions

- Current Air Quality Index (Current AQI) is the method used by the U.S. Environmental Protection Agency (U.S. EPA) to report air quality on a real-time basis
- PM2.5 are solid particles and liquid droplets suspended in air, known as particulate matter, with an aerodynamic diameter of 2.5 micrometers or smaller
- Wildfire smoke is emissions from fires in "wildlands"

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Current AQI

- Current AQI is also referred to as the "NowCast"
  - Available at https://airnow.gov/
- Represents data collected over time periods of varying lengths in order to reflect present conditions as accurately as possible

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Taken from airnow.gov

Determining Exposure to PM2.5

- Employers must determine exposure to PM2.5 for worksites before each shift and periodically thereafter, as needed, by checking AQI forecasts and the Current AQI for PM2.5 at:
  - U.S. EPA AirNow website (https://gispub.epa.gov/airnow/);
  - U.S. Forest Service Wildland Air Quality Response Program website (https://sites.google.com/firenet.gov/wfaqrp-external/home); AND/OR
  - California Air Resources Board website (https://ww2.arb.ca.gov/homepage)

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Section 5141.1 of the California Wildfire Smoke Emergency Order 2019-0719-04E

Wildfire Smoke Hazards

- Wildfire smoke is a mixture of gases and fine particles from burning vegetation and other materials
- The gases and particles from wildfire smoke pose the biggest risk
  - Particles larger than 10 micrometers usually irritate only the eyes, nose, and throat
  - Particles that are 2.5 micrometers or smaller (PM2.5) can be inhaled into the deepest part of the lungs and may cause health issues

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Wildfire Smoke Hazards

- Some immediate health effects from breathing in wildfire smoke include:
  - Runny nose
  - Irritated sinuses
  - Chest pain
  - Headaches
  - Asthma attacks
  - Coughing
  - Trouble breathing
  - Stinging eyes
  - Scratchy throat

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Air Quality Index from Airnow.gov

- "Unhealthy" AQI is 151 to 200
  - Everyone may begin to experience some adverse health effects
  - Members of sensitive groups may experience more serious effects

Air Quality Index (AQI) Values	Levels of Health Concern	Colors
When the AQI is in this range:	*..air quality conditions are:*	*...as symbolized by this color:*
0 to 50	Good	Green
51 to 100	Moderate	Yellow
101 to 150	Unhealthy for Sensitive Groups	Orange
151 to 200	Unhealthy	Red
201 to 300	Very Unhealthy	Purple
301 to 500	Hazardous	Maroon

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Taken from Airnow.gov

Air Quality Index from Airnow.gov

- "Very Unhealthy" AQI is 201 to 300
  - This would trigger a health alert signifying that everyone may experience more serious health effects

Air Quality Index (AQI) Values	Levels of Health Concern	Colors
When the AQI is in this range:	*..air quality conditions are:*	*...as symbolized by this color:*
0 to 50	Good	Green
51 to 100	Moderate	Yellow
101 to 150	Unhealthy for Sensitive Groups	Orange
151 to 200	Unhealthy	Red
201 to 300	Very Unhealthy	Purple
301 to 500	Hazardous	Maroon

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Taken from Airnow.gov

Air Quality Index from Airnow.gov

- "Hazardous" AQI is greater than 300
  - This would trigger a health warning of emergency conditions
  - The entire population is likely to be affected

Air Quality Index (AQI) Values	Levels of Health Concern	Colors
When the AQI is in this range:	*...air quality conditions are:*	*...as symbolized by this color:*
0 to 50	Good	Green
51 to 100	Moderate	Yellow
101 to 150	Unhealthy for Sensitive Groups	Orange
151 to 200	Unhealthy	Red
201 to 300	Very Unhealthy	Purple
301 to 500	Hazardous	Maroon

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Taken from Airnow.gov

Control of Harmful Exposures to Employees

- Employers can to reduce employee exposure to PM2.5 to less than a current AQI of 151 by:
  - First, when feasible, providing enclosed buildings, structures, or vehicles in which the air is filtered; OR
  - Relocating work to a location where the current AQI for PM2.5 is lower

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§5141.1 of the California Wildfire Smoke Emergency Order 2019-0719-04E

Exemptions

- Enclosed buildings or structures in which the air is filtered by a mechanical ventilation system
- Enclosed vehicles
- Concentration of PM2.5 in the air does not exceed a concentration that corresponds to a current AQI of 151 or greater
- Employees are exposed to a current AQI for PM2.5 of 151 or greater for a total of one hour or less during a shift
- Firefighters engaged in wildland firefighting

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Communication

- The employer must establish and implement a system for communicating wildfire smoke hazards by:
  - Informing employees of:
    - The current AQI for PM2.5
    - Protective measures available to employees to reduce their wildfire smoke exposures
  - Encouraging employees to inform their employer of:
    - Worsening air quality
    - Any adverse symptoms that may be the result of wildfire smoke exposure such as asthma attacks, difficulty breathing, and chest pain

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Section 10:

Air Monitoring

Purpose of Air Monitoring

- Air monitoring provides critical information necessary for:
  - Selecting proper personal protective equipment
  - Specifying safe work practices
  - Assessing the potential health effects
  - Determining actions to mitigate the hazards
  - Helping to determine work zones and decon, isolation, and evacuation areas

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Methods

- Real-time field monitoring
  - Using portable field instruments
- Air sampling
  - Using laboratory analysis

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Types of Data

- Qualitative data
  - Identifies hazards that are present
- Quantitative data
  - Specifies the concentration of the hazards
- Combination
  - Most equipment provides both qualitative and quantitative data

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Characteristics

- Consider the following characteristics when selecting instruments:
  - Intrinsic or inherent safety – resistance to fire or explosion
  - Useful results – response times
  - Selectivity – identify specific chemicals
  - Sensitivity – lowest concentration
  - Error – accurate/precise
  - Portability – shock, damage, lightweight

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Sampling

- Obtain enough samples from different locations to assess the entire site
  - One-time and continuous sampling
- Considerations while sampling:
  - Vapor density
  - Changing environmental conditions
  - Frequency
  - Foot traffic
  - Off-site contributing factors

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Multi-Gas Detectors

- Multi-gas detectors can detect up to five gases simultaneously with features that include:
  - Data logging
  - Oxygen detection
  - Toxicity sensors
  - Combustible gas detection
  - Photoionization detection (PIDs)

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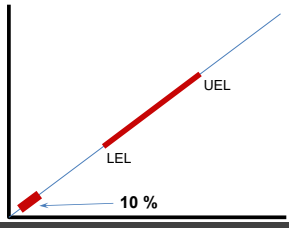
CGI Data Interpretation

Fuel-to-Air Ratio for Flammable Atmospheres



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CGI Interferences

- If the meter is exposed to one of the following, it may give a false reading or will error:
  - Chlorinated solvents
  - (Other) halogens
  - Sulfur compounds
  - Leaded gasoline
  - Acids and bases

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Oxygen Meter

- An oxygen meter measures the amount of oxygen in the atmosphere
- The sensor will read 0% – 25%
- Uses an electrochemical sensor
- Sensor must be replaced every 12 – 18 months, depending on manufacturer

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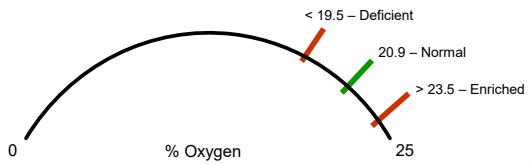
Oxygen Data Interpretation

Oxygen Meters Measure from 0 – 25% Oxygen



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Calibration

Air monitoring instruments must be calibrated and bump-tested in accordance with manufacturer specifications.

