SAFETY DATA SHEET (SDS) EXPLANATION, SAMPLE AND GLOSSARY

Safety Data Sheets (SDS) formerly known as Material Safety Data Sheets are available through your supervisor or on-line at the Department of Environmental Health and Safety website. Call EH&S at 412-624-9505 for assistance, if necessary. OSHA specifies the information that must be included in English on an SDS. SDS should contain the following 16 sections:

Section 1. Product and Company Identification

The chemical and common name(s) is provided for single chemical substances. An identity on the SDS must be cross-referenced to the identity found on the label. Information on the supplier, including an emergency number is found in this section.

Section 2. Hazards Identification

GHS classification of the substance / mixture and any regional information is listed. Elements which appear on GHS labels are listed in this section, including pictograms, signal word, hazard statements and precautionary statements. Example: skull and crossbones and flame.

Section 3. Composition / Information on Ingredients

Contains the chemical identity, common name, any synonyms, CAS number, EC number along with any impurities and stabilizing additives that are classified and contribute to the classification of the chemical.

Section 4. First-Aid Measures

A description of each of the routes of exposure: inhalation, skin, eye contact, and ingestion; also the most important symptoms and whether chronic or acute. Indication of immediate medical attention and any special treatment if needed.

Section 5. Firefighting Measures

Appropriate extinguishing media: water, dry chemical, or foam. Any specific hazards associated with the products of combustion of the chemical. Any special protective equipment and precautions needed for firefighters.

Section 6. Accidental Release Measures

Protective equipment, personal precautions, environmental precautions and emergency procedures. Methods and materials for containment and cleaning up.

Section 7. Handling and Storage

Precautions for safe handling and conditions for safe storage including any incompatibilities.

Section 8. Exposure Control / Personal Protection

Occupational exposure limit values or biological limit values. Appropriate engineering controls and personal protective equipment.

Section 9. Physical and Chemical Properties

Description of the physical properties (ex. physical state and color) and chemical properties (ex. pH, melting point, flash point, flammability rate, relative density).

Section 10. Stability and Reactivity

Information on the chemical stability and possible hazardous reactions that can occur with the use or storage of the chemical. Description of conditions and incompatible materials to avoid. Also a listing of hazardous decomposition products.

Section 11. Toxicological Information

Description of the various toxicological (health) effects and available data used to identify those effects. Information on the likely routes of exposure (inhalation, ingestion, skin and eye contact). Details of the symptoms related to the physical, chemical and toxicological characteristics.

Section 12. Ecological Information

Description of various ecological effects of the chemical (ex. effects on the aquatic and terrestrial environments, degradability, bioaccumulative potential, mobility in soil).

Section 13. Disposal Considerations

Description of waste residues and information on their safe handling and methods of disposal, including the disposal of any contaminated packaging.

Section 14. Transport Information

Details of various packaging and transportation information (including UN Number, UN Proper shipping name, transport hazard class or classes, packing group, if applicable, marine pollutant status).

Section 15. Regulatory Information

Safety, health and environmental regulations specific for the product in question.

Section 16. Other Information including information on preparation and revision of the SDS

Details of updates to the SDS are included in this section.

Sample Safety Data Sheet

The sample Safety Data Sheet provided on the following pages is from the following link, http://www.msdsonline.com/blog/wp-content/media/presentations/Class_3_Acetone_Sample_SDS_US.pdf.

Information on this sample SDS was created by MSDSonline for informational and training purposes only. This SDS is NOT for commercial use.

Acetone

Safety Data Sheet

according to Federal Register / Vol. 77, No. 58 / Monday, March 26, 2012 / Rules and Regulations

Revision date: 04/22/2013 Supersedes: 01/01/2000 Version: 1.0

SECTION 1: Identification of the substance/mixture and of the company/undertaking

Product Identifier

Product form: Substance

Substance name: Acetone

CAS No.: 67-64-1

Formula: C3H6O

Synonyms: Dimethyl ketone, Propan-2-one, Dimethyl ketone, β-Ketopropane, Propanone, 2-Propanone, Dimethyl formaldehyde, Pyroacetic spirit (archaic)

Intended Use Of The Product

Use of the substance/mixture: Solvent

Name, Address, And Telephone Of The Responsible Party

Glendale Industries, Inc.
1234 Anywhere Way
Anytown, US 12345
1.888.362.2007

Emergency telephone number

Emergency number : 1.888.362.2007
For Chemical Emergency, Spill, Leak, Fire, Exposure, or Accident, call GLENTREC– Day or Night

