



GeoSafe[®] Ethanol Handling Alert

Personal Protection & Gear:

- DO NOT handle GeoSafe[®] concentrate indoors.
- Wear proper personal protective gear, including a full face shield, long sleeve shirt and pants made from a non-synthetic fabric.
- Have fresh water readily available while handling/diluting the chemical

Storage:

- Keep in closed metal containers to ensure that no liquid or vapors escape.

Transportation:

- DO NOT transport in open containers.

Mixing:

- Dilute in open, well ventilated area, as far away from the job site as is practical.
- Use only a hand pump approved for flammable liquids or gasoline pumping.
- Electrically ground and bond all equipment and containers including the steel drum, pump and receiving container to dissipate any static electricity.
- DO NOT use plastic containers, they cannot be grounded. This can result in sparks and fire.
- No source of ignition within 20' of the mixing/diluting operation, including welding and smoking.
- Ethanol burns with a very light blue flame and may be difficult to see in the sunlight.

Information on Flammable and Combustible Liquids

- GeoSafe[®] concentrate is a flammable liquid with a Flash Point of 16°C, 61°F.
- In a 25% solution mixed with water it is still considered flammable with having a Flash Point of 34.4°C, 94°F.

Static Electricity

Static electricity discharge is a primary ignition source of fire and explosions. Electric charges can build up on an object or liquid when liquids move. Static electricity can be generated when liquids are poured, pumped, filtered, agitated, stirred or flow through pipes. This is called static electricity. Even when liquids are transported or handled in non-conductive containers, something rubbing the outside surface of the container may cause a static charge.

Disposal

- Store waste flammable and combustible liquids in the same way as unused flammable and combustible liquids.
- “Empty” flammable and combustible liquid containers may contain enough liquid and/or vapor to create an explosion hazard – BE CAREFUL. This amount can be trapped in a seam or be present as a thin film on the inner surface of the drum. Do not perform any work (welding, cutting, drilling, soldering) on an “empty” liquid container.

Note: This information is largely an abstract from the attached document of the Canadian GeoExchange Coalition. Read it and the attached MSDS carefully for additional information.

Houghton Chemical Corporation

Safety Data Sheet



HCC ID: 511581-H01-221202

GeoSafe® Geothermal Fluid

Section 1 - Identification	
Manufacturer Address	Houghton Chemical Corporation 52 Cambridge Street, Allston, MA 02134 1-617-254-1010 or 1-800-777-2466
Emergency Telephone	CHEMTREC: 1-800-424-9300
Chemical Name & Synonyms	Antifreeze/ Inhibited Ethyl Alcohol
Chemical Family	Ethanol Mixture
Recommended Use	Antifreeze Fluid
Restrictions on Use	Dilution to 25% is generally recommended: dilute to meet local condition.

Section 2 – Hazard(s) Identification	
Hazard Classification	Flammable Liquid, Category 2 Eye Damage/Irritation, Category 2A Specific Target Organ Toxicity (Single Exposure), Category 3
Signal Word	Danger
Hazard Statement	Causes serious eye irritation. May cause respiratory irritation. May cause drowsiness or dizziness. Highly flammable liquid and vapor.
Pictogram Description	GHS: Flame, Exclamation Point
Precautionary Statement	<p>Prevention: Wash hands and other contacted skin thoroughly after handling. Wear protective gloves and appropriate eye protection. Avoid breathing fumes or vapors. Use only outdoors or in a well-ventilated area. Keep away from all ignition sources such as sparks and open flames. No Smoking. Keep container tightly closed. Ground & bond container and receiving equipment. Use explosion-proof electrical equipment. Use only non-sparking tools. Take precautionary measures against static discharge.</p> <p>Response:</p> <p>If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If eye irritation persists: Get medical attention.</p> <p>If inhaled: Remove person to fresh air and keep comfortable for breathing. Call a poison control center or doctor if you feel unwell.</p> <p>If on skin or hair: Take off immediately all contaminated clothing. Rinse skin with water.</p> <p>In case of fire, use water, water fog, water spray, alcohol-resistant foam, dry chemical or carbon dioxide to extinguish. Avoid strong water streams or water jets; this may spread the fire.</p> <p>Storage: Store in a well-ventilated place. Keep container tightly closed. Store locked up. Keep cool.</p> <p>Disposal: Contact local sewer, municipal, state and/or federal agencies to determine appropriate disposal options for the product. Dispose of this container with a registered reconditioner or as otherwise appropriate.</p>
Any other Hazard not otherwise classified	Not Applicable

Section 3 – Composition and Information on Ingredients			
Chemical Name	Common name and synonyms	CAS #	% by weight
Ethanol	Ethyl Alcohol	64-17-5	90.6
Water	N/A	7732-18-5	3.0-5.0
Inhibitors & Dye	N/A	Proprietary	3.0-5.0

Section 4 – First aid Measures	
Symptoms of Exposure	
Acute	Irritation of affected area, dizziness, depression of central nervous system, headache, nausea.