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Colorimetric Tube Systems

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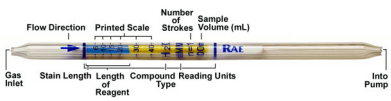
Colorimetric Tubes

- Each box contains 10 tubes
- Instructions on back of box
- Arrow indicates direction of insertion and airflow
- Concentration scale and gas type printed on tube
- Number of strokes, total sample volume, and units of measurement also printed on tube



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Section 11:

Hazard Assessment

Hazard vs. Risk

- A hazard is something that can cause harm
- Risk is the likelihood (probability) that a hazard may cause harm
- The process of evaluating both of these together is called hazard assessment

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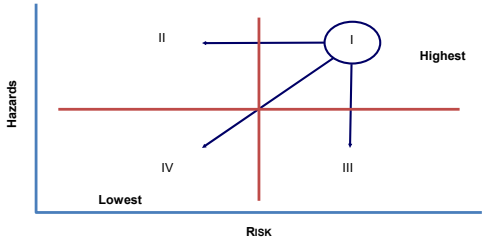
Hazard vs. Risk

Assessment of Hazards & Potential Harm



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DOT/UN Hazard Classes

- Class 1 – Explosives
- Class 2 – Gases
- Class 3 – Flammable Liquids
- Class 4 – Flammable Solids, Spontaneously Combustible & Dangerous When Wet
- Class 5 – Oxidizers & Organic Peroxide
- Class 6 – Poisonous Materials & Infectious Substances
- Class 7 – Radioactive Materials
- Class 8 – Corrosive Materials
- Class 9 – Miscellaneous Hazardous Materials

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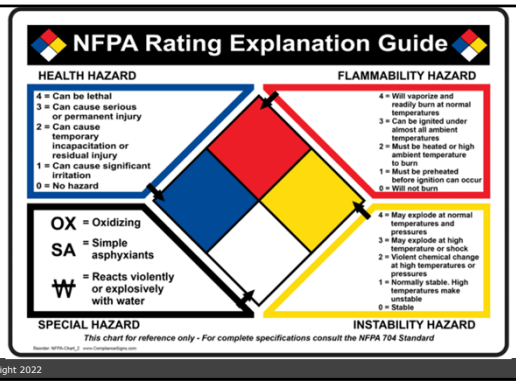

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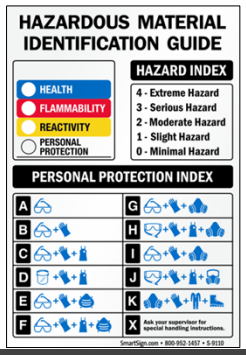
HMIS® III

- Hazardous Materials Information System III (HMIS® III)
- Developed by the National Paint & Coatings Association



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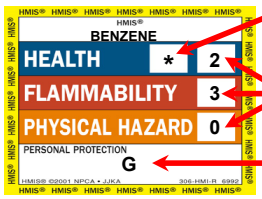
HMIS® Letter	Required Equipment
A	
B	
C	
D	
E	
F	
G	
H	
I	
J	
K	
L – Z	Site-specific. Ask supervisor/safety specialist for instructions.

Safety glasses
Gloves
Protective apron
Face shield
Dust respirator
Vapor respirator
Splash goggles
Air line mask or hood
Full suit
Boots

HMIS® III



The "*" indicates that the rated product is associated with a chronic health effect

A 0 – 4 scale is used, where 0 indicates minimal hazard and 4 indicates an extreme hazard

A letter coding system is used here

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Globally Harmonized System (GHS)

- Enhances the protection of human health and the environment
- Provides a recognized framework for those countries without an existing system
- Reduces the need for testing and evaluation of chemicals
- Facilitates international trade in chemicals whose hazards have been properly assessed and identified on an international basis

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Signal Words

- The signal word indicates the relative degree of severity of a hazard
- The signal words used in the GHS are:
  - "Danger" for the more severe hazards
  - "Warning" for the less severe hazards
- Signal words are standardized and assigned to the hazard categories within endpoints
- Some lower-level hazard categories do not use signal words
- Use only one signal word corresponding to the class of the most severe hazard

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HCS Pictograms & Hazards

- Health Hazard
- Flame
- Exclamation Mark
- Gas Cylinder
- Corrosion
- Exploding Bomb
- Flame-Over-Circle
- Environment (non-mandatory)
- Skull-and-Crossbones

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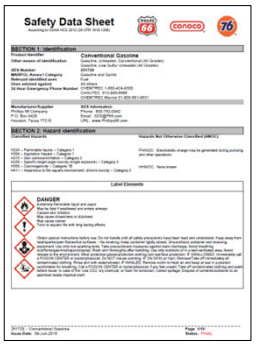
Safety Data Sheets

- Safety Data Sheets (SDSs) were formerly called Material Safety Data Sheets (MSDSs)
- Produced for each hazardous chemical to communicate information on physical, health, or environmental hazards


Safety Data Sheet

According to OSHA HCS (29 CFR 1910.1200)

SECTION 1: Identification

Product Identifier — Conventional Gasoline

Other means of identification — Gasoline, Unleaded, Conventional (All Grades); Gasoline - Low Sulfur Unleaded (All Grades)

SDS Number — 200708

NAIGPCC Answer Category — Gasoline and Spirits

Recommended use — Motor fuel

Uses advised against — All others

24 Hour Emergency Phone Number — CHEMTREC: 1-800-424-9300; CHEMTREC International: CHEMTREC Macau 01-800-99-1,(801)

Manufacturer/Supplier — Phillips 66 Company; P.O. Box 4428; Houston, Texas 77210

SDS Information — Phone: 800-762-0942; Email: SDS@P66.com; URL: www.Phillips66.com

SECTION 2: Hazard identification

Classified Hazards — Hazards Not Otherwise Classified (HNOC)

H224 – Flammable liquids – Category 1
H304 – Aspiration Hazard – Category 1
H315 – Skin corrosion/irritation – Category 2
H319 – Serious eye damage/eye irritation – Eye irritation – Category 2
H350 – Carcinogenicity – Category 1B
H411 – Hazardous to the aquatic environment, chronic toxicity – Category 2

PHNOC: Electrostatic charge may be generated during pumping and other operations.

