Hazard Communication Employee Training

New changes after
Global Harmonization

Hazard Communication – and GHS

- What is GHS
- GHS and how it affects HazComm
- Changes in the HazComm Standard
- Employee training
  - New requirements
  - Hazard Identification
  - Hazard Information
  - Labels
  - Safety Data Sheets

GHS

- United Nations (UN) **Globally Harmonized System** of Classification and Labeling of Chemicals (GHS)
  - Adopted into OSHA's Hazard Communication Standard, May 25, 2012
  - Internationally consistent
  - Employees must be trained on new information

GHS

- Why align HazComm Standard (HCS) with Global Harmonization Standard (GHS)?
  - A common, coherent approach to classifying and communicating chemical hazards.
    - Harmonized definitions of hazards
    - Specific criteria for labels
    - Harmonized format for safety data sheets

HazComm & GHS

- Employers subject to the Hazard Communication Standard must:
  - Update their Hazard Communication Program to ensure GHS compatible elements are current
  - Provide employee training on:
    - New Hazard Classifications
    - New Labels, including pictograms and hazard warning symbols
    - New Safety Data Sheets that will replace MSDSs

NC DOT's Written Hazard Communication Program

- SPP 1910.1200 (Chapter 17)
  - Each facility, worksite, work unit, or work location shall have a written Hazard Communication Program (HCP), which shall include:
    - Facility or worksite identification
    - Program element contact list
    - Chemical list
    - Non-routine tasks hazard awareness provisions
    - HazComm provisions for contractors
    - Employee training documentation
    - Container labeling provisions
    - SDS requirements and availability

NC DOT's Written Hazard Communication Program

- Employees shall be trained so you know:
  - Where hazardous chemicals are present
  - How to detect the presence of hazardous chemicals
  - What health, physical, and other hazards are in your workplace
  - How to protect yourself from those hazards
  - Where to find your written HazComm Program
  - Where and how to find Safety Data Sheets
  - How to get additional information about hazardous chemicals

Hazard Identification and Hazard Information

- Hazard Classes
- Health Hazards
- Physicals Hazards
- Hazard Categories
- Signal Words
- Labels
- Pictograms
- Safety Data Sheets

Hazard Identification

- "Hazardous chemical" means any chemical which is classified as
  - a physical hazard or
  - a health hazard,

  - a simple asphyxiant,
  - a combustible dust,
  - a pyrophoric gas, or
  - a hazard not otherwise classified.

Hazard Identification

- What are each of these hazard classes?

Hazard Criteria Defined

- Health hazard
  - classified in one of the **health hazard classes**
- Physical hazard
  - classified in one of the **physical hazard classes**
- Simple asphyxiant
  - **displaces oxygen** in the ambient atmosphere, and can thus cause oxygen deprivation in those who are exposed, leading to unconsciousness and death
- Pyrophoric gas
  - a chemical in a gaseous state that will **ignite spontaneously** in air at a temperature of 130 degrees F (54.4 degrees C) or below
- Combustible dust
  - covered separately, but **not specifically defined**

Hazard Criteria Defined

- Hazard Not Otherwise Classified (HNOC)
  - Adverse physical or health effect identified through evaluation that does not meet the specified criteria for the physical and health hazard classes
  - HNOC Definition added to ensure that hazards previously covered by HCS continue to be covered.
    - Information will be required on the safety data sheets in Section 2.
    - Such hazards must also be addressed in worker training.

Hazard Classification

- Each physical or health hazard is a “hazard class”
  - (e.g.: Carcinogenicity is a hazard class).
- A “hazard class” may be sub-divided into several “hazard categories” based on the severity of the hazard.
  - The idea of categories is to describe the hazard and the severity in one place

Health Hazards –
10 Health Hazard classes

- Acute Toxicity
- Skin Corrosion / Irritation
- Serious Eye Damage / Eye Irritation
- Respiratory or Skin Sensitization
- Germ Cell Mutagenicity
- Carcinogenicity
- Reproductive Toxicity
- Specific Target Organ Toxicity – Single Exposure STOT-SE
- Specific Target Organ Toxicity – Repeated Exposure STOT-RE
- Aspiration Hazard

Health Hazards

Hazard Class	Hazard Category			
Acute Toxicity	1	2	3	4
Skin Corrosion / Irritation	1A	1B	1C	2
Serious Eye Damage / Eye Irritation	1	2A	2B	
Respiratory or Skin Sensitization	1			
Germ Cell Mutagenicity	1A	1B	2	
Carcinogenicity	1A	1B	2	
Reproductive Toxicity	1A	1B	2	Lactation
STOT – Single Exposure	1	2	3	
STOT – Repeated Exposure	1	2		
Aspiration	1			
Simple Asphyxiants	Single category			

Health Hazards

- Acute Toxicity–Adverse effects from single dose or multiple doses within 24 hrs (4 hrs inhalation)
- Skin Corrosion–Irreversible damage to the skin
- Skin Irritation–Reversible damage to the skin
- Respiratory/Skin Sensitization–leads to hypersensitivity or allergic response
- Reproductive Toxicity–adverse effects on sexual function, fertility, or offspring development

Health Hazards

- Specific Target Organ Toxicity, Single Exposure –
  - Skin, eyes, liver, CNS, …
  - Reversible or Irreversible
  - Immediate or delayed
  - Single or multiple adverse effects
- Specific Target Organ Toxicity, Repeated Exposure –
  - Same except repeated exposure required for adverse effect to present

Health Hazards

- Aspiration Hazard-
  - Entry of liquid or solid into nasal cavity, trachea, or lower respiratory system
- Aspiration Toxicity-
  - Includes severe acute effects such as chemical pneumonia, pulmonary injury, or death

Physical Hazards –
16 Physical Hazard Classes

- Explosives
- Flammable gases
- Flammable aerosols
- Oxidizing gases
- Gases under pressure
- Flammable liquids
- Flammable solids
- Self-reactive chemicals
- Pyrophoric liquids
- Pyrophoric solids
- Self-heating chemicals
- Chemicals which, in contact with water, emit flammable gases
- Oxidizing liquids
- Oxidizing solids
- Organic peroxides
- Corrosive to metals

Physical Hazards

Hazard Categories	Hazard Class	Class
Divisions 1.1–1.6	Explosives	B1
Categories 1 & 2	Flammable Gases	B2
Categories 1 & 2	Flammable Aerosols	B3
One Category	Oxidizing Gases	B4
Four Groups	Gases under Pressure	B5
Categories 1–6	Flammable Liquids	B6
Categories 1 & 2	Flammable Solids	B7
Categories A – G	Self-Reactive Chemicals	B8
One Category	Pyrophoric Liquids	B9
One Category	Pyrophoric Solids	B10
Category 1 & 2a–2c	Self-Heating Chemicals	B11
One Category	Water contact emits flammable gases	B12
Categories 1–3	Oxidizing Liquids	B13
Categories 1–3	Oxidizing Solids	B14
Categories A – G	Organic Peroxides	B15
One Category	Corrosive to Metals	B16