Delayed	Central nervous system depression, narcosis, damage to the heart, damage to the liver, damage to the kidney, irritation of affected area, cyanosis of extremities, nausea, vomiting, diarrhea, acidosis, headache, dizziness, collapse, unconsciousness, coma, death due to respiratory failure.
Inhalation	Causes irritation of respiratory tract. High concentrations may cause central nervous system effects characterized by nausea, headache, dizziness, unconsciousness and coma. Vapors may cause dizziness or suffocation.
Skin	Causes moderate skin irritation. May cause cyanosis of extremities.
Eye Contact	Causes severe eye irritation. May cause light sensitization. May cause chemical conjunctivitis and corneal damage.
Ingestion	May cause gastrointestinal irritation with nausea, vomiting and diarrhea. May cause systemic toxicity with acidosis. May cause central nervous system depression, characterized by excitement, followed by headache, dizziness, drowsiness, and nausea. Advanced stages may cause collapse, unconsciousness, coma and possible death due to respiratory failure.
First Aid Instructions	
Inhalation	Remove to fresh air. Administer oxygen if breathing is difficult. Give artificial respiration if victim is not breathing. Seek medical attention.
Skin	Wash skin with soap and water for at least 20 minutes. Remove any contaminated clothing. Seek medical attention immediately if symptoms or irritation develops.
Eye Contact	Flush with water for at least 20 minutes. Seek medical attention if irritation develops or persists.
Ingestion	DO NOT induce vomiting, seek medical attention immediately. If swallowed give 2 to 3 glasses of water if victim is conscious and alert. Do not give anything by mouth to an unconscious person. To prevent aspiration of swallowed product, lay victim on side with head lower than waist. Vomiting may occur spontaneously. If vomiting occurs and the victim is conscious, give water to victim to further dilute the chemical.
Other	Consult a physician. Show safety data sheet to the doctor in attendance.
Section 5 – Fire Fighting Measures	
Suitable Extinguishing Material	Water, water fog, water spray, alcohol-resistant foam, dry chemical, sand, or carbon dioxide.
Unsuitable Extinguishing Material	Do NOT use straight stream water.
Hazards from Combustion	Smoke may contain the original material in addition to but not limited to: Carbon Monoxide, Carbon Dioxide.
Special Protective Equipment for Firefighters	Wear self-contained breathing apparatus and protective suit. Evacuate personnel to safe areas and keep upwind of fire.
Section 6 – Accidental Release Measures	
Use of personal precautions	Ventilate area of leak or spill. Remove all sources of ignition. Wear appropriate personal protective equipment.
Protective equipment to prevent the contamination of skin, eyes, and clothing.	Usage of safety glasses or goggles is recommended. Chemical resistant gloves, chemical resistant apron, boots, and full suit will be necessary depending on the extent of clean up task. If ventilation does not control airborne concentration then respiratory protection equipment that meets OSHA's 29 CFR 1910.134 and ANSI Z88.2 requirements should be used.
Methods and materials used for containment	Collect liquid in an appropriate container or absorb with inert material and place in spark proof chemical waste container.
Cleanup procedures	Do not flush to sewer. Comply with all federal, state, and local regulations.
Section 7 – Handling and Storage	
Precautions for safe handling	Protect container from physical damage. Wear appropriate personal protection equipment. Do not expose containers to open flame, excessive heat, or direct sunlight. Use explosion proof equipment. Ground and bond containers when transferring material. Use spark-proof tools. Use local exhaust over processing area. Do not eat, drink or smoke around products.
Recommendations on the conditions for safe storage, Storage/handling incompatibilities.	Store in a cool, dry and well ventilated area away from sources of heat, moisture and incompatible materials. Observe all warnings and precautions listed for the product. Keep container closed to prevent contamination. Keep containers ground and bond.
Section 8 – Exposure Controls/Personal Protection	
OSHA Permissible Exposure Limits (PELs)	Not Applicable