HHNOC: None known

Label Elements

DANGER

Extremely flammable liquid and vapor
May be fatal if swallowed and enters airways
Causes skin irritation
Causes serious eye irritation
May cause cancer
Toxic to aquatic life with long lasting effects

Obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Keep away from heat/sparks/open flame/hot surfaces. – No smoking. Keep container tightly closed. Ground/bond container and receiving equipment. Use explosion-proof electrical/ventilating/lighting/equipment. Use only non-sparking tools. Take precautionary measures against static discharge. Wash skin thoroughly after handling. Use only outdoors or in a well-ventilated area. Avoid release to the environment. Wear protective gloves/protective clothing/eye protection/face protection. IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician. Do NOT induce vomiting. IF ON SKIN (or hair): Remove/take off immediately all contaminated clothing. Rinse skin with water/shower. IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing. Call a POISON CENTER or doctor/physician if you feel unwell. Collect spillage. Dispose of contents/container to an approved waste disposal plant.

SECTION 1 – Conventional Gasoline
Product Name: Conventional Gasoline
Issue Date: 28-Jun-2019

Page: 1/14
Notes: FINAL

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Safety Data Sheets

- Sections 1 – 8:
  - General information
- Sections 9 – 11 and 16:
  - Technical and scientific information
  - Date of preparation or last revision
- Sections 12 – 15:
  - OSHA will not enforce the contents of these sections

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Section 12:
Site Control

Site Control

- The purpose of site control is to reduce or prevent the spread of contamination by establishing artificial and/or physical barriers
- Site control must be site-specific

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Site Map

- A site map is essential to site control
  - Access & evacuation routes
  - Areas requiring special PPE
  - Topographic features, climatic conditions, drainage, landmarks
- Maps are ever-changing and are influenced by:
  - Accidents
  - Changes in site activities
  - Emergencies
  - Unanticipated hazards

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Site Preparation

- Key focus is worker safety
- Major steps:
  - Construct roadway(s)
  - Arrange traffic flow patterns
  - Eliminate physical hazards (when possible)
  - Install skid-resistant devices as needed
  - *[Continued…]*

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Site Preparation

- Construct operation pads for mobile facilities
- Construct loading docks and processing, staging, and decon areas
- Provide illumination as needed
  - Install electrical equipment and connections as needed

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Site Zones

- Zones are developed to ensure that:
  - Personnel are protected against hazards specific to where they are working
  - Contamination is confined to designated areas
  - Personnel can be located and evacuated in an emergency

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Site Zones

- Exclusion zone / hot zone
  - Encompasses all known or suspected hazardous materials
- Contamination reduction zone / warm zone
  - Between exclusion zone and support zone
  - Contamination reduction corridor is established within this zone
- Support zone / cold zone
  - Area outside contamination reduction zone where equipment and rescue personnel are stationed
- Zones can change at any time during the operation!

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Site Zones

- Size and shape of each zone depends on the hazards present:
  - Nature and extent of chemical hazard
  - Features of the site
  - Potential for other accidents to occur
  - Weather conditions
  - Nature of the work
  - Size of contaminated area
  - Off-site hazards

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Section 13:
Decontamination

Decontamination

- Goal of decontamination is to reduce contamination to a safe, negligible level
- Indirectly supports the site control objective
- Must be performed on all personnel and equipment
- Last line of defense is washing your hands and face

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Sources of Contamination

- Direct contamination
  - High-contact surfaces
  - Hands
  - Feet
- Indirect contamination
  - Airborne: gas, vapor, aerosol

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Prevention of Contamination

- Establish standard operating procedures, such as:
  - Avoid contact with hazardous substances
  - Use remote sampling/handling
  - Bag equipment for protection
  - Wear disposable outer garments
  - Encase source of contamination with sheeting/overpacking
  - Dress properly for exclusion zone work
  - Check PPE for cuts or punctures

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Decon Methods

- Physical decon (dry)
  - Remove PPE to prevent cross- contamination
- Chemical decon (wet)
  - Wash with decon solution
- Combination (partial wet)
  - Wash some areas
  - Remove PPE

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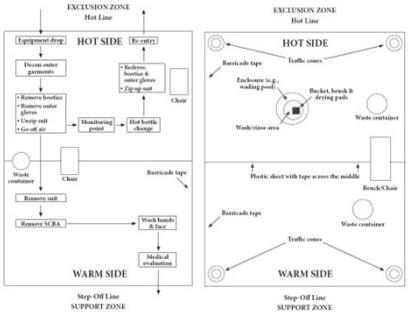
Decon Planning

- Chemical hazards
- Potential for contamination
- Level of protection
- Number of people
- Location
- Emergencies



Level A Decon Setup

Level B/C Decon Setup

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Decon Emergencies

- Mild emergency
  - Container spill
  - Minor injury
- Go to decon station and perform decon procedures to exit exclusion zone
  - Decon must be set up at a safe distance from the hazard

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Decon Emergencies

- Moderate emergency
  - Large spill
  - Potential for fire
- Personal judgment
  - Go to decon station and quickly decon
  - Bypass decon station and move to a safer distance before removing PPE

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Decon Emergencies

- Serious emergency
  - Fire/explosion
  - Large chemical reaction
- Bypass decon station
  - Move to a safer location
  - Stop and remove PPE
  - Leave PPE for later cleanup
  - Wash hands and face as soon as practical

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HAZWOPER Refresher Summary

- Each employee is responsible for his/her own health and safety and that of others
- Knowing the different types of hazards in the workplace and the control measures in place will help to prevent injuries and deaths

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THANK YOU!

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HAZWOPER Acronyms & Abbreviations

ACGIH	American Conference of Governmental Industrial Hygienists
AIHA	American Industrial Hygiene Association
ANSI	American National Standards Institute
APF	Assigned Protection Factor
APR	Air-Purifying Respirator
AQMD	Air Quality Management District
ARC	American Red Cross
"C"/Ceil	Ceiling Limit
CAA	Clean Air Act
CalEPA	California Environmental Protection Agency
Cal/OSHA	California Occupational Safety and Health Administration
Caltrans	California Department of Transportation
CAMEO	Computer-Aided Management of Emergency Operations
CAS	Chemical Abstracts Service
CCR	California Code of Regulations
CDC	Centers for Disease Control and Prevention
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CGI	Combustible Gas Indicator
CHEMTREC	Chemical Transportation Emergency Center
CPC	Chemical Protective Clothing
CUPA	Certified Unified Program Agency
CVC	California Vehicle Code

