

# Examples of Hazards

**Acceleration** (uncontrolled – too much, too little)

- Inadvertent motion
- Sloshing of liquids
- Movement of loose objects

**Deceleration** (uncontrolled – too much, too little)

- Impacts (sudden stops)
- Failure of brakes, wheels, tires, gears, etc.
- Falling objects
- Fragments or missiles

**Chemical Reaction** (non-fire, can be subtle over time)

- Disassociation, product reverts to separate components
- Combination, new product formed from mixture
- Corrosion, rust, etc.

**Electrical**

- Shock
- Burns
- Overheating
- Ignition of combustibles
- Inadvertent activation
- Explosion, electrical
- Equipment malfunctions/ceases to operate

**Explosions**

- Commercial explosive present
- Explosive mixture created
- Explosive material (gas, liquid, dust)

**External Events**

- Extreme weather conditions
- Earthquakes
- Vandalism/sabotage

**Flammability and Fires**

- Presence of fuel – solid, liquid, gas
- Presence of strong oxidizer – oxygen, peroxide, etc.

**Heat and Temperature**

- Source of heat, nonelectrical

- Hot surface burns
- Very cold surface burns
- Increased gas pressure caused by heat
- Increased flammability caused by heat
- Increased volatility caused by heat
- Increased activity caused by heat

**Human Error**

- Commission
- Construction
- Decision making
- Design
- Omission
- Operations
- Maintenance
- Testing and inspection

**Ignition Sources**

- Furnaces
- Incinerators
- Vehicles
- Electrical switches
- Static electricity
- Hot surfaces
- Cigarettes

**Management System Failures**

- Inadequate staffing
- Insufficient training
- Lack of administrative controls and audits

**Mechanical**

- Sharp edges or points
- Rotating equipment
- Reciprocating equipment
- Pinch points
- Weights to be lifted
- Stability/toppling tendency
- Ejected parts or fragments

**Pressure**

- Compressed gas
- Compressed air tool
- Pressure system exhaust

- Accidental release
- Objects propelled by pressure
- Water hammer
- Flex hose whipping
- Over-pressurization leading to hose, valve or vessel failure
- Negative pressure effects

**Process upsets**

- Process deviations (pressure, temperature, flowrate, concentration, impurities)
- Phase/state change
- Reaction rate/heat of reaction

**Leak of Material**

- Flammable
- Toxic
- Corrosive
- Reactive
- Pyrophoric
- Oxidizing
- Slippery

**Radiation**

- Ionizing radiation
- Ultraviolet light
- High intensive visible light
- Infrared light
- Electromagnetic radiation
- Laser radiation

**Toxicity** (Gas, liquid or solid)

- Asphyxiant
- Irritant
- Systemic poison
- Carcinogen
- Mutagen

**Vibration**

- Vibrating tools
- High noise source
- Metal fatigue
- Flow or jet vibration

The information in this table is useful in describing the hazards identified in the JHA. The list is not all inclusive. The "chemical" descriptions are from 29CFR1910.1200. All other hazard descriptions are from the OSHA publication, *Job Hazard Analysis*.