Physical Hazards

- Explosives – explodes
- Flammable gases
- Flammable aerosols – an aerosol with a flammable component e.g. insect repellants
- Oxidizing gases–causes or contributes to combustion more than air does
- Gases under pressure–contained under pressure of 29psig or greater
  - Compressed
  - Liquefied
  - Dissolved
  - Refrigerated

Physical Hazards

- Flammable liquids–flash point <199.4 F, 93C
- Flammable solids–readily combustible or may cause fire through friction
- Self-reactive chemicals–thermally unstable
- Pyrophoric liquids/solids–ignites on contact with air
- Self-heating chemicals–liable to self-heat on contact with air
- Chemicals which, in contact with water, emit flammable gases –

Physical Hazards

- Oxidizing liquids and Oxidizing solids–not necessarily combustible but may contribute oxygen to combustion
- Organic peroxides
  - May be unstable
  - May be liable to explosive detonation
  - May burn rapidly
  - May be sensitive to impact or friction
  - May react dangerously with other chemicals
- Corrosive to metals–by chemical action, materially damage or destroy metals

Health & Physical Hazards

- Manufacturers must
  - identify which class and category applies to their chemical
  - provide health and physical hazard information in the Safety Data Sheet
  - provide signal words and pictograms indicating health and physical hazards
- Employers must
  - ensure employees are trained to understand the hazard information provided by the manufacturer

Hazard Warnings (Signal Words)

- Signal Words: "…indicate the relative level of severity of hazard and alert the reader to a potential hazard on the label."
- "Danger" is used for more severe hazards
- "Warning" is used for less severe hazards

Labels

- Labels are (now) required to have:
  - Product identifier
  - Supplier name, address, and telephone number
  - Pictogram symbols
  - Signal word
  - Hazard statement(s)
  - Precautionary statement(s)
  - Supplementary information

Labels

OSHA® QUICK CARD™

Hazard Communication Standard Labels

OSHA has updated the requirements for labeling of hazardous chemicals under its Hazard Communication Standard (HCS). As of June 1, 2015, all labels will be required to have pictograms, a signal word, hazard and precautionary statements, the product identifier, and supplier identification. A sample revised HCS label, identifying the required label elements, is shown on the right. Supplemental information can also be provided on the label as needed.

For more information:

OSHA® Occupational Safety and Health Administration

(800) 321-OSHA (6742)
www.osha.gov

SAMPLE LABEL

CODE _____
Product Name _____
} Product Identifier

Company Name _____
Street Address _____
City _____ State _____
Postal Code _____ Country _____
Emergency Phone Number _____
} Supplier Identification

Hazard Pictograms

Signal Word
Danger

Keep container tightly closed. Store in a cool, well-ventilated place that is locked.
Keep away from heat/sparks/open flame. No smoking.
Only use non-sparking tools.
Use explosion-proof electrical equipment.
Take precautionary measures against static discharge.
Ground and bond container and receiving equipment.
Do not breathe vapors.
Wear protective gloves.
Do not eat, drink or smoke when using this product.
Wash hands thoroughly after handling.
Dispose of in accordance with local, regional, national, international regulations as specified.

In Case of Fire: use dry chemical (BC) or Carbon Dioxide (CO_2) fire extinguisher to extinguish.

First Aid
If exposed call Poison Center:
If on skin (or hair): Take off immediately any contaminated clothing. Rinse skin with water.

} Precautionary Statements

Highly flammable liquid and vapor.
May cause liver and kidney damage.
} Hazard Statements

Supplemental Information

Directions for Use

_____
_____
_____

Fill weight: _____ Lot Number: _____
Gross weight: _____ Fill Date: _____
Expiration Date: _____

OSHA 3492-02 2012

Labels – Workplace Labeling Systems

- Unit specific workplace labeling systems have to be updated to meet the new standards.

Pictograms

Note: Border must be red.

Pictograms

Health Hazard

- Carcinogen
- Mutagenicity
- Reproductive Toxicity
- Respiratory Sensitizer
- Target Organ Toxicity
- Aspiration Toxicity

Pictograms

Flame

- Flammables
- Pyrophoric
- Self-Heating
- Emits Flammable Gas
- Self-Reactives
- Organic Peroxides

Pictograms

Exclamation Mark

- Irritant (skin and eye)
- Skin Sensitizer
- Acute Toxicity (harmful)
- Narcotic Effects
- Respiratory Tract Irritant
- Hazardous to Ozone Layer (Non-Mandatory)

Pictograms

Gas Cylinder

- Gases under pressure

Pictograms

Corrosion

- Skin Corrosion/Burns
- Eye Damage
- Corrosive to Metals

Pictograms

Exploding Bomb

- Explosives
- Self-Reactives
- Organic Peroxides

Pictograms

Flame Over Circle

- Oxidizers

Pictograms

Environment

(non-mandatory)

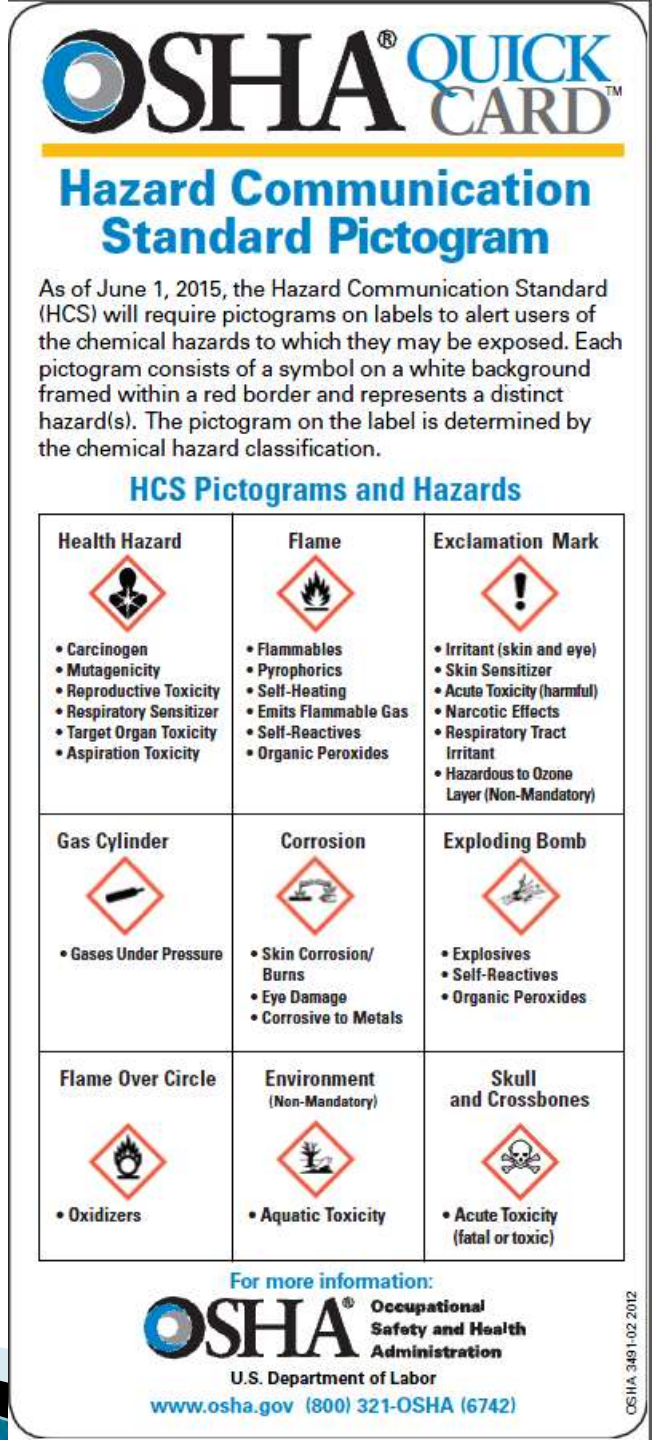
- **Aquatic Toxicity**

Pictograms

Skull & Crossbones

- Acute Toxicity (fatal or toxic)