SECTION 2: Hazards identification

Classification of the substance or mixture

GHS-US classification

Flam. Liq. 2 H225
Eye Irrit. 2A H319
STOT SE 3 H336

Label elements

GHS-US labeling

Hazard pictograms (GHS-US) :

Signal word (GHS-US) : Danger

Hazard statements (GHS-US) : H225 - Highly flammable liquid and vapour
H319 - Causes serious eye irritation
H336 - May cause drowsiness or dizziness

Precautionary statements (GHS-US) : P210 - Keep away from heat, open flames, sparks. - No smoking.
P233 - Keep container tightly closed.
P240 - Ground/bond container and receiving equipment.
P241 - Use explosion-proof electrical, lighting, ventilating equipment.
P242 - Use only non-sparking tools.
P243 - Take precautionary measures against static discharge.
P261 - Avoid breathing mist, spray, vapours.
P264 - Wash hands, forearms, and exposed areas thoroughly after handling.
P271 - Use only outdoors or in a well-ventilated area.
P280 - Wear eye protection, protective clothing, protective gloves.
P303+P361+P353 - IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower.
P304+P340 - IF INHALED: Remove person to fresh air and keep comfortable for breathing.

P305+P351+P338 - If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P312 - Call a POISON CENTER or doctor if you feel unwell.
P337+P313 - If eye irritation persists: Get medical advice/attention.
P370+P378 - In case of fire: Use appropriate media for extinction.
P403+P233 - Store in a well-ventilated place. Keep container tightly closed.
P235 - Keep cool.
P405 - Store locked up.
P501 - Dispose of contents/container according to local, regional, national, and international regulations.

Other hazards
No additional information available

Unknown acute toxicity (GHS US)
No data available

SECTION 3: Composition/information on ingredients

Substances

Name	Product Identifier	%	GHS-US classification
Acetone	(CAS No.) 67-64-1	100	Flam. Liq. 2, H225 Eye Irrit. 2A, H319 STOT SE 3, H336

Full text of H-phrases: see section 16

SECTION 4: First aid measures

Description of first aid measures
First-aid measures general: Never give anything by mouth to an unconscious person. If you feel unwell, seek medical advice (show the label where possible).
First-aid measures after inhalation: When symptoms occur: go into open air and ventilate suspected area. Remove to fresh air and keep at rest in a position comfortable for breathing. Call a POISON CENTER/doctor/physician if you feel unwell.
First-aid measures after skin contact: Remove contaminated clothing. Drench affected area with water for at least 15 minutes.
First-aid measures after eye contact: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
First-aid measures after ingestion: Rinse mouth. Do NOT induce vomiting.

Most important symptoms and effects, both acute and delayed
Symptoms/injuries: Eye irritation.
Symptoms/injuries after inhalation: May cause drowsiness or dizziness.
Symptoms/injuries after eye contact: Causes serious eye irritation.
Symptoms/injuries after ingestion: Ingestion may cause nausea, vomiting and diarrhea.

Indication of any immediate medical attention and special treatment needed
If medical advice is needed, have product container or label at hand.

SECTION 5: Firefighting measures

Extinguishing media
Suitable extinguishing media: Dry chemical, alcohol foam, carbon dioxide.
Unsuitable extinguishing media: Do not use a heavy water stream. A heavy water stream may spread burning liquid.

Special hazards arising from the substance or mixture
Fire hazard: Highly flammable liquid and vapour.
Explosion hazard: May form flammable/explosive vapour-air mixture.
Reactivity: Reacts with chloroform and bromoform under basic conditions, causing fire and explosion hazard. Ignites on contact with the chloride.

Advice for firefighters
Firefighting instructions: Exercise caution when fighting any chemical fire.
Protection during firefighting: Firefighters should wear full protective gear. Do not enter fire area without proper protective equipment, including respiratory protection.

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SECTION 6: Accidental release measures

Personal precautions, protective equipment and emergency procedures

General measures: Use special care to avoid static electric charges. Keep away from heat/sparks/open flames/hot surfaces. – No smoking. Avoid breathing (vapor, mist). Use only outdoors or in a well-ventilated area. Handle in accordance with good industrial hygiene and safety practice.

For non-emergency personnel

Protective equipment: Use appropriate personal protection equipment (PPE).

Emergency procedures: Evacuate unnecessary personnel.

For emergency responders

Protective equipment: Equip cleanup crew with proper protection. Use appropriate personal protection equipment (PPE).