American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Values	ACGIH TLV: 1000 ppm (1900 mg/m3)	
Other Exposure Limits	USA OSHA: Table Z-1 Limits for Air Contaminants - 1910.1000: 1000 ppm (1900 mg/m3)	
Engineering Control	Use mechanical explosion-proof ventilation to control airborne levels below exposure guidelines.	
Individual Protection Measures	Wear protective safety glasses or goggles, gloves, apron, vapor respirator.	
Section 9 – Physical and Chemical and Chemical Properties		
Appearance (physical state, color, etc.)	Liquid, Clear, Light Blue	
Upper/lower flammability or explosive limits	LOWER: 3.3% (V) UPPER: 19% (V)	
Odor	Fragrant	
Vapor pressure	5946.16 Pa / 44.6mmHg	
Odor threshold	Not Applicable	
Vapor density (air = 1)	1.60	
pH	8.0 - 9.5	
Relative density	0.810 - 0.820	
Freezing point (as 50%)	-130°F / -90°C	
Solubility(ies)	Miscible in water	
Initial boiling point and boiling range	172°F / 78°C	
Flash point	57.2°F / 14.0°C	
Evaporation rate (Butyl Acetate = 1)	1.7	
Flammability (solid, gas)	Flammable	
Partition coefficient: n-octanol/water	No Data Available	
Auto-ignition temperature	685.4°F / 363.0°C	
Decomposition temperature; and	Not Applicable	
Viscosity	1.5 cps at 60°F	
Section 10 – Stability and Reactivity		
Reactivity	Product is stable under typical use temperatures.	
Chemical Stability	Product is stable under typical use temperatures.	
Hazardous Reactions	Avoid contact with oxidizing materials, strong bases, alkali metals, ammonia and peroxides.	
Conditions to Avoid	Heat, flames, ignition sources and incompatibles. Vapors may form explosive mixture with air.	
Incompatible Materials	Avoid contact with oxidizing materials, strong bases, alkali metals, ammonia and peroxides.	
Decomposition Products	Carbon dioxide and carbon monoxide may form when heated to decomposition.	
Section 11 – Toxicological Information		
Likely Routes of Exposure	Eyes / Skin / Ingestion / Inhalation	
	Effects from Short Term Exposure	Effects from Long Term Exposure
Delayed Effects	Irritation of affected area	Irritation of affected area
Immediate Effects	Irritation of affected area	Irritation of affected area
Chronic Effects	Not Applicable	Reproductive toxicity - Human - Female - Oral. Effects on newborn: Apgar score (human only). Teratogenicity.
The numerical measures of toxicity (e.g., acute toxicity estimates such as the LD50 (median lethal dose)) - the estimated amount [of a substance] expected to kill 50% of test animals in a single dose.		Ingestion: LD50 - Rats - 7060 mg/kg Inhalation: LC50 - Rats - 10h - 20000ppm
Description of the symptoms. This description includes the symptoms associated with exposure to the chemical including symptoms from the lowest to the most severe exposure.		Central nervous system depression, narcosis, damage to the heart, damage to the liver, damage to the kidney, irritation of affected area, cyanosis of extremities, nausea, vomiting, diarrhea, acidosis, headache, dizziness, collapse, unconsciousness, coma, death due to respiratory failure.