Pictograms



OSHA® QUICK CARD™

Hazard Communication Standard Pictogram

As of June 1, 2015, the Hazard Communication Standard (HCS) will require pictograms on labels to alert users of the chemical hazards to which they may be exposed. Each pictogram consists of a symbol on a white background framed within a red border and represents a distinct hazard(s). The pictogram on the label is determined by the chemical hazard classification.

HCS Pictograms and Hazards

Health Hazard • Carcinogen • Mutagenicity • Reproductive Toxicity • Respiratory Sensitizer • Target Organ Toxicity • Aspiration Toxicity	**Flame** • Flammables • Pyrophorics • Self-Heating • Emits Flammable Gas • Self-Reactives • Organic Peroxides	**Exclamation Mark** • Irritant (skin and eye) • Skin Sensitizer • Acute Toxicity (harmful) • Narcotic Effects • Respiratory Tract Irritant • Hazardous to Ozone Layer (Non-Mandatory)
Gas Cylinder • Gases Under Pressure	**Corrosion** • Skin Corrosion/ Burns • Eye Damage • Corrosive to Metals	**Exploding Bomb** • Explosives • Self-Reactives • Organic Peroxides
Flame Over Circle • Oxidizers	**Environment** (Non-Mandatory) • Aquatic Toxicity	**Skull and Crossbones** • Acute Toxicity (fatal or toxic)

For more information:

OSHA® Occupational Safety and Health Administration

U.S. Department of Labor

www.osha.gov (800) 321-OSHA (6742)

OSHA 3491-02 2012

Precautionary Statements

- measures to minimize or prevent adverse effects from exposure to a hazardous chemical, or improper storage or handling
- Examples:
  - Keep away from heat/spark/open flame
  - Wash hands thoroughly after handling
  - Do not breathe vapors
  - In Case of Fire use dry chemical (BC) fire extinguisher…
  - First Aid: If exposed, call Poison Center…

Labels

OSHA® QUICK CARD™

Hazard Communication Standard Labels

OSHA has updated the requirements for labeling of hazardous chemicals under its Hazard Communication Standard (HCS). As of June 1, 2015, all labels will be required to have pictograms, a signal word, hazard and precautionary statements, the product identifier, and supplier identification. A sample revised HCS label, identifying the required label elements, is shown on the right. Supplemental information can also be provided on the label as needed.

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SAMPLE LABEL

CODE_____
Product Name_____
} **Product Identifier**

Company Name_____
Street Address_____
City_____ State____
Postal Code_____ Country____
Emergency Phone Number_____
} **Supplier Identification**

Hazard Pictograms

Signal Word
Danger

Highly flammable liquid and vapor.
May cause liver and kidney damage.
} **Hazard Statements**

Keep container tightly closed. Store in a cool, well-ventilated place that is locked.
Keep away from heat/sparks/open flame. No smoking.
Only use non-sparking tools.
Use explosion-proof electrical equipment.
Take precautionary measures against static discharge.
Ground and bond container and receiving equipment.
Do not breathe vapors.
Wear protective gloves.
Do not eat, drink or smoke when using this product.
Wash hands thoroughly after handling.
Dispose of in accordance with local, regional, national, international regulations as specified.

In Case of Fire: use dry chemical (BC) or Carbon Dioxide (CO2) fire extinguisher to extinguish

First Aid
If exposed call Poison Center.
If on skin (or hair): Take off immediately any contaminated clothing. Rinse skin with water.

} **Precautionary Statements**

Supplemental Information

Directions for Use
_____
_____
_____

Fill weight:_____ Lot Number:_____
Gross weight:_____ Fill Date:_____
Expiration Date:_____

OSHA 3492-02 2012

SAMPLE LABEL

CODE _____
Product Name _____

Product Identifier

Company Name _____
Street Address _____
City _____ State ____
Postal Code _____ Country ____
Emergency Phone Number _____

Supplier Identification

Hazard Pictograms

Signal Word
Danger

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Hazard Statements

Supplemental Information

Directions for Use

_____
_____
_____

Fill weight: _____ Lot Number: _____
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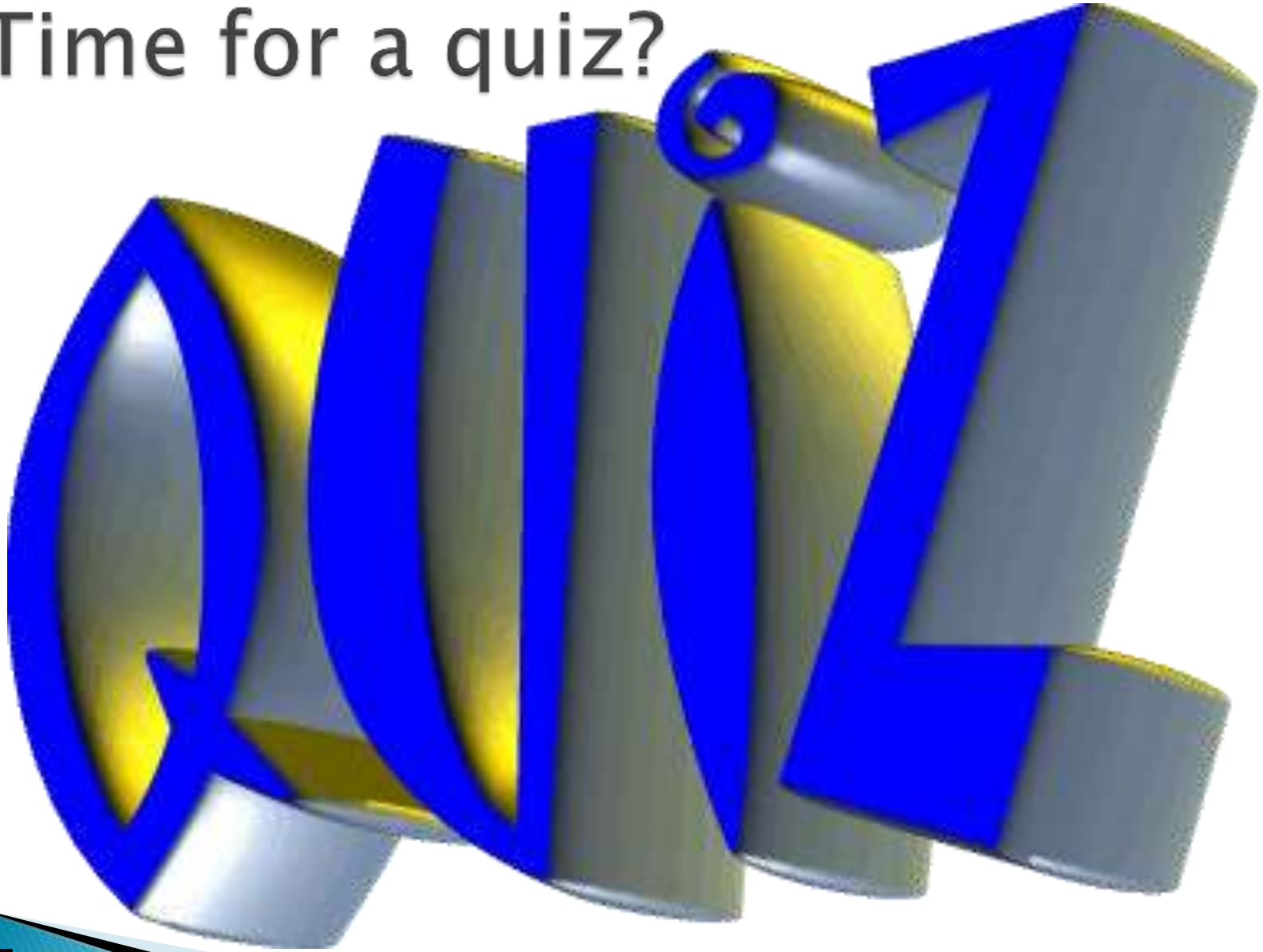
Time for a quiz?