Emergency procedures: Ventilate area.

Environmental precautions

Prevent entry to sewers and public waters.

Methods and material for containment and cleaning up

For containment: Absorb and/or contain spill with inert material, then place in suitable container. Do not take up in combustible material such as: saw dust or cellulosic material.

Methods for cleaning up: Clear up spills immediately and dispose of waste safely.

Reference to other sections

See heading 8, Exposure Controls and Personal Protection.

SECTION 7: Handling and storage

Precautions for safe handling

Additional hazards when processed: Handle empty containers with care because residual vapours are flammable.

Precautions for safe handling: Use only non-sparking tools. Keep away from heat/sparks/open flames/hot surfaces. – No smoking. Avoid breathing mist, spray, vapours. Use only outdoors or in a well-ventilated area. Wear recommended personal protective equipment.

Hygiene measures: Handle in accordance with good industrial hygiene and safety procedures. Wash hands and other exposed areas with mild soap and water before eating, drinking, or smoking and again when leaving work.

Conditions for safe storage, including any incompatibilities

Technical measures: Proper grounding procedures to avoid static electricity should be followed. Ground/bond container and receiving equipment. Use explosion-proof electrical, lighting, ventilating equipment.

Storage conditions: Store in a dry, cool and well-ventilated place. Keep container closed when not in use.

Incompatible products: Strong acids. Strong bases. Strong oxidizers.

Incompatible materials: Heat sources.

Storage area: Keep in fireproof place.

Special rules on packaging: Attacks many plastics.

Specific end use(s)

Solvent.

SECTION 8: Exposure controls/personal protection

Control parameters

Acetone (67-64-1)		
USA ACGIH	ACGIH TWA (ppm)	500 ppm
USA ACGIH	ACGIH STEL (ppm)	750 ppm
USA NIOSH	NIOSH REL (TWA) (mg/m3)	590 mg/m³
USA NIOSH	NIOSH REL (TWA) (ppm)	250 ppm
USA IDLH	US IDLH (ppm)	2500 ppm (10% LEL)
USA OSHA	OSHA PEL (TWA) (mg/m3)	2400 mg/m³
USA OSHA	OSHA PEL (TWA) (ppm)	1000 ppm

Exposure controls

Appropriate engineering controls : Ensure all national/local regulations are observed. Gas detectors should be used when flammable gases/vapours may be released. Proper grounding procedures to avoid static electricity should be followed. Use explosion-proof equipment. Ensure adequate ventilation, especially in confined areas.

Personal protective equipment : Fireproof clothing. Insufficient ventilation: wear respiratory protection. Protective goggles. Gloves.

Hand protection : Wear chemically resistant protective gloves.

Eye protection : Chemical goggles or safety glasses.

Skin and body protection : Wear fireproof clothing.

Respiratory protection : If exposure limits are exceeded or irritation is experienced, NIOSH approved respiratory protection should be worn.

Thermal hazard protection : Wear suitable protective clothing.

Other information : When using, do not eat, drink or smoke.

SECTION 9: Physical and chemical properties

Information on basic physical and chemical properties

Physical state	:	Liquid
Appearance	:	Clear, volatile liquid.
Colour	:	Colorless
Odour	:	Characteristic. Sweet. Mint-like.
Odour threshold	:	No data available
pH	:	No data available
Relative evaporation rate (butylacetate=1)	:	No data available
Melting point	:	-94.7 °C (-138.46°F)
Freezing point	:	No data available
Boiling point	:	56.05 °C (132.89°F) at 1013.25 hPa
Flash Point	:	-20 °C (-4°F)
Auto-ignition temperature	:	No data available
Decomposition Temperature	:	No data available
Flammability (solid, gas)	:	No data available
Vapour pressure	:	233 hPa (at 20 °C)
Relative vapour density at 20 °C	:	No data available
Relative density	:	No data available
Density	:	0.7845 g/cm³ (at 25 °C)
Solubility	:	Miscible.
Log Pow	:	No data available
Log Kow	:	-0.24
Viscosity, kinematic	:	No data available
Viscosity, dynamic	:	0.32 cP
Explosive properties	:	No data available
Oxidising properties	:	No data available
Explosive limits	:	Not applicable

Other information

No additional information available

SECTION 10: Stability and reactivity

Reactivity Reacts with chloroform and bromoform under basic conditions, causing fire and explosion hazard. Ignites on contact with the chloride.

Chemical Stability Stable under recommended handling and storage conditions (see section 7). Highly flammable liquid and vapour. May form flammable/explosive vapour-air mixture.