CWA	Clean Water Act
Decon	Decontamination
CA DFW	California Department of Fish and Wildlife
DOT	Department of Transportation (Federal)
DTSC	Department of Toxic Substances Control (CalEPA)
ERG	Emergency Response Guidebook
EPA	Environmental Protection Agency (Federal)
EPCRA	Emergency Planning and Community Right-to-Know Act
FEMA	Federal Emergency Management Agency
FIFRA	Federal Insecticide, Fungicide, and Rodenticide Act
FM	Factory Mutual
FRA	Federal Railroad Administration
GC	Gas Chromatography
GPR	Ground-Penetrating Radar
Hazmat	Hazardous Material
HAZWOPER	Hazardous Waste Operations and Emergency Response
HEPA	High-Efficiency Particulate Air
HMIS	Hazardous Materials Identification System
HMTA	Hazardous Materials Transportation Act
HSC	California Health and Safety Code
IC	Incident Commander
ICS	Incident Command System
IDLH	Immediately Dangerous to Life or Health
LC_{50}	Lethal Concentration 50%
LD_{50}	Lethal Dose 50%
LEL/LFL	Lower Explosive Limit / Lower Flammable Limit
mg/kg	Milligrams per Kilogram

mg/m³	Milligrams per Cubic Meter
MSA	Mine Safety Appliances
MSHA	Mine Safety Health Administration
MSDS	Material Safety Data Sheet
MUC	Maximum Use Concentration
NFPA	National Fire Protection Association
NIOSH	National Institute for Occupational Safety and Health
NOAA	National Oceanic and Atmosphere Administration
NPL	National Priorities List
NRA	Nuclear Regulatory Agency
NRC	National Response Center
OES	Office of Emergency Services (California Governor's Office)
OSHA	Occupational Safety and Health Administration
OSPR	Office of Spill Prevention and Response
OV/AG	Organic Vapor / Acid Gas (Cartridge)
PAPR	Powered Air-Purifying Respirator
PEL	Permissible Exposure Limit (OSHA & Cal/OSHA)
PF	Protection Factor
PIO	Public Information Officer
PPB	Parts per Billion
PPE	Personal Protective Equipment
PPM	Parts per Million
PPT	Parts per Trillion
PVC	Polyvinyl Chloride
RCRA	Resource Conservation and Recovery Act
REL	Recommended Exposure Limit (NIOSH)
RWQCB	Regional Water Quality Control Board

SAR	Supplied Air Respirator
SARA	Superfund Amendments and Reauthorization Act (1986)
SCBA	Self-Contained Breathing Apparatus
SDS	Safety Data Sheet
SEMS	Standardized Emergency Management System
SIC	Standard Industry Code
SOP	Standard Operating Procedure
STEL	Short-Term Exposure Limit
STLC	Soluble Threshold Limit Concentration
SWQCB	State Water Quality Control Board
TCLP	Toxicity Characteristic Leaching Procedure
TLV	Threshold Limit Value
TSCA	Toxic Substances Control Act
TSDF	Treatment, Storage, and Disposal Facility
TTLC	Total Threshold Limit Concentration
TWA	Time-Weighted Average
UEL/UFL	Upper Explosive Limit / Upper Flammable Limit
UL	Underwriters Laboratories
USCG	United States Coast Guard
USDA	United States Department of Agriculture
USFS	United States Forest Service
WET	Wet Extraction Test (California)

Safety Data Sheet

According to OSHA HCS 2012 (29 CFR 1910.1200)

SECTION 1: Identification

Product Identifier	**Conventional Gasoline**
Other means of identification	Gasoline, Unleaded, Conventional (All Grades) Gasoline, Low Sulfur Unleaded (All Grades)
SDS Number	**251720**
MARPOL Annex I Category	Gasoline and Spirits
Relevant identified uses	Fuel
Uses advised against	All others
24 Hour Emergency Phone Number	CHEMTREC 1-800-424-9300 CANUTEC 613-996-6666 CHEMTREC Mexico 01-800-681-9531

Manufacturer/Supplier
Phillips 66 Company
P.O. Box 4428
Houston, Texas 77210

SDS Information
Phone: 800-762-0942
Email: SDS@P66.com
URL: www.Phillips66.com

SECTION 2: Hazard identification

Classified Hazards

H224 -- Flammable liquids -- Category 1
H304 -- Aspiration Hazard -- Category 1
H315 -- Skin corrosion/irritation -- Category 2
H336 -- Specific target organ toxicity (single exposure) -- Category 3
H350 -- Carcinogenicity -- Category 1B
H411 -- Hazardous to the aquatic environment, chronic toxicity -- Category 2

Hazards Not Otherwise Classified (HNOC)

PHNOC: Electrostatic charge may be generated during pumping and other operations

HHNOC: None known

Label Elements

DANGER

Extremely flammable liquid and vapor
May be fatal if swallowed and enters airways
Causes skin irritation
May cause drowsiness or dizziness
May cause cancer
Toxic to aquatic life with long lasting effects

Obtain special instructions before use; Do not handle until all safety precautions have been read and understood; Keep away from heat/sparks/open flames/hot surfaces. - No smoking; Keep container tightly closed; Ground/bond container and receiving equipment; Use only non-sparking tools; Take precautionary measures against static discharge; Avoid breathing dust/fume/gas/mist/vapours/spray; Wash skin thoroughly after handling; Use only outdoors or in a well-ventilated area; Avoid release to the environment; Wear protective gloves/protective clothing and eye/face protection; IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician; Do NOT induce vomiting; IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower; IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing; Call a POISON CENTER or doctor/physician if you feel unwell; Take off contaminated clothing and wash before reuse; In case of fire: Use CO2, dry chemical, or foam for extinction; Collect spillage; Dispose of contents/container to an approved waste disposal plant

SECTION 3: Composition/information on ingredients

Chemical Name	CASRN	Concentration[1]
Gasoline	86290-81-5	100

Hazardous Constituent(s) Contained Within Above Complex Substance(s)

Chemical Name	CASRN	Concentration[1]
Toluene	108-88-3	0-35
Xylenes (o-, m-, p- isomers)	1330-20-7	0-15
Benzene	71-43-2	0-5
n-Hexane	110-54-3	0-5
Ethylbenzene	100-41-4	0-5

[1] All concentrations are percent by weight unless ingredient is a gas. Gas concentrations are in percent by volume.

SECTION 4: First aid measures

Eye Contact: If irritation or redness develops from exposure, flush eyes with clean water. If symptoms persist, seek medical attention.

Skin Contact: Remove contaminated shoes and clothing, and flush affected area(s) with large amounts of water. If skin surface is damaged, apply a clean dressing and seek medical attention. If skin surface is not damaged, cleanse affected area(s) thoroughly by washing with mild soap and water or a waterless hand cleaner. If irritation or redness develops, seek medical attention. Wash contaminated clothing before reuse. If product is injected into or under the skin, or into any part of the body, regardless of the appearance of the wound or its size, the individual should be evaluated immediately by a physician. (see Note to Physician)

Inhalation: If respiratory symptoms develop, move victim away from source of exposure and into fresh air in a position comfortable for breathing. If breathing is difficult, oxygen or artificial respiration should be administered by qualified personnel. If symptoms persist, seek medical attention.

Ingestion: Aspiration hazard: Do not induce vomiting or give anything by mouth because this material can enter the lungs and cause severe lung damage. If victim is drowsy or unconscious and vomiting, place on the left side with the head down. If possible, do not leave victim unattended and observe closely for adequacy of breathing. Seek medical attention.

Most important symptoms and effects, both acute and delayed: Effects of overexposure can include slight irritation of the respiratory tract, nausea, vomiting, and signs of nervous system depression (e.g., headache, drowsiness, dizziness, loss of coordination, disorientation and fatigue). Continued exposure to high concentrations can result in vomiting, cardiac irregularities and sudden loss of consciousness. Prolonged or repeated contact may dry skin and cause irritation.