a pictogram quiz

Safety Data Sheets

- Material Safety Data Sheets will be phased out and replaced with Safety Data Sheets
- SDS Format is mandatory – 16 sections
- Requirements are found in Appendix D

Employee Training – SDSs

- HCS2012 adopted the GHS term “Safety Data Sheet,” replacing “Material Safety Data Sheet.”
- Essentially the same except SDS has a “consistent user-friendly, 16 section format.”
- Many manufacturers have been using the 16 section format for years.

Employee Training – SDSs

- Sections 1 – 8 contain general information
  1. Identification
  2. Hazards
  3. Composition
  4. First Aid
  5. Safe handling practices
  6. Emergency control measures (e.g., fire fighting).
  7. Handling and Storage
  8. Exposure Controls & Personal Protective Equipment
- This information should be helpful to those who need to get the information quickly

Employee Training – SDSs

- Sections 9 – 11, & 16 contain other technical and scientific information
  9. Physical and chemical properties
  10. Stability and reactivity information
  11. Toxicological information

  16. Other information (date of SDS, changes to previous version, manufacturer's contact info (where to get additional info)…

Employee Training – SDSs

- Sections 12 –15 are required
  - …to be consistent with the UN Globally Harmonized System of Classification and Labeling of Chemicals (GHS)
    12. Ecological information
    13. Disposal considerations
    14. Transport information
    15. Regulatory information
  - OSHA will not enforce the content of these sections because they concern matters handled by other agencies

SDSs

- Section 1 – Identification
  - Product identifier
  - Recommended uses
  - Manufacturer or importer name, address, phone #
  - Emergency phone number
- Section 2 – Hazard(s) Identification
  - Hazard Classification
  - Signal Word
  - Hazard Statement(s)
  - Symbol(s) – Pictogram(s)
  - Precautionary Statements
  - Other Hazard information

SDSs

CAIG LABORATORIES, INC.

MATERIAL SAFETY DATA SHEET

Page 1 of 7
MSDS-E-GN5MS-15

Prepared to OSHA, ACC, ANSI, NOHSC, WHMIS & 2001/58 EC Standards | MSDS Revision: 3.0 | MSDS Revision Date: 05/01/2008

1. PRODUCT IDENTIFICATION

1.1	Product Name:	DeoxIT® GOLD, GN5MS-15, 5% Spray, 14 g
1.2	Chemical Name:	See ingredients listed in section 2
1.3	Synonyms:	DeoxIT® GOLD, GN5MS-15, 5% Spray
1.4	Trade Names:	DeoxIT® GOLD, GN5MS-15, 5% Spray
1.5	Product Use:	Conditioner, enhancer for contacts & connectors
1.6	Manufacturer's Name:	CAIG Laboratories, Inc.
1.7	Manufacturer's Address:	12200 Thatcher Court, Poway, CA 92064-6876
1.8	Business Phone:	+1 (800)-224-4123
1.9	Emergency Phone:	CHEMTREC 1-800-424-9300/1-703-527-3887
1.10	Other Product Names:	NA

CHEMICAL RESPONSE CARD:	01
RESPONSE TEAM PPE:	
WHMIS:	
HEALTH:	1
FLAMMABILITY:	0
REACTIVITY:	0
PERSONAL PROTECTION:	B

2. HAZARD IDENTIFICATION

2.1 Hazard Identification:
This product is Classified as a HAZARDOUS SUBSTANCE and as DANGEROUS GOODS according to the classification criteria of [NOHSC: 1088 (1999)] and ADG Code (Australia). Colorless, volatile liquid with ethereal and faint sweetish odor. Non-flammable material. Overexposure may cause dizziness and loss of concentration. At higher levels, CNS depression and cardiac arrhythmia may result from exposure. Vapors displace air and can cause asphyxiation in confined spaces. At high temperatures (>250°C), decomposition products may include Hydrofluoric Acid (HF) and carbonyl halides.

2.2 Routes of Entry: Inhalation: YES | Absorption: YES | Ingestion: YES

2.3 Effects of Exposure:
EYES: Mild to moderate irritation.
SKIN: Irritant and potential skin sensitizer. Prolonged or repeated contact may cause contact dermatitis (localized redness or rash).
INGESTION: Gastrointestinal irritation and central nervous system depression.
INHALATION: Central nervous system depressant. Irritating to the upper respiratory tract.

2.4 Symptoms of Overexposure:
EYES: Mild irritation, redness, and watering.
SKIN: Contact dermatitis, characterized by localized red or puffy dry skin and itching.
INGESTION: Nausea, vomiting, and diarrhea.
INHALATION: Mouth, nose, and throat irritation, dizziness, nausea, light-headedness, drunkenness, and loss of coordination.

2.5 Acute Health Effects:
EYES: Mild to moderate irritation.
SKIN: Irritant and potential skin sensitizer. Prolonged or repeated contact may cause contact dermatitis (localized redness or rash).
INGESTION: Gastrointestinal irritation and central nervous system depression.
INHALATION: Central nervous system depressant. Irritating to the upper respiratory tract.

2.6 Chronic Health Effects:
EYES: Mild to moderate irritation.
SKIN: Irritant and potential skin sensitizer. Prolonged or repeated contact may cause contact dermatitis (localized redness or rash).
INGESTION: Gastrointestinal irritation and central nervous system depression.
INHALATION: Central nervous system depressant. Irritating to the upper respiratory tract.