Possibility Of Hazardous Reactions The substance can form explosive peroxides on contact with strong oxidants such as acetic acid, nitric acid, hydrogen peroxide. Acetone may form explosive mixtures with chromic anhydride, chromyl chloride,

hexachloromelamine, hydrogen peroxide, nitric acid and acetic acid, nitric acid and sulfuric acid, nitrosyl chloride, nitrosyl perchlorate, nitryl perchlorate, permonosulfuric acid, potassium tert-butoxide, thiodiglycol and hydrogen peroxide.

Conditions To Avoid Avoid ignition sources. Heat. Sparks. Open flame. Direct sunlight. Extremely high or low temperatures.

Incompatible Materials Attacks many plastics. Strong acids. Strong bases. Strong oxidizers.

Hazardous Decomposition Products Carbon oxides (CO, CO2). May release flammable gases.

SECTION 11: Toxicological information

Information on toxicological effects

Acute toxicity : Not classified

Acetone (\f)67-64-1	
LD50 oral rat	5800 mg/kg
LD50 dermal rabbit	15688 mg/kg
LC50 inhalation rat (mg/l)	76000 mg/m³

Skin corrosion/irritation: Not classified

Serious eye damage/irritation: Causes serious eye irritation.

Respiratory or skin sensitisation: Not classified

Germ cell mutagenicity: Not classified

Carcinogenicity: Not classified

Reproductive toxicity: Not classified

Specific target organ toxicity (single exposure): May cause drowsiness or dizziness.

Specific target organ toxicity (repeated exposure): Not classified

Aspiration hazard: Not classified

Symptoms/injuries after inhalation: May cause drowsiness or dizziness.

Symptoms/injuries after eye contact: Causes serious eye irritation.

Symptoms/injuries after ingestion: Ingestion may cause nausea, vomiting and diarrhea.

SECTION 12: Ecological information

Toxicity

Acetone (67-64-1)	
LC50 fishes 1	4144.846 mg/l (Exposure time: 96 h - Species: Oncorhynchus mykiss)
EC50 Daphnia 1	1679.66 mg/l (Exposure time: 48 h - Species: Daphnia magna [Static])
LC50 fish 2	6210 - 8120 mg/l (Exposure time: 96 h - Species: Pimephales promelas [static])
EC50 Daphnia 2	12600 - 12700 mg/l (Exposure time: 48 h - Species: Daphnia magna)

Persistence and degradability

Acetone (67-64-1)	
Persistence and degradability	Readily biodegradable in water. Not established.

Bioaccumulative potential

Acetone (67-64-1)	
BCF fish 1	0.69
Log Kow	-0.24
Bioaccumulative potential	Not established.

Mobility in soil

No additional information available

Other adverse effects

Other information : Avoid release to the environment.

SECTION 13: Disposal considerations

Waste treatment methods

Regional legislation (waste): U.S. - RCRA (Resource Conservation & Recovery Act) - Basis for Listing - Appendix VII. U.S. - RCRA (Resource Conservation & Recovery Act) - Constituents for Detection Monitoring. U.S. - RCRA (Resource Conservation & Recovery Act) - List for Hazardous Constituents. U.S. - RCRA (Resource Conservation & Recovery Act) - Phase 4 LDR Rule - Universal Treatment Standards. U.S. - RCRA (Resource Conservation & Recovery Act) - TSD Facilities Ground Water Monitoring. U.S. - RCRA (Resource Conservation & Recovery Act) - U Series Wastes - Acutely Toxic Wastes & Other Hazardous Characteristics.

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Waste disposal recommendations: To be disposed of as hazardous waste. Dispose of contents/container in accordance with local/regional/national/international regulations.

Additional information: Handle empty containers with care because residual vapours are flammable.

SECTION 14: Transport information

In accordance with ICAO/IATA/DOT/TDG

UN number

UN-No.(DOT) : 1090

DOT NA no. UN1090

UN proper shipping name

Department of Transportation (DOT) : 3 - Class 3 - Flammable and combustible liquid 49 CFR 173.120

Hazard Classes ACETONE

Hazard labels (DOT) : 3 - Flammable liquid

Packing group (DOT) : II - Medium Danger

DOT Special Provisions (49 CFR 172.102) : IB2 - Authorized IBCs: Metal (31A, 31B and 31N); Rigid plastics (31H1 and 31H2); Composite (31HZ1). Additional Requirement: Only liquids with a vapor pressure less than or equal to 110 kPa at 50 C (1.1 bar at 122 F), or 130 kPa at 55 C (1.3 bar at 131 F) are authorized.
T4 - 2.65 178.274(d)(2) Normal..... 178.275(d)(3)
TP1 - The maximum degree of filling must not exceed the degree of filling determined by the following: (image) Where: tr is the maximum mean bulk temperature during transport, and tf is the temperature in degrees celsius of the liquid during filling.