Notes to Physician: Epinephrine and other sympathomimetic drugs may initiate cardiac arrhythmias in persons exposed to high concentrations of hydrocarbon solvents (e.g., in enclosed spaces or with deliberate abuse). The use of other drugs with less arrhythmogenic potential should be considered. If sympathomimetic drugs are administered, observe for the development of cardiac arrhythmias.

When using high-pressure equipment, injection of product under the skin can occur. In this case, the casualty should be sent immediately to the hospital. Do not wait for symptoms to develop. High-pressure hydrocarbon injection injuries may produce substantial necrosis of underlying tissue despite an innocuous appearing external wound. These injuries often require extensive emergency surgical debridement and all injuries should be evaluated by a specialist in order to assess the extent of injury. Early surgical treatment within the first few hours may significantly reduce the ultimate extent of injury.

Federal regulations (29 CFR 1910.1028) specify medical surveillance programs for certain exposures to benzene above the action level or PEL (specified in Section (i)(1)(i) of the Standard). In addition, employees exposed in an emergency situation shall, as described in Section (i)(4)(i), provide a urine sample at the end of the shift for measurement of urine phenol.

SECTION 5: Firefighting measures

NFPA 704 Hazard Class

Health: 1 **Flammability:** 3 **Instability:** 0

0 (Minimal)
1 (Slight)
2 (Moderate)

3 (Serious)
4 (Severe)

Extinguishing Media: Dry chemical, carbon dioxide, or foam is recommended. Water spray is recommended to cool or protect exposed materials or structures. Carbon dioxide can displace oxygen. Use caution when applying carbon dioxide in confined spaces. Simultaneous use of foam and water on the same surface is to be avoided as water destroys the foam. Water may be ineffective for extinguishment, unless used under favorable conditions by experienced fire fighters.

Specific hazards arising from the chemical

Unusual Fire & Explosion Hazards: Extremely flammable. This material can be ignited by heat, sparks, flames, or other sources of ignition (e.g., static electricity, pilot lights, mechanical/electrical equipment, and electronic devices such as cell phones, computers, calculators, and pagers which have not been certified as intrinsically safe) Vapors may travel considerable distances to a source of ignition where they can ignite, flash back, or explode. May create vapor/air explosion hazard indoors, in confined spaces, outdoors, or in sewers. This product will float and can be reignited on surface water. Vapors are heavier than air and can accumulate in low areas. If container is not properly cooled, it can rupture in the heat of a fire.

Hazardous Combustion Products: Combustion may yield smoke, carbon monoxide, and other products of incomplete combustion. Oxides of nitrogen and sulfur may also be formed.

Special protective actions for firefighters: For fires beyond the initial stage, emergency responders in the immediate hazard area should wear protective clothing. When the potential chemical hazard is unknown, in enclosed or confined spaces, a self contained breathing apparatus should be worn. In addition, wear other appropriate protective equipment as conditions warrant (see Section 8).

Isolate the hazard area and deny entry to unnecessary and unprotected personnel Stop spill/release if it can be done safely. Move undamaged containers from immediate hazard area if it can be done safely Water spray may be useful in minimizing or dispersing vapors and to protect personnel. Cool equipment exposed to fire with water, if it can be done safely. Avoid spreading burning liquid with water used for cooling purposes.

See Section 9 for Flammable Properties including Flash Point and Flammable (Explosive) Limits

SECTION 6: Accidental release measures

Personal precautions, protective equipment and emergency procedures: Extremely flammable. Spillages of liquid product will create a fire hazard and may form an explosive atmosphere. Keep all sources of ignition and hot metal surfaces away from spill/release if safe to do so. The use of explosion-proof electrical equipment is recommended. Stay upwind and away from spill/release. Avoid direct contact with material. For large spillages, notify persons down wind of the spill/release, isolate immediate hazard area and keep unauthorized personnel out. Wear appropriate protective equipment, including respiratory protection, as conditions warrant (see Section 8). See Sections 2 and 7 for additional information on hazards and precautionary measures.

Environmental Precautions: Stop and contain spill/release if it can be done safely. Prevent spilled material from entering sewers, storm drains, other unauthorized drainage systems, and natural waterways. Use foam on spills to minimize vapors Use water sparingly to minimize environmental contamination and reduce disposal requirements. If spill occurs on water notify appropriate authorities and advise shipping of any hazard. Spills into or upon navigable waters, the contiguous zone, or adjoining shorelines that cause a sheen or discoloration on the surface of the water, may require notification of the National Response Center (phone number 800-424-8802).

Methods and material for containment and cleaning up: Notify relevant authorities in accordance with all applicable regulations. Immediate cleanup of any spill is recommended. Dike far ahead of spill for later recovery or disposal. Absorb spill with inert material such as sand or vermiculite, and place in suitable container for disposal. If spilled on water remove with appropriate methods (e.g. skimming, booms or absorbents). In case of soil contamination, remove contaminated soil for remediation or disposal, in accordance with local regulations.

Recommended measures are based on the most likely spillage scenarios for this material; however local conditions and regulations may influence or limit the choice of appropriate actions to be taken.

SECTION 7: Handling and storage

Precautions for safe handling: Obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking. Take precautionary measures against static discharge. Use only non-sparking tools. Wear protective gloves/protective clothing/eye protection/face protection. Wash thoroughly after handling. Use good personal hygiene practices and wear appropriate personal protective equipment (see section 8). Extremely Flammable. May vaporize easily at ambient temperatures. The vapor is heavier than air and may create an explosive mixture of vapor and air. Beware of accumulation in confined spaces and low lying areas. Open container slowly to relieve any pressure. Electrostatic charge may accumulate and create a hazardous condition when handling or processing this material. To avoid fire or explosion, dissipate static electricity during transfer by grounding and bonding containers and equipment before transferring material. The use of explosion-proof electrical equipment is recommended and may be required (see appropriate fire codes). Refer to NFPA-70 and/or API RP 2003 for specific bonding/grounding requirements. Do not enter confined spaces such as tanks or pits without following proper entry procedures such as ASTM D-4276 and 29CFR 1910.146. Do not wear contaminated clothing or shoes. Keep contaminated clothing away from sources of ignition such as sparks or open flames.

High pressure injection of hydrocarbon fuels, hydraulic oils or greases under the skin may have serious consequences even though no symptoms or injury may be apparent. This can happen accidentally when using high pressure equipment such as high pressure grease guns, fuel injection apparatus or from pinhole leaks in tubing of high pressure hydraulic oil equipment.

For use as a motor fuel only. Do not use as a solvent due to its flammable and potentially toxic properties. Siphoning by mouth can result in lung aspiration which can be harmful or fatal.

The use of hydrocarbon fuel in an area without adequate ventilation may result in hazardous levels of incomplete combustion products (e.g. carbon monoxide, oxides of sulfur and nitrogen, benzene and other hydrocarbons) and/or dangerously low oxygen levels.

Gasoline engine exhaust contains hazardous combustion products and has been identified as a possible cancer hazard. Exposure should be minimized to reduce potential risk.