Target Organs:
Eyes, skin and respiratory system.

NOTE: All WHMIS required information is included. It is located in appropriate sections based on the ANSI Z400.1-1998 format.

SDSs

- Section 3 – Composition / Ingredients
  - Chemical name
  - Common name and synonyms
  - CAS number
  - Composition of hazardous ingredients in mixtures, and
    - are present above the cutoff concentration limits, or
    - present a health risk below the cutoff conc. Limits
  - Hazardous constituents that the manufacturer claims is a “Trade Secret”

SDSs

- Section 4 – First Aid Measures
  - First aid measures subdivided by routes of exposure: inhalation, skin & eye contact, ingestion
  - Most important symptoms/affects, acute & delayed
  - Indication of required immediate medical attention and special treatments if needed
- Section 5 – Fire Fighting Measures
  - Suitable (& Unsuitable) extinguishing media
  - Specific hazards, (e.g., any hazardous combustion products)
  - Special protective equipment and precautions

SDSs

CAIG LABORATORIES, INC.

MATERIAL SAFETY DATA SHEET

Prepared to OSHA, ACC, ANSI, NOHSC, WHMIS & 2001/58 EC Standards | MSDS Revision: 3.0 | MSDS Revision Date: 05/01/2008

3. COMPOSITION & INGREDIENT INFORMATION

CHEMICAL NAME(S)	CAS No.	RTECS No.	EINECS No.	%	EXPOSURE LIMITS IN AIR (mg/m³) ACGIH ppm TLV	ACGIH ppm STEL	NOHSC ppm ES-TWA	NOHSC ppm ES-STEL	NOHSC ppm ES-PEAK	OSHA ppm TLV	OSHA ppm STEL	OSHA ppm IDLH	OTHER
1,1,1,3,3-PENTAFLUOROPROPANE	460-73-1	UNK	419-170-6	≤ 75	300	NE	NF	NF	NF	300	NE	NE	
HYDROCARBON PROPELLANT:				≤ 20									
ISOBUTANE	75-28-5	TZ4300000	200-857-2	NA	NE	NE	NF	NF	NF	NE	NE	NE	
PROPANE	74-98-6	TX2275000	200-827-9	NA	NE	NE	NF	NF	NF	1000	NE	NE	
ISOPROPYL ALCOHOL	67-63-0	NT8050000	200-661-7	≤ 5	400	NE	983	500	12 30	400	NE	2000	
DeoxIT® GOLD G100L	TRADE SECRET	NA	NA	≤ 5	NE	NE	NF	NF	NF	NE	NE	NE	

4. FIRST AID MEASURES

4.1 First Aid:

EYES: Flush eyes thoroughly with copious amounts of water for at least 15 minutes, holding eyelid(s) open to ensure complete flushing. If irritation persists, seek immediate medical attention.

SKIN: Remove contaminated clothing and wash affected areas with soap and water. If irritation persists, seek prompt medical attention. Do not wear contaminated clothing until after it has been properly cleaned.

INGESTION: Drink plenty of water. If irritation persists, contact a physician.

INHALATION: Remove victim to fresh air at once. If breathing is difficult, administer supplemental oxygen and seek immediate medical attention. If breathing stops, perform artificial respiration.

4.2 Medical Conditions Aggravated by Exposure:

None reported by the manufacturer.

HEALTH	1
FLAMMABILITY	0
REACTIVITY	0
PROTECTIVE EQUIPMENT	
EYES / SKIN	

5. FIREFIGHTING MEASURES

5.1 Flashpoint & Method:

ND. Level 1 aerosol.

5.2 Autoignition Temperature:

412 °C (774 °F) – 1,1,1,3,3-Pentafluoropropane

5.3 Flammability Limits: Lower Explosive Limit (LEL): NA Upper Explosive Limit (UEL): NA

5.4 Fire & Explosion Hazards:

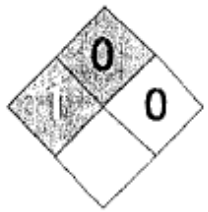
Carbon dioxide, carbon monoxide, hydrocarbons.

5.5 Extinguishing Methods:

CO_2, Alcohol foam, Dry Chemical, Water Fog

5.6 Firefighting Procedures:

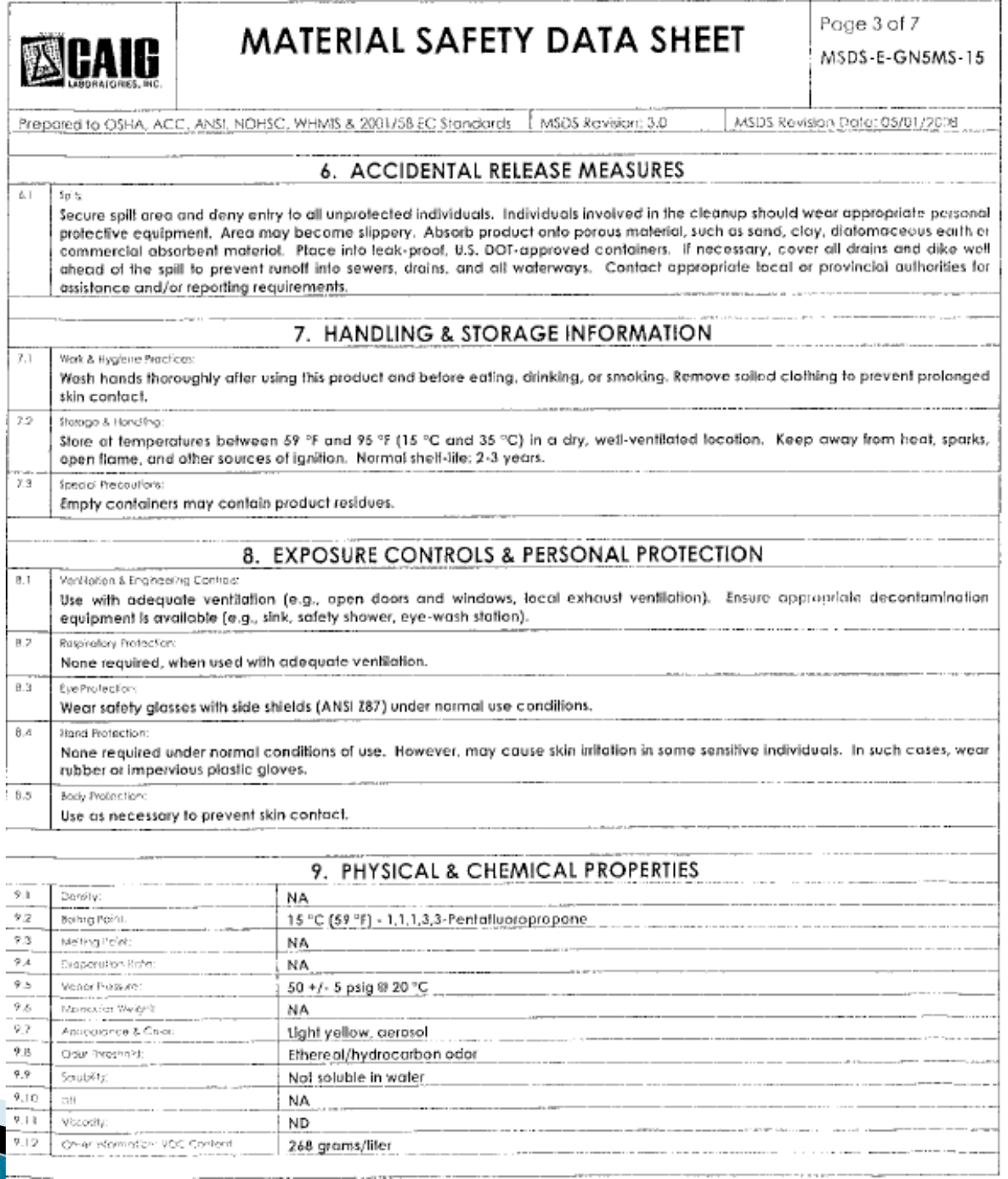
Wear NIOSH/MSHA approved self-contained breathing apparatus and protective clothing. Use a water spray to cool containers involved in fire. Do not use direct water stream. Container storage areas exposed to direct flame contact should be cooled with large quantities of water as needed to prevent weakening of container structure. Keep containers cool until well after the fire is out to prevent rupture. Prevent runoff from fire control or dilution from entering sewers, drains, drinking water supply, or any natural waterway.