Listed in the National Toxicology Program (NTP) Report on Carcinogens?	Probable, possible or confirmed.	Found to be a potential carcinogen in the International Agency for Research on Cancer (IARC) Monographs?	Probable, possible or confirmed.	Found to be a potential carcinogen by OSHA?	Probable, possible or confirmed.
Section 12 – Ecological Information					
Ecotoxicity	Low Ecotoxicity				
Persistence and Degradability	Biodegradable				
Bioaccumulation	Does not bioaccumulate significantly				
Mobility in Soil	Dissolves in water. If product enters soil, it will be highly mobile and may contaminate ground water				
Other Adverse Effects	No Data Available				
Section 13 – Disposal Considerations					
Do not dump into sewers, on ground or into any bodies of water. Contact local sewer, municipal, state and/or federal agencies to determine appropriate disposal options					
Section 14 – Transport Information					
Is product DOT regulated in Non-Bulk packaging?				Yes	
DOT BULK					
UN number			UN1170		
UN proper shipping name			Ethanol solution		
Transport hazard class(es)			3		
Packing group number			II		
Environmental hazards (e.g., identify if it is a marine pollutant according to the International Maritime Dangerous Goods Code (IMDG Code))			No		
Guidance on transport in bulk (according to Annex II of MARPOL 73/783 and the International Code for the Construction and Equipment of Ships Carrying Dangerous Chemicals in Bulk (International Bulk Chemical Code (IBC Code))			Yes		
Any special precautions which an employee should be aware of or needs to comply with, in connection with transport or conveyance either within or outside their premises			Not Regulated		
Section 15 – Regulatory Information (Not indicated anywhere else on this SDS)					
Safety Regulations		OSHA Hazard Communication Standard: This product is a "Hazardous Chemical" as defined by the OSHA Hazard Communication Standard, 29 CFR 1910.1200. Flammable liquid, target organ effect carcinogen.			
Health Regulations		Not Available			
Environmental Regulations		Not Available			
SARA 311/312		Based upon available information, this material is classified as the following health and/or physical hazards according to Section 311 & 312		Superfund Amendments and Reauthorization Act of 1986 Title III (SARA) Sections 311 and 312: Immediate (Acute) Health Hazard - No; Delayed (Chronic) Health Hazard - Yes; Fire Hazard - Yes; Reactive Hazard - No; Sudden Release of Pressure Hazard - No. Section 313: Product does not contain any chemical components with known CAS numbers that exceed the threshold reporting levels established. Section	
HMIS		Blue/Health		2	
		Red/Flammability		3	
		Orange/Physical Hazard		0	
		White/Personal Protection		X	
NFPA		Health (Blue)		2	

0 (no hazard) to 4 (severe risk)	Flammability (Red)	3
	Instability/Reactivity (Yellow)	N/A
	Special (White)	0
US Toxic Substance Control Act		
CA Proposition 65		
CEPA – Domestic Substances List (DSL)		
Section 16 – Other Information		
<p>This SDS is applicable for all dilutions and containers for this brand of product. The information herein is provided in good faith and believed to be accurate as of the effective revision date shown. However, no warranty, express or implied, is given. Regulatory requirements are subject to change and may differ between various locations. It is the buyer's/ user's responsibility to ensure that activities comply with all federal, state, provincial or local law.</p>		
Product Dilutions Differentials		
Properties¹	25%	20%
GeoSafe® Geothermal Fluid	22.6%	18.1%
Performance Additives and Water	77.4%	81.9%
Specific Gravity (15/15°C 60/60°F)	0.970 - 0.980	0.980 - 0.985
Reserve Alkalinity (minimum)	0.2	0.1
Freeze Point (maximum)	10°F / -12°C	20°F / -7°C
¹ Data for the concentrate is based on volume of Ethanol; data for mixtures is based on volume of GeoSafe® Geothermal Fluid.		
Revision Date: 12/2/2022		



TECHNICAL INFORMATION NOTE

CGC-TN-2011-01
April 13 2011

Safe Operating Procedure for Handling Ethanol

Purpose

To define the Standard Operating Procedures in a manner that informs and instructs operators on the key health and safety points and controls to remember when handling Ethanol.

Background

Hazards can include:

- Fires/Explosions
- Electrocutation
- Spills
- Chemical exposure e.g. burns, dermatitis

To avoid these hazards, proper bonding and grounding procedures must be followed when decanting flammable and combustible liquids.

An individual can be exposed to this chemical through many routes of entry including: eyes, skin, inhalation and ingestion. It is important that all safety precautions are taken prior to handling this chemical.

Information on Flammable and Combustible Liquids

Ethanol is a flammable liquid with a flash point of 16°C and Upper Explosive Limit of 19% Volume and a Lower Explosive Limit of 3.3% Volume.

In a 25% solution by volume with water Ethanol's flashpoint is 34.4°C, this is still considered flammable.

An Ethanol mixture of 20% - 27% is recommended. Refer to the standard CAN/CSA 448-02 consolidated standard for direction regarding approved Ethanol concentration mixtures.

The flashpoint of a liquid is the lowest temperature at which the liquid gives off enough vapour to be ignited (start burning) at the surface of the liquid. Sometimes more than one flashpoint is reported for a chemical. Since testing methods and purity of the liquid tested may vary, flashpoints are intended to be used as guides only, not as fine lines between safe and unsafe.