DOT Packaging Exceptions (49 CFR 173.xxx) : 150

DOT Packaging Non Bulk (49 CFR 173.xxx) : 202

DOT Packaging Bulk (49 CFR 173.xxx) : 242

Additional information

Emergency Response Guide (ERG) Number : 127

Other information : No supplementary information available.

Transport by sea

DOT Vessel Stowage Location : B - (i) The material may be stowed "on deck" or "under deck" on a cargo vessel and on a passenger vessel carrying a number of passengers limited to not more than the larger of 25 passengers, or one passenger per each 3 m of overall vessel length; and (ii) "On deck only" on passenger vessels in which the number of passengers specified in paragraph (k)(2)(i) of this section is exceeded.

MFAG-No. : 127

Air transport

DOT Quantity Limitations Passenger aircraft/rail (49 CFR 173.27) : 5 L

DOT Quantity Limitations Cargo aircraft only (49 CFR 175.75) : 60 L

SECTION 15: Regulatory information

US Federal regulations

Acetone (67-64-1)	
Listed on the United States TSCA (Toxic Substances Control Act) inventory	
EPA TSCA Regulatory Flag	T - T - indicates a substance that is the subject of a Section 4 test rule under TSCA.

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US State regulations

Acetone(67-64-1)	
State or local regulations	U.S. - Massachusetts - Right To Know List U.S. - New Jersey - Right to Know Hazardous Substance List U.S. - Pennsylvania - RTK (Right to Know) List

SECTION 16: Other information

Indication of changes : 04/23/2013

Other information : This document has been prepared in accordance with the SDS requirements of the OSHA Hazard Communication Standard 29 CFR 1910.1200.

GHS Full Text Phrases:

Eye Irrit. 2A	Serious eye damage/eye irritation Category 2A
Flam. Liq. 2	Flammable liquids Category 2
STOT SE 3	Specific target organ toxicity (single exposure) Category 3
H225	Highly flammable liquid and vapour
H319	Causes serious eye irritation
H336	May cause drowsiness or dizziness

NFPA health hazard : 1 - Exposure could cause irritation but only minor residual injury even if no treatment is given.

NFPA fire hazard : 3 - Liquids and solids that can be ignited under almost all ambient conditions.

NFPA reactivity : 0 - Normally stable, even under fire exposure conditions, and are not reactive with water.

HMIS III Rating

Health : 1 Slight Hazard - Irritation or minor reversible injury possible

Flammability : 3 Serious Hazard

Physical : 0 Minimal Hazard

This information is based on our current knowledge and is intended to describe the product for the purposes of health, safety and environmental requirements only. It should not therefore be construed as guaranteeing any specific property of the product.

SDS US (GHS HazCom) - US Only

SDS Glossary

Action Level. The exposure level (concentration in air) at which OSHA regulations to protect employees takes effect (29 CFR 1910.1001-1047); e.g. workplace air analysis, employee training, medical monitoring, and recordkeeping. Exposure at or above action level is termed occupational exposure. Exposure below this level can also be harmful. This level is generally half the PEL.

Acute Exposure. Exposure of short duration, usually to relatively high concentrations or amounts of material.

Aerosols – Any non-refillable receptacles made of metal, glass, or plastics and containing a compressed, liquefied or dissolved under pressure, with or without a liquid, paste or powder, and 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 state or in a gaseous state. Aerosol includes aerosol dispensers.

Air Purifying Respirator - A respirator that uses chemical sorbents to remove specific gases and vapors from the air or that uses a mechanical filter to remove particulate matter. An air purifying respirator must only be used when there is sufficient oxygen to sustain life.

Allergen. A substance that causes an allergic reaction.

Allergy. A condition in which an initial symptomless exposure to a specific allergen later gives rise to sensitivity to further exposure. Symptoms may be exhibited in a variety of ways, usually by respiratory distress or skin eruptions.