SDSs

- Section 6 – Accident Release Measures (spills)
  - Personal precautions, PPE, & emergency procedures
  - Methods & materials for containment and cleanup
- Section 7 – Handling & Storage
  - Precautions for safe handling
  - Conditions for safe storage, including any incompatibilities
- Section 8 – Exposure Controls/Personal Protection
  - PELs, TLVs, RELs, manufacturer/importer exposure limits
  - Appropriate engineering controls
  - Individual protection measures including PPE

SDSs



CAIG LABORATORIES, INC.

MATERIAL SAFETY DATA SHEET

Prepared to OSHA, ACC, ANSI, NOHSC, WHMIS & 2001/58 EC Standards | MSDS Revision: 3.0 | MSDS Revision Date: 05/01/2008

6. ACCIDENTAL RELEASE MEASURES

6.1 Spills:
Secure spill area and deny entry to all unprotected individuals. Individuals involved in the cleanup should wear appropriate personal protective equipment. Area may become slippery. Absorb product onto porous material, such as sand, clay, diatomaceous earth or commercial absorbent material. Place into leak-proof, U.S. DOT-approved containers. If necessary, cover all drains and dike well ahead of the spill to prevent runoff into sewers, drains, and all waterways. Contact appropriate local or provincial authorities for assistance and/or reporting requirements.

7. HANDLING & STORAGE INFORMATION

7.1 Work & Hygiene Practices:
Wash hands thoroughly after using this product and before eating, drinking, or smoking. Remove soiled clothing to prevent prolonged skin contact.

7.2 Storage & Handling:
Store at temperatures between 59 °F and 95 °F (15 °C and 35 °C) in a dry, well-ventilated location. Keep away from heat, sparks, open flame, and other sources of ignition. Normal shelf-life: 2-3 years.

7.3 Special Precautions:
Empty containers may contain product residues.

8. EXPOSURE CONTROLS & PERSONAL PROTECTION

8.1 Ventilation & Engineering Controls:
Use with adequate ventilation (e.g., open doors and windows, local exhaust ventilation). Ensure appropriate decontamination equipment is available (e.g., sink, safety shower, eye-wash station).

8.2 Respiratory Protection:
None required, when used with adequate ventilation.

8.3 Eye Protection:
Wear safety glasses with side shields (ANSI Z87) under normal use conditions.

8.4 Hand Protection:
None required under normal conditions of use. However, may cause skin irritation in some sensitive individuals. In such cases, wear rubber or impervious plastic gloves.

8.5 Body Protection:
Use as necessary to prevent skin contact.

9. PHYSICAL & CHEMICAL PROPERTIES

9.1	Density:	NA
9.2	Boiling Point:	15 °C (59 °F) - 1,1,1,3,3-Pentafluoropropane
9.3	Melting Point:	NA
9.4	Evaporation Rate:	NA
9.5	Vapor Pressure:	50 +/- 5 psig @ 20 °C
9.6	Molecular Weight:	NA
9.7	Appearance & Color:	Light yellow, aerosol
9.8	Odor Threshold:	Ethereal/hydrocarbon odor
9.9	Solubility:	Not soluble in water
9.10	pH:	NA
9.11	Viscosity:	ND
9.12	Other Information: VOC Content	268 grams/liter

SDSs

- Section 9 – Physical & Chemical Properties
  - Appearance (physical state, color, etc.)
  - Odor, odor threshold
  - pH
  - Melting pt., Freezing pt., Boiling pt., Flash pt.
  - Evaporation rate
  - Flammability, U/LFL or U/LEL
  - Vapor pressure, vapor density
  - Relative density, solubility
  - Auto-ignition temp., Decomposition temp.
  - Viscosity
  - …

SDSs

- Section 10 – Stability & Reactivity
  - Reactivity, chemical stability, possibility of hazardous reactions
  - Conditions to avoid (e.g., static discharge, shock…)
  - Incompatible materials
  - Hazardous decomposition products

SDSs

- Section 11 – Toxicological information
  - Likely routes of exposure
  - Symptoms related to physical, chemical, toxicological characteristics
  - Delayed & immediate effects
  - Chronic effects from short & long term exposure
  - Numerical measures of toxicity (LD50, LC50…)
  - Whether listed by NTP, or IARC (carcinogen?)

SDSs

CAIG LABORATORIES, INC.

MATERIAL SAFETY DATA SHEET

Prepared to OSHA, ACC, ANSI, NOHSC, WHMIS & 2001/58 EC Standards | MSDS Revision: 3.0 | MSDS Revision Date: 05/01/2009

10. STABILITY & REACTIVITY

10.1 Stability:
Stable under normal conditions of use (see section 7)

10.2 Hazardous Decomposition Products:
Change in color signifies exposure to ultraviolet light or exceeding shelf life. Will not degrade to unstable products. Discard solution.

10.3 Hazardous Polymerization:
Will not occur.

10.4 Conditions to Avoid:
Use or storage near open flames, sparks, high heat (>100 °F) or other heat sources, and proximity to incompatible substances and heavily trafficked areas.

10.5 Incompatible Substances:
Strong oxidizers.

11. TOXICOLOGICAL INFORMATION

11.1 Toxicity Data:
1,1,1,3,3-Pentafluoropropane: Acute Dermal (rabbit) – LD_{50} > 2,000 mg/kg; Cardiac Sensitization (dogs) – No effects noted at 35,000 ppm, the threshold for induction of cardiac arrhythmias in the presence of injected adrenalin was 44,000 ppm. Acute Inhalation (rat): 4-hr. LC_{50} > 200,000 ppm. No lethality at 200,000 ppm. Evidence of transient anesthetic effect. Acute Inhalation (mouse): 4-hr. LC50 > 100,000 ppm. No lethality at 100,000 ppm. Evidence of transient under activity during exposure.