A material's flammable or explosive limits also relate to its fire and explosion hazards. These limits give the range between the lowest and highest concentrations of vapour in air that will burn or explode.

At normal room temperatures, flammable liquids can give off enough vapour to form burnable mixtures with air. As a result, they can be a serious fire hazard. Flammable liquid fires burn very fast. They also give off a lot of heat and often clouds of thick, black, toxic smoke.

Combustible liquids at temperatures above their flashpoint also release enough vapour to form burnable mixtures with air. Hot combustible liquids can be as serious a fire hazard as flammable liquids.

Most flammable and combustible liquids flow easily. A small spill can cover a large area of workbench or floor. Burning liquids can flow under doors, down stairs and even into neighbouring buildings, spreading fire widely. Materials like wood, cardboard and cloth can easily absorb flammable and combustible liquids. Even after a spill has been cleaned up, a dangerous amount of liquid could still remain in surrounding materials or clothing, giving off hazardous vapours.

Static Electricity

Electric charges can build up on an object or liquid when certain liquids move in contact with other materials. This can occur when liquids are poured, pumped, filtered, agitated, stirred or flow through pipes. This buildup of electrical charge is called static electricity.

Even when liquids are transported or handled in non-conductive containers, something rubbing the outside surface of the container may cause a static charge to build up in the liquid. The amount of charge that develops depends, in part, on how much liquid is involved and how fast it is flowing or is being agitated or stirred.

Flammable and combustible liquids can present a static electricity hazard depending on their ability to generate static electricity, how well they conduct electricity (conductivity), and their flash point.

According to the NFPA (Code 77), solvents that are soluble in water (or can dissolve some water themselves) do not build up static electricity. Examples of such liquids include alcohols and ketones like acetone. However, when liquids are transferred into non-conductive containers (e.g., plastic, glass), even conductive solvents may build up a charge because the plastic or glass containers decrease the rate at which the charge in the solvent dissipates.

The flash point and vapour pressure of the liquid and the temperature are other factors to consider. The vapour levels will be higher in the air around the container if you are working outside on a hot summer day than in the winter when the temperature is below 0°C (32°F) or colder.

Generally, the conditions for igniting a liquid are optimal when the liquid is used at a temperature that produces a vapour in air concentration (at the surface of the liquid) that is halfway between the upper and lower flammability limits. Recognizing that these conditions represent an "optimal" fire hazard, one has to take appropriate precautions, as outlined in the following procedure.

Bonding and Grounding

To prevent the build up of static electricity and prevent sparks from causing a fire, it is important to bond metal dispensing and receiving containers together before pouring. Bonding is done by making an electrical connection from one metal container to the other. This ensures that there will be no difference in electrical potential between the two containers and, therefore, no sparks will be formed.

- Static electricity is present when liquids are dispensed. Static electricity can ignite flammable and combustible material.
- Grounding and bonding wires must be used to prevent dangerous static electricity when transferring flammables or combustibles from one container to another. By grounding and bonding a pathway is provided between the dispensing container, the receiving container and an earth ground so that any static electricity is safely dissipated into the ground.

Manager's Responsibilities

- Managers must prepare, post and maintain an inventory of all hazardous material in use.
- Managers are responsible for ensuring storage, providing personal protective equipment, safe handling and spill response are all reviewed for new hazardous materials coming on site.
- Managers shall keep a floor plan readily accessible at the workplace, showing the names of all hazardous materials and their locations and post at a conspicuous location.
- Provide training on handling chemicals, use of personal protective equipment, and bonding and grounding.
- Comply with the Workplace Hazardous Materials Information System Regulation (WHMIS) under the Occupational Health and Safety Act with respect to material safety data sheets, labeling and worker training.
- All employees must attend WHMIS training and have training with respect to the chemical hazards they are required to handle.
- Up to date material safety data sheets (MSDSs) (no more than 3 years old) are kept for each hazardous product listed in the inventory.
- Use the MSDS to develop an emergency plan.
- Emergency Plan must be posted. Employees must be trained in emergency procedures.
- Class B Fire extinguishers must *be close at hand in areas where the product is used and stored*.
- Employees will be trained on the use of fire extinguishing equipment.