Asphyxiant. A vapor or gas that can cause unconsciousness or death by suffocation (lack of oxygen). Most simple asphyxiants are harmful to the body only when they become so concentrated that they reduce (displace) the available oxygen in the air (normally about 21%) to dangerous levels (18% or lower). Examples of simple asphyxiants are carbon dioxide, nitrogen, hydrogen, and helium. Chemical asphyxiants like carbon monoxide (CO) reduce the blood's ability to carry oxygen, or like cyanide, interfere with the body's utilization of oxygen.

Autoignition Temperature. The minimum temperature at which a substance ignites without application of a flame or spark. Do not heat materials to greater than 80% of this temperature.

Boiling Point, BP. The temperature at which a liquid's vapor pressure equals the surrounding atmospheric pressure so that the liquid rapidly vaporizes. Flammable materials with low BPs generally present special fire hazards [e.g. butane, BP = -0.5ºC (31ºF); gasoline, BP = 38ºC (100ºF)). For mixtures, a range of temperature is given.

Carcinogen. A material that either causes cancer in humans, or, because it causes cancer in animals, is considered capable of causing cancer in humans.

CAS Number. Means “Chemical Abstract Service” number. Is a unique numeric identifier that is used to designate only one substance and is a link to information on that substance.

Ceiling Limit, C. The concentration not to exceed at any time. "An employee's exposure [to a hazardous material] shall at no time exceed the ceiling value" (OSHA).

Chemical Identity – A name that will uniquely identify a chemical. This can be a name that is in accordance with the nomenclature systems of the International Union of Pure and Applied Chemistry (IUPAC) or the Chemical Abstracts Service (CAS), or a technical name.

Chronic Exposure. Continuous or intermittent exposure extending over a long time period, usually applies to relatively low material amounts or concentrations.

Chronic Health Effect. An adverse effect on a human or animal body with symptoms that develop slowly over a long time period and persist or that recur frequently. See Acute Health Effect.

Chronic Toxicity. A material's property that produces chronic health effects (see above), usually resulting from repeated doses of or exposure to the material over a relatively prolonged time period. Ordinarily used to denote effects noted in experimental animals.

Combustible. A term the NFPA, DOT, and others use to classify certain materials with low flash points that ignite easily. Both NFP A and DOT generally define combustible liquids as having a flash point of 38ºC (100ºF) but below 93.3ºC (200ºF).

Compressed Gas – Gas which when packaged under pressure is entirely gaseous at -50°C; including all gases with a critical temperature €-50°C.

Contact Sensitizer – Substance that will induce an allergic response following skin contact. The definition of “contact sensitizer” is equivalent to “skin sensitizer”.
Corrosive. A chemical that causes visible destruction of or irreversible alterations in living tissue by chemical action at the site of contact, or that causes a severe corrosion rate in steel or aluminum.

Cryogenic. Relating to extremely low temperatures as for refrigerant gases.

EC Number (or ECN). Reference number used by the European Communities to identify dangerous substances, in particular those registered under EINECS.

Engineering Controls. Engineering control systems reduce potential hazards by isolating the worker from the hazard or by removing the hazard from the work environment. Methods include substitution, ventilation, isolation, and enclosure. This is preferred over administrative controls and personal protective equipment.

Explosive. A material that produces a sudden, almost instantaneous release of pressure, gas, and heat when subjected to abrupt shock, pressure, or high temperature.

Exposure Limits. The concentration in workplace air of a chemical deemed the maximum acceptable. This means that most workers can be exposed at given levels or lower without harmful effects. Exposure limits in common use are: 1) TLV-TWA (threshold limit value-time-weighted average); 2) STEL (short-term exposure limit); and 3) C (ceiling value).

Flammable. Describes any solid, liquid, vapor, or gas that ignites easily and burns rapidly. Both NFPA and DOT generally define flammable liquids as having a flash point below 38ºC (100ºF)

Flammable Gas – Gas having a flammable range with air at 20°C and a standard pressure of 101.3 kPa.

Flammable Limits (Flammability Limits, Explosive Limits). Minimum and maximum concentrations of a flammable gas or vapor between which ignition can occur. Concentrations below the lower flammable limit (LFL) are too lean to burn, while concentrations above the upper flammable limit (UFL) are too rich. All concentrations between LFL and UFL are in the flammable range, and special precautions are needed to prevent ignition or explosion.

Flammable Liquid – Liquid having a flash point of not more than 93°C.

Flammable Solid – Solid which is readily combustible, or may cause or contribute to fire through friction.

Flash Point(FP), Lowest temperature at which a flammable liquid gives off sufficient vapor to form an ignitable mixture with air near its surface or within a vessel. Combustion does not continue. FP is determined by laboratory tests in cups.