Static Accumulation Hazard: Electrostatic charge may accumulate and create a hazardous condition when handling this material. To minimize this hazard, bonding and grounding of tanks, transfer piping, and storage tank level floats are necessary but may not, by themselves, be sufficient. Review all operations which have the potential of generating and accumulating an electrostatic charge and/or a flammable atmosphere (including tank and container filling, splash filling, tank cleaning, sampling, gauging, switch loading, filtering, mixing, agitation, and vacuum truck operations) and use appropriate mitigating procedures. Special care should be given to ensure that special slow load procedures for "switch loading" are followed to avoid the static ignition hazard that can exist when higher flash point material (such as fuel oil or diesel) is loaded into tanks previously containing low flash point products (such as gasoline or naphtha). For more information, refer to OSHA Standard 29 CFR 1910.106, 'Flammable and Combustible Liquids', National Fire Protection Association (NFPA 77, 'Recommended Practice on Static Electricity', and/or the American Petroleum Institute (API) Recommended Practice 2003, 'Protection Against Ignitions Arising Out of Static, Lightning, and Stray Currents'.

Conditions for safe storage: Keep container(s) tightly closed and properly labeled. Use and store this material in cool, dry, well-ventilated areas away from heat, direct sunlight, hot metal surfaces, and all sources of ignition. Store only in approved containers. Post area "No Smoking or Open Flame." Keep away from any incompatible material (see Section 10). Protect container(s) against physical damage. Outdoor or detached storage is preferred. Indoor storage should meet OSHA standards and appropriate fire codes.

Portable Containers: Static electricity may ignite gasoline vapors when filling portable containers. To avoid static buildup do not use a nozzle lock open device. Use only approved containers for the storage of gasoline. Place the container on the ground before filling. Keep the nozzle in contact with the container during filling. Do not fill any portable container in or on a vehicle or marine craft.

"Empty" containers retain residue and may be dangerous. Do not pressurize, cut, weld, braze, solder, drill, grind, or expose such containers to heat, flame, sparks, or other sources of ignition. They may explode and cause injury or death. "Empty" drums should be completely drained, properly bunged, and promptly shipped to the supplier or a drum reconditioner. All containers should be disposed of in an environmentally safe manner and in accordance with governmental regulations. Before working on or in tanks which contain or have contained this material, refer to OSHA regulations, ANSI Z49.1, and other references pertaining to cleaning, repairing, welding, or other contemplated operations.

SECTION 8: Exposure controls/personal protection

Chemical Name	ACGIH	OSHA	Phillips 66
Gasoline	TWA: 300 ppm STEL: 500 ppm	Carcinogen	0.5 ppm TWA8hr 0.25 ppm TWA12hr 2.5 ppm STEL Skin

Toluene	TWA: 20 ppm	TWA: 200 ppm Ceiling: 300 ppm	20 ppm TWA8hr
Xylenes (o-, m-, p- isomers)	TWA: 100 ppm STEL: 150 ppm	TWA: 100 ppm TWA: 435 mg/m^3	100 ppm TWA8hr 100 ppm TWA12hr 150 mg/m^3 STEL Skin
Benzene	TWA: 0.5 ppm STEL: 2.5 ppm Skin	TWA: 10 ppm TWA: 1 ppm STEL: 5 ppm Ceiling: 25 ppm Carcinogen	0.5 ppm TWA8hr 0.25 ppm TWA12hr 2.5 ppm STEL Skin Carcinogen
n-Hexane	TWA: 50 ppm Skin	TWA: 500 ppm TWA: 1800 mg/m^3	50 ppm TWA8hr 25 ppm TWA12hr Skin
Ethylbenzene	TWA: 20 ppm	TWA: 100 ppm TWA: 435 mg/m^3 Carcinogen	20 ppm TWA8hr 10 ppm TWA12hr Skin

Note: State, local or other agencies or advisory groups may have established more stringent limits. Consult an industrial hygienist or similar professional, or your local agencies, for further information.

Engineering controls: If current ventilation practices are not adequate to maintain airborne concentrations below the established exposure limits, additional engineering controls may be required.

Eye/Face Protection: The use of eye protection that meets or exceeds ANSI Z.87.1 is recommended to protect against potential eye contact, irritation, or injury. Depending on conditions of use, a face shield may be necessary.

Skin/Hand Protection: The use of gloves impervious to the specific material handled is advised to prevent skin contact. Users should check with manufacturers to confirm the breakthrough performance of their products. Depending on exposure and use conditions, additional protection may be necessary to prevent skin contact including use of items such as chemical resistant boots, aprons, arm covers, hoods, coveralls, or encapsulated suits. Suggested protective materials: Nitrile

Respiratory Protection: Where there is potential for airborne exposure above the exposure limit a NIOSH certified air purifying respirator equipped with organic vapor cartridges/canisters may be used.

A respiratory protection program that meets or is equivalent to OSHA 29 CFR 1910.134 and ANSI Z88.2 should be followed whenever workplace conditions warrant a respirator's use. Air purifying respirators provide limited protection and cannot be used in atmospheres that exceed the maximum use concentration (as directed by regulation or the manufacturer's instructions), in oxygen deficient (less than 19.5 percent oxygen) situations, or under conditions that are immediately dangerous to life and health (IDLH).

If benzene concentrations equal or exceed applicable exposure limits, OSHA requirements for personal protective equipment, exposure monitoring, and training may apply (29CFR1910.1028 - Benzene).

Other Protective Equipment: Eye wash and quick-drench shower facilities should be available in the work area. Thoroughly clean shoes and wash contaminated clothing before reuse.

Suggestions provided in this section for exposure control and specific types of protective equipment are based on readily available information. Users should consult with the specific manufacturer to confirm the performance of their protective equipment. Specific situations may require consultation with industrial hygiene, safety, or engineering professionals.

SECTION 9: Physical and chemical properties

Note: Unless otherwise stated, values are determined at 20°C (68°F) and 760 mm Hg (1 atm). Data represent typical values and are not intended to be specifications.

Appearance: Clear to amber
Physical Form: Liquid
Odor: Gasoline
Odor Threshold: No data
pH: Not applicable
Vapor Density (air=1): >1
Upper Explosive Limits (vol % in air): 7.6
Lower Explosive Limits (vol % in air): 1.4
Evaporation Rate (nBuAc=1): >1
Particle Size: Not applicable
Percent Volatile: 100%
Flammability (solid, gas): Not applicable

Flash Point: < -49 °F / < -45 °C
Test Method: (estimate)
Initial Boiling Point/Range: 80 - 440 °F / 27 - 227 °C
Vapor Pressure: 330-775 mm Hg / 6.4-15 psia (Reid VP) @ 100°F / 37.8°C
Partition Coefficient (n-octanol/water) (Kow): No data
Melting/Freezing Point: No data
Auto-ignition Temperature: 833 °F / 445 °C
Decomposition Temperature: No data
Specific Gravity (water=1): 0.72-0.75 @ 60ºF (15.6ºC)
Bulk Density: 6.17 lbs/gal
Viscosity: No data
Solubility in Water: Negligible

SECTION 10: Stability and reactivity

Reactivity: Not chemically reactive.