Employee's Responsibilities

- Proper use of all personal protective equipment required to do their job safely
- Follow proper procedures in handling chemicals
- Report any defects in any equipment or personal protective equipment
- Report existence of any hazards

Safe Operating Procedure

Personal Protective Equipment

The following personal protective equipment must be worn when handling Ethanol:

- Rubber Industrial Gloves

- Leather, steel toe boots
- Long sleeved shirt and long pants made from a non-synthetic fabric
- Safety goggles or Face Shield

Before handling the Chemical:

- Employees must be trained by the manufacturer or its approved agent.
- Review the MSDS
- Employees must be trained in emergency procedures.
- Employees must be trained on the use of fire extinguishing equipment.

Handling the Chemical:

- When handling Ethanol, avoid contact with eyes, skin and clothing. Do not ingest the chemical and avoid inhalation.
- Never cut or weld in the same area where flammable or combustible liquids are present
- If chemicals are spilled on clothes, remove clothing and wash as soon as possible
- Flammable liquids give off invisible vapours that spread and catch fire quickly from something as small as static electricity. Proper bonding and grounding procedures must be followed.
- Empty containers may contain hazardous product residues; keep these containers closed when not in use.

Before Dispensing

- Ensure all personal protective equipment is being used
- Make sure an appropriate container is selected and that container is clean
- Ensure the appropriate labels are placed on the container prior to filling. Workplace labels must include name of the material, safe handling instructions and information about where the Material Safety Data Sheets (MSDS) is available in the workplace
- Ensure that a fire extinguisher is immediately accessible.
- Ensure adequate access to fresh water in the event of eye and skin contact or spill.

Dispensing

- All dispensing should be done outdoors to prevent the buildup of flammable vapours.
- Areas where flammable liquids are being poured should be well ventilated. Use natural ventilation where possible, mechanical ventilation should have explosion proof motors and spark resistant fans.
- Remove all sources of ignition from the area. (Including but not limited to trouble lights, open flames, sparks, torches, fusing irons and cell phones.) There must be no source of ignition within 10 feet of the mixing/diluting operation.
- Smoking must not be allowed in the area.
- Ensure that fixed equipment as well as transfer containers are properly bonded and grounded to prevent accumulation of static charge.
- Pour flammable liquids slowly to avoid the buildup of static electricity
- Use only an approved pump - i.e. hand pump approved for flammable liquids or gasoline pumping when filling a container with Ethanol and place the hose in bottom of the container (to control static and to prevent spills)
- Place spout into container being filled and gradually open valve, filling to desired level or weight.
- Close valve and pause to ensure all drips remain in the container. Ensure that all containers are tightly closed.

Filling and Flushing

- Flush carts should always be kept outdoors to prevent build up flammable vapours.
- Use of flush carts indoors is only acceptable if adequate ventilation to prevent build up of vapours is present and there is no outdoor alternative.
- All electrical equipment in the room, including but not limited to mechanical ventilation and pumps must have explosion proof motors and spark resistant fans.
- All ignition sources are to be removed (Including but not limited to trouble lights, open flames, sparks, torches, fusing irons, cell phones). There must be no source of ignition within 10 feet of the filling and flushing operation.
- Smoking must not be allowed in the area.
- Any other trades working in the vicinity should be advised to cease work in the area until work is complete and the area has been ventilated to remove all vapours.

How to Attach Bonding or Grounding Wires.

- Grounding and bonding wires must be used to prevent dangerous static electricity when transferring flammables or combustibles from one container to another. By grounding and bonding a pathway is provided between the dispensing container, the receiving container and an earth ground so that any static electricity is safely dissipated into the ground. A Grounding wire electrically attaches material to ground.
Y Connect a charged object to another object with a conductor such as a copper wire that has an adequate conductive path to the earth (i.e. drains the charge away as rapidly as it is produced).
- Y Connect one or more conductive objects to the ground (grounding electrodes or a cold water pipe made of steel, copper or cast iron are also acceptable).
- A Bonding wire electrically attaches material to each other.
Y Connect the dispensing and receiving containers with a conductor (such as a copper wire) so that static electricity charge is equalized between the objects.
- A Copper Busbar is a grounded electrical connection for multiple grounding wires.

Important Notes:

- Bonding alone does not eliminate the static charge. Both bonding and grounding must be done to eliminate the charge.
- A metal connection must be made with the bonding/grounding wires and the containers. All rust, paint and dirt must be removed before trying to make a connection.
- Avoid using plastic containers for flammable/combustible liquids – they can build up static electricity and you cannot ground them.
- **Do not** use any short cuts! Always ensure proper grounding and bonding procedures are followed.
- If the containers are not properly bonded and grounded, the resulting static spark could cause a serious explosion/injury.