Fume. An airborne dispersion of minute solid particles arising from the heating of a solid (such as molten metal, welding).

Gas. A formless fluid that occupies the space of its enclosure. It can settle to the bottom or top of an enclosure when mixed with other materials. It can be changed to its liquid or solid state only by increased pressure and/or decreased temperature.

General Ventilation (Also known as dilution ventilation). The removal of contaminated air and its replacement with clean air from the general workplace area as opposed to local ventilation, which is specific air changing in the immediate area of a contamination source. An example of local ventilation is a laboratory fume hood.

GHS – Globally Harmonized System of Classification and Labeling of Chemicals

Hazard Communication. Requires chemical manufacturers and importers to assess the hazards associated with the materials in their workplace (29 CFR 1910.1200). Material safety data sheets, labeling, and training are all results of this law.

Hazard Statement – A statement assigned to a hazard class and category that describes the nature of the hazards of a hazardous product, including, where appropriate, the degree of hazard.

Hazardous Chemical, Material. In a broad sense, any substance or mixture of substances having properties capable of producing adverse effects on the health or safety of a human. Included are substances that are carcinogens, toxic, irritants, corrosives, sensitizers, and agents that damage the lungs, skin, eyes, mucous membranes, etc.

HEPA. High-efficiency particulate air filter. Has a 99.97% removal efficiency for .03-micron particles.

Incompatible. Describes materials that could cause dangerous reactions and the release of energy from direct contact with one another.

Irritant - A chemical, which is not corrosive, but which causes a reversible inflammatory effect on living tissue by chemical action at the site of contact.

Label. Any written, printed, or graphic sign or symbol displayed on or affixed to containers of hazardous chemicals. A label should identify the hazardous material, appropriate hazard warnings, and name and address of the chemical manufacturer, importer, or other responsible party.

Latency Period. Time that elapses between exposure and first manifestations of disease or illness. Latency periods can range from minutes to decades, depending on hazardous material and disease produced.

Local Ventilation. The drawing off of contaminated air directly from its source. This type of ventilation is recommended for hazardous airborne materials. Treatment of exhausted air to remove contaminants may be required.

Lower Explosive Limit, Lower Flammable Limit. Refers to the lowest concentration of gas or vapor (% by volume in air) that bums or explodes if an ignition source is present at ambient temperatures.

Material Safety Data Sheet. Also MSDS. Material safety data sheet. OSHA has established guidelines for descriptive data that should be concisely provided on a data sheet to serve as the basis for written hazard communication programs. The thrust of the law is to have those who make, distribute, and use hazardous materials responsible for effective communication.

Mutagen - A substance or agent capable of altering the genetic material in a living cell.

Neurotoxin - A material that affects the nerve cells and may produce emotional or behavioral abnormalities.

NFPA. National Fire Protection Association.

NIOSH. National Institute of Occupational Safety and Health.

Nonflammable. Incapable of easy ignition. Does not bum, or bums very slowly. Also, a DOT hazard class for any compressed gas other than a flammable one.
Nuisance Particulates. Dusts that do not produce significant organic disease or toxic effect from "reasonable" concentrations and exposures.

Odor Threshold. The lowest concentration of a material's vapor (or a gas) in air that is detectable by odor.

OSHA. The Occupational Safety and Health Administration. Part of the U.S. Department of Labor.

Oxidizer. The DOT defines an oxidizer or oxidizing material as a substance that yields oxygen readily to stimulate the combustion (oxidation) of organic matter. Chlorate (CIOI23), permanganate ($Mn0_4$), and nitrate (NO) compounds are examples of oxidizers. Note that they all contain large amounts of oxygen (0).

PEL. Permissible Exposure Limit. Established by OSHA. This may be expressed as a time-weighted average (TWA) limit, short-term exposure limit (STEL), or as a ceiling exposure limit. A ceiling limit must never be exceeded instantaneously even if the TWA exposure limit is not violated. OSHA PELs have the force of law. Note that ACGIH TLVs and NIOSH RELs are recommended exposure limits.

Physical Hazard. Means a chemical for which there is scientifically valid evidence that it is a combustible liquid, a compressed gas, explosive, flammable, and organic peroxide, an oxidizer, pyrophoric, unstable (reactive) or water-reactive.

Pictogram – A graphical composition that may include a symbol plus other graphic elements, such as a border, background pattern or color that is intended to convey specific information.