Chemical stability: Stable under normal ambient and anticipated conditions of use.

Possibility of hazardous reactions: Hazardous reactions not anticipated.

Conditions to avoid: Avoid high temperatures and all sources of ignition. Prevent vapor accumulation.

Incompatible materials: Avoid contact with strong oxidizing agents and strong reducing agents.

Hazardous decomposition products: Not anticipated under normal conditions of use.

SECTION 11: Toxicological information

Information on Toxicological Effects

Substance / Mixture

Acute Toxicity	Hazard	Additional Information	LC50/LD50 Data
Inhalation	Expected to have a low degree of toxicity by inhalation		>5.2 mg/L (vapor)
Dermal	Unlikely to be harmful		3.75 g/kg
Oral	Unlikely to be harmful		14 g/kg

Aspiration Hazard: May be fatal if swallowed and enters airways

Skin Corrosion/Irritation: Causes skin irritation. Repeated exposure may cause skin dryness or cracking.

Serious Eye Damage/Irritation: Causes mild eye irritation.

Skin Sensitization: Not expected to be a skin sensitizer.

Respiratory Sensitization: No information available.

Specific Target Organ Toxicity (Single Exposure): May cause drowsiness and dizziness.

Specific Target Organ Toxicity (Repeated Exposure): Not expected to cause organ effects from repeated exposure. Two year inhalation studies of wholly vaporized unleaded gasoline, and 90 days studies of various petroleum naphthas, did not produce significant target organ toxicity in laboratory animals. Nephropathy in male rats, characterized by the accumulation of alpha-2-u- globulin in epithelial cells of the proximal tubules was observed, however follow-up studies suggest that these changes are unique to the male rat.

Carcinogenicity: May cause cancer. Based on component information. Two year inhalation studies of vaporized unleaded gasoline produced an increased incidence of kidney tumors in male rats and liver tumors in female mice. Repeated skin application of various petroleum naphthas in mice for two years resulted in an increased incidence of skin tumors but only in the presence of severe skin irritation. Follow-up mechanistic studies suggest that the occurrence of these tumors may be the consequence of promotional processes and not relevant to human risk assessment. Epidemiology data collected from a study of more than 18,000 petroleum marketing and distribution workers showed no increased risk of leukemia, multiple myeloma, or kidney cancer from gasoline exposure. Unleaded gasoline has been identified as a possible carcinogen by the International Agency for Research on Cancer.

Germ Cell Mutagenicity: Not expected to cause heritable genetic effects. Gasoline was negative in microbial mutagenicity and unscheduled DNA tests in rat hepatocytes. Gasoline did not induce chromosome aberrations in vivo in rat bone marrow cells and was negative in a mouse dominant lethal assay.

Reproductive Toxicity: Not expected to cause reproductive toxicity. No evidence of developmental toxicity was found in pregnant laboratory animals (rats and mice) exposed to high vapor concentrations of unleaded gasoline and petroleum naphthas via inhalation. A two-generation reproductive toxicity study of vapor recovery gasoline did not adversely affect reproductive function or offspring survival and development.

Other Comments: Gasoline engine exhaust has been classified by the International Agency for Research on Cancer (IARC) as possibly carcinogenic to human.

Information on Toxicological Effects of Components

Xylenes (o-, m-, p- isomers)

Reproductive Toxicity: Both mixed xylenes and the individual isomers produced limited evidence of developmental toxicity in laboratory animals. Inhalation and oral administration of xylene resulted in decreased fetal weight, increased incidences of delayed ossification, skeletal variations and resorptions, but no evidence of teratogenicity.

Target Organ(s): Rats exposed to xylenes at 800, 1000 or 1200 ppm 14 hours daily for 6 weeks demonstrated high frequency hearing loss. Another study in rats exposed to 1800 ppm 8 hours daily for 5 days demonstrated middle frequency hearing loss.

Toluene

Carcinogenicity: Exposure of rats and mice to toluene at concentrations ranging from 120-1200 ppm for two years did not demonstrate evidence of carcinogenicity. Toluene has not been listed as a carcinogen by IARC.

Reproductive Toxicity: Exposure to toluene during pregnancy has demonstrated limited evidence of developmental toxicity in laboratory animals. Decreased fetal body weight and increased skeletal variations in both inhalation and oral studies, but only at doses that were maternally toxic. No fetal toxicity was seen at doses that were not maternally toxic. Decreased sperm counts have been observed in male rats in the absence of a reduction in fertility. Toluene has been reported to cause mental or growth retardation in the children of solvent abusers who directly inhale toluene during pregnancy.

Target Organ(s): Epidemiology studies suggest that chronic occupational overexposure to toluene may damage color vision. Subchronic and chronic inhalation studies with toluene produced kidney and liver damage, hearing loss and central nervous system (brain) damage in laboratory animals. Intentional misuse by deliberate inhalation of high concentrations of toluene has been shown to cause liver, kidney, and central nervous system damage, including hearing loss and visual disturbances.

Benzene

Carcinogenicity: Benzene is an animal carcinogen and is known to produce acute myelogenous leukemia (a form of cancer) in humans. Benzene has been identified as a human carcinogen by IARC, the US National Toxicology Program and the US-Occupational Safety and Health Administration.

Reproductive Toxicity: Some studies in occupationally exposed women have suggested benzene exposure increased risk of miscarriage and stillbirth and decreased birth weight and gestational age. The size of the effects detected in these studies was small, and ascertainment of exposure and outcome in some cases relied on self-reports, which may limit the reliability of these results.

Target Organ(s): Prolonged or repeated exposures to benzene vapors can cause damage to the blood and blood forming organs, including disorders like leukopenia, thrombocytopenia, and aplastic anemia.

Germ Cell Mutagenicity: Benzene exposure has resulted in chromosomal aberrations in human lymphocytes and animal bone marrow cells. Exposure has also been associated with chromosomal aberrations in sperm cells in human and animal studies.

Ethylbenzene

Carcinogenicity: Rats and mice exposed to 0, 75, 250, or 750 ppm ethyl benzene in a two year inhalation study demonstrated limited evidence of kidney, liver, and lung cancer. Ethyl benzene has been listed as a possible human carcinogen by IARC.

Target Organ(s): In rats and mice exposed to 0, 75, 250, or 750 ppm ethyl benzene in a two year inhalation study there was mild damage to the kidney (tubular hyperplasia), liver (eosinophilio foci, hypertrophy, necrosis), lung (alveolar epithelium metaplasia), thyroid (hyperplasia), thyroid (hyperplasia) and pituitary (hyperplasia). In animal models (particularly rats), ethyl benzene affects the auditory function mainly in the cochlear mid-frequency range and ototoxicity was observed after combined exposure to noise and ethyl benzene. There is no evidence of either ethyl benzene-induced hearing losses or ototoxicity with combined exposure to ethyl benzene and noise in workers.

n-Hexane

Reproductive Toxicity: Prolonged exposure to high concentrations of n-hexane (>1,000 ppm) resulted in decreased sperm count and degenerative changes in the testes of rats but not those of mice.