Storage

- Do not handle or store near an open flame, heat or other sources of ignition or electrical or electromagnetic fields.
- Ensure the chemical is stored in a cool, dry, well ventilated area, away from heat and ignition sources.
- Place away from incompatible materials.
- Use of OH&S, CSA or ULC approved storage must be used for storing flammable materials.

Spills and Leaks

- Planning, training and practicing for emergencies are important so that everyone knows what they must do.
- Ensure that an adequate drainage system is available for any spills or leaks
- Be ready to handle emergencies safely. In emergencies like chemical fires and spills, act fast.
- Leave the area at once if you are not trained to handle the problem or if it is clearly beyond your control.
- Alert other people in the area to the emergency.
- Call the fire department and Ministry of Environment immediately.
- Isolate hazard area and restrict access.
- Remove ignition sources and work with non- sparking tools
- For small spills – soak up with absorbent material and scoop into containers
- For large spills – prevent contamination of waterways. Dike and pump into suitable containers, remembering to ground and bond as you work. Clean up residual with absorbent material, place in appropriate container and flush with water.

Disposal

- Store waste flammable and combustible liquids in the same way as unused flammable and combustible liquids.
- Clean drums made of compatible material can be used to store waste liquids if they are vented, grounded and bonded similarly to dispensing drums. Approved safety disposal cans are also available for waste liquids.
- Place cloth, paper and other solid materials that are soaked with flammable and combustible liquids in approved oily waste disposal cans. These are made of metal and have self-closing lids. Do not overfill them, and empty them at least at the end of every workday to reduce the chance of spontaneous combustion.
- Clearly label all waste containers with their contents.
- Be careful with "empty" flammable and combustible liquid containers. They may contain enough liquid or vapour to create an explosion hazard. This amount can easily be trapped in a seam or be present as a very thin film on the inner surface of the drum. Do not perform any work (welding, cutting, drilling, soldering) on an "empty" liquid container until all liquid and vapours have been cleaned out.
- Never pour waste flammable liquids down sinks or drains.

- Dispose of them through hazardous waste collection and disposal companies.

References

Canadian Centre for Occupational Health and Safety

http://www.ccohs.ca/oshanswers/prevention/flammable_stati_c.html

http://www.ccohs.ca/oshanswers/chemicals/flammable/flam.h_tml

Material Safety Data Sheet for Ethanol

Additional Resources

Ontario Fire Code

National Fire Protection Association (NFPA) 30: Flammable and Combustible Liquids Code

NFPA 77: Recommended Practice on Static Electricity

Regulation 851: Regulation for Industrial Establishments (Sections 22, 23 Fire Prevention – Protection, 63 Material Handling and 79, 81-84 Protective Equipment).

[Health and Safety Advisory Geothermal Systems: Ethanol and ethanol/water mixtures.](#)

Document Management

Effective Date:	April 13, 2011
Revision Date:	

DISCLAIMER

Heating, Refrigeration and Air Conditioning Institute of Canada (HRAI) and Canadian Geo Exchange Coalition (CGC) provide the information contained in these voluntary guidelines in good faith but make no representation as to its comprehensiveness or accuracy. This document is intended only as a guide to be followed voluntarily for the appropriate precautionary handling of Ethanol and Ethanol-Water Mixtures intended for use in geothermal loops (the "Material") by a properly trained person. Individuals receiving this information must exercise their independent judgment in determining its appropriateness for any particular purpose. These voluntary guidelines have not been reviewed or approved by any government agency or authority. **HRAI AND CGC MAKE NO REPRESENTATIONS OR WARRANTIES, EITHER EXPRESS OR IMPLIED, INCLUDING WITHOUT LIMITATION ANY WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, WITH RESPECT TO THE INFORMATION SET FORTH IN THESE VOLUNTARY GUIDELINES OR THE MATERIAL. ACCORDINGLY, HRAI AND CGC WILL NOT BE RESPONSIBLE FOR ANY DAMAGES OR INJURY WHATSOEVER RESULTING FROM USE OF OR RELIANCE UPON THE INFORMATION CONTAINED IN THESE VOLUNTARY GUIDELINES.**