11.2 Acute Toxicity:
See section 2.5

11.3 Chronic Toxicity:
See section 2.6

11.4 Suspected Carcinogen:
NE

11.5 Reproductive Toxicity:
NO.

Mutagenicity:	This product is not reported to produce mutagenic effects in humans.
Embryotoxicity:	This product is not reported to produce embryotoxic effects in humans.
Teratogenicity:	This product is not reported to produce teratogenic effects in humans.
Reproductive Toxicity:	This product is not reported to produce reproductive effects in humans.

11.6 Irritancy of Product:
See Section 2.3

11.7 Biological Exposure Indices:
NE

11.8 Physician Recommendations:
Treat symptomatically.

12. ECOLOGICAL INFORMATION

12.1 Environmental Stability:
This product will slowly volatile from soil. Components of this product will slowly decompose into organic compounds.

12.2 Effects on Plants & Animals:
There is no specific data available for this product.

12.3 Effects on Aquatic Life:
1,1,1,3,3-Pentafluoropropane: Partition Coefficient: Log P_{ow} = 1.35 @ 21.5°C; Acute toxicity to Daphnia magna (Limit Test): NOEC > 97.9 mg/L; 48 hr. EC_{50} > 97.9 mg/L. Acute toxicity to Rainbow Trout (Limit Test): NOEC > 10 mg/L; 96 hr. EC_{50} > 81.8 mg/L

13. DISPOSAL CONSIDERATIONS

13.1 Waste Disposal:
Dispose of in accordance with federal, state or local regulations.

13.2 Special Considerations:
NA

SDSs
(content for sections 12-15 are non-mandatory)

- Section 12 – Ecological info.
  - Aquatic & terrestrial ecotoxicity
  - Persistence and degradability
  - Bioaccumulative potential
  - Mobility in soil
  - Other adverse effects (e.g., ozone depleter)
- Section 13 – Disposal considerations
  - Safe handling and disposal of waste residues and contaminated packaging
    (Note: disposal of unused or released material may be subject to EPA requirements)

SDSs

(content for sections 12-15 are non-mandatory)

- Section 14 – Transport information
  - UN number and proper shipping name
  - Transport hazard classes, Packaging group
  - Environmental hazards (e.g., “marine pollutant”)
  - Transport in bulk
  - Special prections
- Section 15 – Regulatory information
  - Safety, health & environmental regulations specific for the product

(Section 16 is Mandatory)

- Section 16 – Other information
  - Date of preparation, or last revision, of SDS.

SDSs

14. TRANSPORTATION INFORMATION

The basic description (ID Number, proper shipping name, hazard class & division, packing group) is shown for each mode of transportation.
Additional descriptive information may be required by 49 CFR, IATA/ICAO, IMDG, SCT, ADGR and the CTDGR.

14.1	49 CFR (Ground): CONSUMER COMMODITY, ORM-D
14.2	IATA (Air): ID8000, CONSUMER COMMODITY, 9 (≤ 820 ml) UN1950, AEROSOLS, 2.2 (> 820 ml)
14.3	IMDG (Ocean): UN1950, AEROSOLS, 2.2, LTD QTY (≤ 1.0 L)
14.4	TDGR (Canada): MARK PACKAGE "LIMITED QUANTITY" or "QUANTITÉ LIMITÉE" or "LTD QTY" or "QUANT LTÉE" (≤ 1.0 L)
14.5	ADR/RID (EU): UN1950, AEROSOLS, 2, 5 A, ADR, LTD QTY (X ≤ 1.0 L)
14.6	SCT (Mexico): UN1950, AEROSOLS, 2.2, CANTIDAD LIMITADA
14.7	ADGR (Australia): UN1950, AEROSOLS, 2.2, LTD QTY

15. REGULATORY INFORMATION

15.1	SARA Reporting Requirements: NA
15.2	SARA Threshold Planning Quantity: NA
15.3	TSCA Inventory Status: All chemical substances of this product are listed on the TSCA Inventory or are otherwise exempt from inventory status.
15.4	CERCLA Reportable Quantity (RQ): NA
15.5	Other Federal Requirements: Contains HFC-245fa, a greenhouse gas, a substance which may contribute to global warming. Regulated under Section 612 (SNAP) of the Clean Air Act and 40 CFR Part 82, subpart G.
15.6	Other Canadian Regulations: This product has been classified according to the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR. The components of this product are listed on the DSL/NDSL. None of the components of this product are listed on the Priorities Substances List.
15.7	State Regulatory Information: The primary component of this product is not listed on the following state lists: California OSHA; California Proposition 65; Massachusetts Right to Know List of Chemicals; New Jersey Right to Know List 8:59 Appendix A; Pennsylvania Hazardous Substances List 34 323 Appendix A; Wisconsin Hazardous Substances List NR 605.09; Minnesota Hazardous Substances List; and Florida Toxic Substances List.
15.8	67/548/EEC (European Union) Requirements: The primary component of this product is listed in Annex I of EU Directive 67/548/EEC:

16. OTHER INFORMATION

16.1	Other Information: NA
16.2	Terms & Definitions: See last page of this MSDS.
16.3	Disclaimer: This Material Safety Data Sheet is offered pursuant to OSHA's Hazard Communication Standard, 29 C.F.R. §1910.1200. Other government regulations must be reviewed for applicability to this product. To the best of ShipMate's & CAIG Laboratories, Inc.'s knowledge, the information contained herein is reliable and accurate as of this date; however, accuracy, suitability or completeness are not guaranteed and no warranties of any type, either expressed or implied, are provided. The information contained herein [illegible] If this product[s] is combined with other materials, all component properties must be considered. Data may be changed from time to time. Be sure to consult the latest edition.
16.4	Prepared for: CAIG Laboratories, Inc. 12200 Thatcher Court Poway, CA 92064-6876 +1 (800) CAIG-123 (244-4123) phone +1 (858) 486-8398 fax http://www.caig.com/
16.5	Prepared by: ShipMate, Inc. PO Box 787 Sisters, OR 97759-0787 USA Phone: +1 (310) 370-3600 Fax: +1 (310) 370-5700 e-mail: shipmate@shipmate.com

SDSs

CAIG LABORATORIES, INC.

MATERIAL SAFETY DATA SHEET

Prepared to OSHA, ACC, ANSI, NOHSC, WHMIS & 2001/58 EC Standards | MSDS Revision: 3.0 | MSDS Revision Date: 05/01/2008

DEFINITION OF TERMS

A large number of abbreviations and acronyms appear on a MSDS. Some of these that are commonly used include the following:

GENERAL INFORMATION:

CAS No.	Chemical Abstract Service Number

EXPOSURE LIMITS IN AIR:

ACGIH	American Conference on Governmental Industrial Hygienists
TLV	Threshold Limit Value
OSHA	U.S. Occupational Safety and Health Administration
PEL	Permissible Exposure Limit
IDLH	Immediately Dangerous to Life and Health

FIRST AID MEASURES:

CPR	Cardiopulmonary resuscitation - method in which a person whose heart has stopped receives manual chest compressions and breathing to circulate blood and provide oxygen to the body.