Polymerization - A chemical reaction in which one or more small molecules combine to form larger molecules. A hazardous polymerization is such a reaction that takes place at a rate that releases large amounts of energy.

PPE. Personal protective equipment. Devices or clothing worn to help insulate a worker from direct exposure to hazardous materials. Example include gloves and respirators.

Precautionary Statement – A phrase (and/or pictogram) that describes recommended measures that should be taken to minimize or prevent adverse effects resulting from exposure to a hazardous product, or improper storage or handling of a hazardous product.

RCRA. *Resource Conservation and Recovery Act,* PL 94-580.

Reactivity. A substance's tendency to undergo chemical reaction either by itself or with other material with the release of energy. Undesirable effects such as pressure buildup, temperature increase, or formation of noxious, toxic, or corrosive by-products may occur because of the substance's reactivity to heating, burning, direct contact with other materials, or other conditions in use or in storage.

Reproductive Health Hazard/Toxin. Any agent with a harmful effect on the adult male or female reproductive systems or on the developing fetus or child. Such hazards affect people in many ways, including loss of sexual drive, mental disorders, impotence, infertility, sterility, mutagenic effects on germ cells, teratogenic effects on the fetus, and transplacental carcinogenesis.

Respirator. A variety of devices that limit inhalation of toxic materials. They range from disposable dust masks to self-contained breathing apparatus (SCBA). All have specific uses and limitations. Their use is covered by OSHA, 29 CFR 1910.134 See SCBA, Chemical Cartridge Respirator.

Routes of Entry. To do bodily damage, a material must contact the body. The method of bodily contact is called the route of entry. The routes of entry are: I) absorption (eye or skin contact); 2) ingestion; and 3) inhalation.

SDS – Safety Data Sheet; document that replaces Material Safety Data Sheets.

Signal Word – A word used to indicate the relative level of severity of hazard and alert the reader to a potential hazard on the label; ‘Danger’ or ‘Warning’ are signal words on a label.

Spontaneously Combustible - A material that ignites as a result of retained heat from processing, or which will oxidize to generate heat and ignite, or which absorbs moisture to generate heat and ignite.

Synonyms. Alternative names by which a material may be known.

Target Organ Effects. Chemically-caused effects from exposure to a material on specific listed organs and systems such as liver, kidneys, nervous system, lungs, skin and eyes.

Teratogen - A substance or agent, exposure to which by a pregnant female can result in malformations in the fetus.

TLV. Threshold limit value. A term used to express the airborne concentration of a material to which most workers can be exposed during normal daily and weekly schedule without adverse effects. ACGIH expresses TLV s in three ways: 1) TLV TWA, the allowable time-weighted average concentration for a normal 8-hour workday or 40-hour week; 2) TLV STEL, the short-term exposure limit or maximum concentration for a continuous exposure period of 15 minutes (maximum of four such periods per day, with at least 60 minutes between exposure periods, and provided that the daily TLV- TWA is not exceeded); and 3) Ceiling (C), the concentration not to exceed at any time.

Toxicology. The study of the nature, effects, and detection of poisons in living organisms. Also, substances that are otherwise harmless but prove toxic under particular conditions. The basic assumption of toxicology is that there is a relationship among the dose (amount), the concentration at the affected site, and the resulting effects.

Toxic Substance. Any chemical or material that: 1) has evidence of an acute or chronic health hazard and 2) is listed in the NIOSH *Registry of Toxic Effects of Chemical Substances* (RTECS), provided that the substance causes harm at any dose level; causes cancer or reproductive effects in animals at any dose level; has a median lethal dose (LD_{50}) of less than 500 mg/kg of body weight when administered orally to rats; has a median LD_{50} of less than 1000 mg/kg of body weight when administered by continuous contact to the bare skin of albino rabbits; or has a median lethal concentration (LD_{50}) in air of less than 2000 ppm by volume of gas vapor, or less than 20 mg/L of mist, fume, or dust when administered to albino rats.

Upper Explosive Limit, Upper Flammable Limit. VEL, UFL. The highest concentration of a material in air that produces an explosion or fire, or that ignites when it contacts an ignition source (high heat, electric arc, spark, or flame). Any concentration above the UEL in air is too rich to be ignited. See Flammable Limits.

Vapor. The gaseous state of a material normally encountered as liquid.

Vapor density - The weight of a vapor or gas compared to the weight of an equal volume of air is an expression of the density of the vapor or gas.

VOC. Volatile organic compounds. Used in coatings and paint because they evaporate very rapidly. Regulated by the EPA per the *Clean Air Act.*