Hazard Type	Specific Hazard or Consequence (GHS Criteria)	Specific Description
Chemical	Acute toxicity (Health Hazard)	<i>Acute toxicity</i> refers to those adverse effects occurring following oral or dermal administration of a single dose of a substance, or multiple doses given within 24 hours, or an inhalation exposure of 4 hours.
Chemical	Aspiration hazard (Health Hazard)	<i>Aspiration</i> means the entry of a liquid or solid chemical directly through the oral or nasal cavity, or indirectly from vomiting, into the trachea and lower respiratory system.
Chemical	Carcinogenicity (Health Hazard)	<i>Carcinogen</i> means a substance or a mixture of substances which induce cancer or increase its incidence. Substances and mixtures which have induced benign and malignant tumors in well-performed experimental studies on animals are considered also to be presumed or suspected human carcinogens unless there is strong evidence that the mechanism of tumor formation is not relevant for humans.
Chemical	Corrosive to metals (Physical Hazard)	A substance or a mixture that by chemical action will materially damage, or even destroy, metals is termed "corrosive to metal."
Chemical	Explosive (Physical Hazard)	An <i>explosive chemical</i> is a solid or liquid chemical which is in itself capable by chemical reaction of producing gas at such a temperature and pressure and at such a speed as to cause damage to the surroundings. Pyrotechnic chemicals are included even when they do not evolve gases.
Chemical	Flammable gas, liquid, solid, or aerosol (Physical Hazard)	<p><b>Flammable gas</b> means a material which is a gas that is flammable in air at 68°F (20 °C) or less and a pressure of 14.7 psia (101 kPa).</p> <p><b>Flammable liquid</b> means a liquid having a flash point of not more than 100°F (38°C).</p> <p><b>Flammable solids</b> are solids that are readily combustible, or may cause or contribute to fire through friction. Readily combustible solids are powdered, granular, or pasty substances which are dangerous if they can be easily ignited by brief contact with an ignition source, such as a burning match, and if the flame spreads rapidly.</p> <p><b>Aerosols</b> are any gas compressed, liquefied or dissolved under pressure within a non-refillable container made of metal, glass or plastic, with or without a liquid, paste or powder. The container is fitted with a release device allowing the contents to be ejected as solid or liquid particles in suspension in a gas, as a foam, paste or powder or in a liquid or gaseous state. Aerosols are classified as flammable if they contain any component classified as flammable according to the GHS criteria for flammable liquids, flammable gases, or flammable solids.</p>

Hazard Type	Specific Hazard or Consequence (GHS Criteria)	Specific Description
Chemical	Gas under pressure (Physical Hazard)	<i>Gases under pressure</i> are gases which are contained in a receptacle at a pressure of 200 kPa (29 psi) (gauge) or more, or which are liquefied or liquefied and refrigerated.
Chemical	Germ cell mutagenicity (Health Hazard)	A mutation is defined as a permanent change in the amount or structure of the genetic material in a cell. The term mutation applies both to heritable genetic changes that may be manifested at the phenotypic level and to the underlying DNA modifications when known (including, for example, specific base pair changes and chromosomal translocations). The term mutagenic and mutagen will be used for agents giving rise to an increased occurrence of mutations in populations of cells and/or organisms.
Chemical	Organic peroxides (Physical Hazard)	An organic peroxide is an organic liquid or solid which contains the bivalent -O-O- structure and may be considered a derivative of hydrogen peroxide, where one or both of the hydrogen atoms have been replaced by organic radicals.
Chemical	Oxidizing gas, liquid, or solid (Physical Hazard)	Oxidizing gas means any gas which may, generally by providing oxygen, cause or contribute to the combustion of other material more than air does.  An oxidizing liquid or solid is a substance which, while not necessarily combustible, may, generally by yielding oxygen, cause or contribute to the combustion of other material.
Chemical	Pyrophoric liquid or solid (Physical Hazard)	A pyrophoric liquid is a liquid which, even in small quantities, is liable to ignite within five minutes after coming into contact with air.  A pyrophoric solid is a solid which, even in small quantities, is liable to ignite within five minutes after coming into contact with air.
Chemical	Reproductive toxicity (Health Hazard)	<i>Reproductive toxicity</i> includes <i>adverse effects on sexual function and fertility</i> in adult males and females, as well as <i>adverse effects on development of the offspring</i> . Some reproductive toxic effects cannot be clearly assigned to either impairment of sexual function and fertility or to developmental toxicity. Nonetheless, chemicals with these effects shall be classified as reproductive toxicants.
Chemical	Respiratory or skin sensitization (Health Hazard)	Respiratory sensitizer means a chemical that will lead to hypersensitivity of the airways following inhalation of the chemical. Skin sensitizer means a chemical that will lead to an allergic response following skin contact.