HAZARDOUS MATERIALS IDENTIFICATION SYSTEM: HMIS

HEALTH, FLAMMABILITY & REACTIVITY RATINGS:

0	Minimal Hazard
1	Slight Hazard
2	Moderate Hazard
3	Severe Hazard
4	Extreme Hazard

PERSONAL PROTECTION RATINGS:

A	Safety Glasses
B	Splash Goggles
C	Face Shield & Eye Protection
D	Gloves
E	Boots
F	Synthetic Apron
G	Full Suit
H	Dust Respirator
I	Vapor Respirator
J	Dust & Vapor Respirator
K	Full Face Respirator
X	Airline Hood/Mask or SCBA

Consult your supervisor or S.O.P. for special handling directions.

Note: the dotted circle indicates that this respiratory protective equipment is required for high concentrations or for large volume spills or releases of product.

OTHER STANDARD ABBREVIATIONS:

NA	Not Available
NR	No Results
NE	Not Established
ND	Not Determined
ML	Maximum Limit
SCBA	Self-Contained Breathing Apparatus

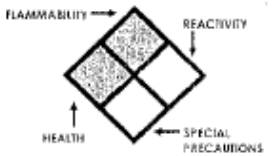
NATIONAL FIRE PROTECTION ASSOCIATION: NFPA

FLAMMABILITY LIMITS IN AIR:

Autoignition Temperature	Minimum temperature required to initiate combustion in air with no other source of ignition
LEL	Lower Explosive Limit - lowest percent of vapor in air, by volume, that will explode or ignite in the presence of an ignition source
UEL	Upper Explosive Limit - highest percent of vapor in air, by volume, that will explode or ignite in the presence of an ignition source

HAZARD RATINGS:

0	Minimal Hazard
1	Slight Hazard
2	Moderate Hazard
3	Severe Hazard
4	Extreme Hazard
ACD	Acidic
ALK	Alkaline
COR	Corrosive
-W-	Use No Water
OX	Oxidizer



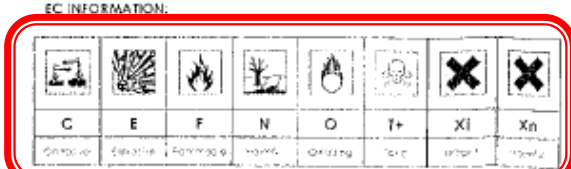
TOXICOLOGICAL INFORMATION:

LD_{50}	Lethal Dose (solids & liquids) which kills 50% of the exposed animals
LC_{50}	Lethal concentration (gases) which kills 50% of the exposed animal
ppm	Concentration expressed in parts of material per million parts
TD_{Lo}	Lowest dose to cause a symptom
TCLo	Lowest concentration to cause a symptom
TD_{Lo}, LD_{Lo}, & LD_{o} or TC, TC_{Lo}, LC_{Lo}, & LC_{o}	Lowest dose (or concentration) to cause lethal or toxic effects
IARC	International Agency for Research on Cancer
NTP	National Toxicology Program
RTECS	Registry of Toxic Effects of Chemical Substances
BCF	Bioconcentration Factor
TL_m	Median threshold limit
log Kow or log Koc	Coefficient of Oil/Water Distribution

REGULATORY INFORMATION:

WHMIS	Canadian Workplace Hazardous Material Information System
DOT	U.S. Department of Transportation
TC	Transport Canada
EPA	U.S. Environmental Protection Agency
DSL	Canadian Domestic Substance List
NDSL	Canadian Non-Domestic Substance List
PSL	Canadian Priority Substances List
TSCA	U.S. Toxic Substance Control Act
EU	European Union (European Union Directive 67/548/EEC)

EC INFORMATION:



Safety Data Sheets

OSHA® QUICK CARD™

Hazard Communication Safety Data Sheets

The Hazard Communication Standard (HCS) requires chemical manufacturers, distributors, or importers to provide Safety Data Sheets (SDSs) (formerly known as Material Safety Data Sheets or MSDSs) to communicate the hazards of hazardous chemical products. As of June 1, 2015, the HCS will require new SDSs to be in a uniform format, and include the section numbers, the headings, and associated information under the headings below:

Section 1, Identification includes product identifier; manufacturer or distributor name, address, phone number; emergency phone number; recommended use; restrictions on use.

Section 2, Hazard(s) identification includes all hazards regarding the chemical; required label elements.

Section 3, Composition/information on ingredients includes information on chemical ingredients; trade secret claims.

Section 4, First-aid measures includes important symptoms/effects, acute, delayed; required treatment.

Section 5, Fire-fighting measures lists suitable extinguishing techniques, equipment; chemical hazards from fire.

Section 6, Accidental release measures lists emergency procedures; protective equipment; proper methods of containment and cleanup.

Section 7, Handling and storage lists precautions for safe handling and storage, including incompatibilities.

(Continued on other side)

For more information:

OSHA® Occupational Safety and Health Administration

U.S. Department of Labor

www.osha.gov (800) 321-OSHA (6742)

OSHA 3493-02 2012

OSHA® QUICK CARD™

Hazard Communication Safety Data Sheets

Section 8, Exposure controls/personal protection lists OSHA's Permissible Exposure Limits (PELs); Threshold Limit Values (TLVs); appropriate engineering controls; personal protective equipment (PPE).

Section 9, Physical and chemical properties lists the chemical's characteristics.

Section 10, Stability and reactivity lists chemical stability and possibility of hazardous reactions.

Section 11, Toxicological information includes routes of exposure; related symptoms, acute and chronic effects; numerical measures of toxicity.

Section 12, Ecological information*
Section 13, Disposal considerations*
Section 14, Transport information*
Section 15, Regulatory information*

Section 16, Other information, includes the date of preparation or last revision.

*Note: Since other Agencies regulate this information, OSHA will not be enforcing Sections 12 through 15 (29 CFR 1910.1200(g)(2)).

Employers must ensure that SDSs are readily accessible to employees.
See Appendix D of 29 CFR 1910.1200 for a detailed description of SDS contents.

For more information:

OSHA® Occupational Safety and Health Administration

U.S. Department of Labor

www.osha.gov (800) 321-OSHA (6742)

OSHA 3493-02 2012

Summary

- HCS2012 same as HCS1994
  - Written Hazard Communication plan
  - Facility labeling requirements
  - Employee training
- HCS2012 changes from HCS 1994
  - Hazard classification instead of hazard determination
  - Labels required to have
    - Pictograms
    - hazard statements
    - signal words
  - SDSs have required format and required content
  - Employees have to be trained on the new information

Implementation

- Employee training
  - New employees – must be trained when hired,
  - Current employees – must be trained by 12/1/2013
- Replace MSDSs with SDSs as provided by the manufacturer or by 3E
- Update workplace specific Hazcomm programs and any workplace specific labeling systems by 12/1/2016, AND
- provide employee training

Questions?