Target Organ(s): Excessive exposure to n-hexane can result in peripheral neuropathies. The initial symptoms are symmetrical sensory numbness and paresthesias of distal portions of the extremities. Motor weakness is typically observed in muscles of the toes and fingers but may also involve muscles of the arms, thighs and forearms. The onset of these symptoms may be delayed for several months to a year after the beginning of exposure. The neurotoxic properties of n-hexane are potentiated by exposure to methyl ethyl ketone and methyl isobutyl ketone.

SECTION 12: Ecological information

GHS Classification:
H411 -- Hazardous to the aquatic environment, chronic toxicity -- Category 2
Toxic to aquatic life with long lasting effects.

Toxicity: Acute aquatic toxicity studies on samples of gasoline and naphtha streams show acute toxicity values greater than 1 mg/L and mostly in the range 1-100 mg/L. These tests were carried out on water accommodated fractions, in closed systems to prevent evaporative loss. Results are consistent with the predicted aquatic toxicity of these substances based on their hydrocarbon

composition. These substances should be regarded as toxic to aquatic organisms, with the potential to cause long term adverse effects in the aquatic environment.

Persistence and Degradability: The hydrocarbons in this material are not readily biodegradable but are regarded as inherently biodegradable since their hydrocarbon components can be degraded by microorganisms.

Persistence per IOPC Fund definition: Non-Persistent

Bioaccumulative Potential: Log Kow values measured for the hydrocarbon components of this material range from 3 to greater than 6 and therefore are regarded as having the potential to bioaccumulate. In practice, metabolic processes or physical properties may prevent this effect or limit bioavailability.

Mobility in Soil: On release to water, hydrocarbons will float on the surface and since they are sparingly soluble, the only significant loss is volatilization to air. In air, these hydrocarbons are photodegraded by reaction with hydroxyl radicals with half lives varying from 6.5 days for benzene to 0.5 days for n-dodecane.

Other adverse effects: None anticipated.

SECTION 13: Disposal considerations

The generator of a waste is always responsible for making proper hazardous waste determinations and needs to consider state and local requirements in addition to federal regulations. This material, if discarded as produced, would not be a federally regulated RCRA "listed" hazardous waste. However, it would likely be identified as a federally regulated RCRA hazardous waste for the following characteristic(s) shown below. See Sections 7 and 8 for information on handling, storage and personal protection and Section 9 for physical/chemical properties. It is possible that the material as produced contains constituents which are not required to be listed in the SDS but could affect the hazardous waste determination. Additionally, use which results in chemical or physical change of this material could subject it to regulation as a hazardous waste.Container contents should be completely used and containers should be emptied prior to discard. Container residues and rinseates could be considered to be hazardous wastes.

EPA Waste Number(s)
- D001 - Ignitability characteristic
- D018 - Benzene

SECTION 14: Transport information

U.S. Department of Transportation (DOT)
UN Number: UN1203
UN proper shipping name: Gasoline
Transport hazard class(es): 3
Packing Group: II
Environmental Hazards: Marine pollutant - Environmentally Hazardous
Special precautions for user: *If transported in bulk by marine vessel in international waters, product is being carried under the scope of MARPOL Annex I.*
Container(s) greater than 5 liters (liquids) or 5 kilograms (solids), shipped by water mode and ALL bulk shipments may require the shipping description to contain the "Marine Pollutant" notation [49 CFR 172.203(l)] and the container(s) to display the [Marine Pollutant Mark] [49 CFR 172.322].
Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code: Not applicable

SECTION 15: Regulatory information

CERCLA/SARA - Section 302 Extremely Hazardous Substances and TPQs (in pounds):
This material does not contain any chemicals subject to the reporting requirements of SARA 302 and 40 CFR 372.

CERCLA/SARA - Section 311/312 (Title III Hazard Categories)

Acute Health Hazard:	Yes
Chronic Health Hazard:	Yes
Fire Hazard:	Yes
Pressure Hazard:	No
Reactive Hazard:	No

CERCLA/SARA - Section 313 and 40 CFR 372:
This material contains the following chemicals subject to the reporting requirements of Section 313 of SARA Title III and 40 CFR

372:

Chemical Name	Concentration[1]	de minimis
Toluene	0-35	1.0%
Xylenes (o-, m-, p- isomers)	0-15	1.0%
Benzene	0-5	0.1%
n-Hexane	0-5	1.0%
Benzene, 1,2,4-trimethyl-	0-5	1.0%
Ethylbenzene	0-5	0.1%
Cyclohexane	0-2	1.0%

[1] All concentrations are percent by weight unless ingredient is a gas. Gas concentrations are in percent by volume.

EPA (CERCLA) Reportable Quantity (in pounds):
EPA's Petroleum Exclusion applies to this material - (CERCLA 101(14)).

California Proposition 65:
Warning: This material may contain detectable quantities of the following chemicals, known to the State of California to cause cancer, birth defects or other reproductive harm, and which may be subject to the warning requirements of California Proposition 65 (CA Health & Safety Code Section 25249.5):

Chemical Name	Type of Toxicity
Toluene	Developmental Toxicant
Benzene	Cancer Developmental Toxicant Male Reproductive Toxicant
Ethylbenzene	Cancer
Unleaded Gasoline (Wholly Vaporized)	Cancer

Gasoline engine exhaust is on the Proposition 65 list of chemicals known to the State of California to cause cancer.

International Hazard Classification

Canada:
This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and the SDS contains all the information required by the Regulations.

International Inventories
All components are either listed on the US TSCA Inventory, or are not regulated under TSCA.
All components are either on the DSL, or are exempt from DSL listing requirements.

U.S. Export Control Classification Number: EAR99

SECTION 16: Other information

Issue Date:	Previous Issue Date:	SDS Number	Status:
09-Jun-2016	09-May-2016	251720	FINAL

Revised Sections or Basis for Revision:
Product Name / Synonyms (Section 1)

Guide to Abbreviations:
ACGIH = American Conference of Governmental Industrial Hygienists; CASRN = Chemical Abstracts Service Registry Number; CEILING = Ceiling Limit (15 minutes); CERCLA = The Comprehensive Environmental Response, Compensation, and Liability Act; EPA = Environmental Protection Agency; GHS = Globally Harmonized System; IARC = International Agency for Research on Cancer; INSHT = National Institute for Health and Safety at Work; IOPC = International Oil Pollution Compensation; LEL = Lower Explosive Limit; NE = Not Established; NFPA = National Fire Protection Association; NTP = National Toxicology Program; OSHA = Occupational Safety and Health Administration; PEL = Permissible Exposure Limit (OSHA); SARA = Superfund Amendments and Reauthorization Act; STEL = Short Term Exposure Limit (15 minutes); TLV = Threshold Limit Value (ACGIH); TWA = Time Weighted Average (8 hours); UEL = Upper Explosive Limit; WHMIS = Worker Hazardous Materials Information System (Canada)

Disclaimer of Expressed and implied Warranties:

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