Hazard Type	Specific Hazard or Consequence (GHS Criteria)	Specific Description
Chemical	Self-heating substance (Physical Hazard)	A self-heating substance is a solid or liquid, other than a pyrophoric substance, which, by reaction with air and without energy supply, is liable to self-heat. This endpoint differs from a pyrophoric substance in that it will ignite only when in large amounts (kilograms) and after long periods of time (hours or days).
Chemical	Self-reactive substance (Physical Hazard)	Self-reactive substances are thermally unstable liquids or solids liable to undergo a strongly exothermic thermal decomposition even without participation of oxygen (air).
Chemical	Skin corrosion or irritation (Health Hazard)	Skin corrosion is the production of irreversible damage to the skin; namely, visible necrosis through the epidermis and into the dermis, following the application of a test substance for up to 4 hours. Skin irritation is the production of reversible damage to the skin following the application of a test substance for up to 4 hours.
Chemical	Specific target organ toxicity (single or repeated exposure) (Health Hazard)	<i>Specific target organ toxicity - single exposure, (STOT- SE)</i> means specific, nonlethal target organ toxicity arising from a single exposure to a chemical.
Chemical	Substances which, in contact with water emit flammable gases (Physical Hazard)	Substances that, in contact with water, emit flammable gases are solids or liquids which, by interaction with water, are liable to become spontaneously flammable or to give off flammable gases in dangerous quantities.
Electrical	<i>Shock/Short Circuit</i>	<i>Contact with exposed conductors or a device that is incorrectly or inadvertently grounded, such as when a metal ladder comes into contact with power lines. 60Hz alternating current (common house current) is very dangerous because it can stop the heart.</i>
Electrical	<i>Fire</i>	<i>Use of electrical power that results in electrical overheating or arcing to the point of combustion or ignition of flammables, or electrical component damage.</i>
Electrical	<i>Static/ESD</i>	<i>The moving or rubbing of wool, nylon, other synthetic fibers, and even flowing liquids can generate static electricity. This creates an excess or deficiency of electrons on the surface of material that discharges (spark) to the ground resulting in the ignition of flammables or damage to electronics or the body's nervous system.</i>
Electrical	<i>Loss of Power</i>	<i>Safety-critical equipment failure as a result of loss of power.</i>
Ergonomics	Strain	<i>Damage of tissue due to overexertion (sprains and strains) or repetitive motion.</i>
Ergonomics	Human error	A system design, procedure, or equipment that is error-provocative. (A switch goes up to turn something off).
Excavation	Collapse	<i>Soil collapse in a trench or excavation as a result of improper or inadequate shoring. Soil type is critical in determining the risk associated with this hazard.</i>

Hazard Type	Specific Hazard or Consequence (GHS Criteria)	Specific Description
Fall	Slip/Trip	<i>Conditions that result in falls (impacts) from height or traditional walking surfaces (such as slippery floors, poor housekeeping, uneven walking surfaces, exposed ledges, etc.)</i>
Fire/Heat	Burn	<i>Temperatures that can cause burns to the skin or damage to other organs. Fires require a heat source, fuel, and oxygen.</i>
Mechanical/Vibration	Chaffing/Fatigue	<i>Vibration that can cause damage to nerve endings or material fatigue that can result in a critical safety- critical failure.</i>
Mechanical	Failure	<i>Equipment failure typically occurs when devices exceed designed capacity or are inadequately maintained.</i>
Mechanical	Caught-by/ Caught-in	<i>Skin, muscle, or a body part exposed to crushing, caught- between, cutting, tearing, shearing items or equipment.</i>
Noise	Hearing Damage	<i>Noise levels (&gt; 85 dBA 8 hr TWA) that result in hearing damage or inability to communicate safety-critical information.</i>
Radiation	Ionizing	<i>Alpha, Beta, Gamma, neutral particles, and X-rays that cause injury (tissue damage) by ionization of cellular components.</i>
Radiation	Non-Ionizing	<i>Ultraviolet, visible light, infrared, and microwaves that cause injury to tissue by thermal or photochemical means.</i>
Struck By	Mass Acceleration	<i>Accelerated mass that strikes the body causing injury or death. (Examples are falling objects and projectiles.)</i>
Struck Against		<i>Injury to a body part as a result of coming into contact of a surface in which action was initiated by the person. (An example is when a screwdriver slips.)</i>
Temperature Extreme	Heat/Cold	<i>Temperatures that result in heat stress, exhaustion, or metabolic slow down such as hyperthermia/hypothermia.</i>
Visibility	Limited	<i>Lack of lighting or obstructed vision that results in an error or other hazard.</i>
Weather	Phenomena	<i>Created by snow, rain, wind and or ice.</i>

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