

August 13, 2015

West Virginia Department of Environmental Protection
Division of Land Restoration
Office of Environmental Remediation
601 57th Street SE
Charleston, WV 25304

Attention: Mr. David W. Long
Project Manager

**Subject: VRRP Interim Site Assessment Work Plan
Freedom Industries, Incorporated -- Etowah Terminal
Kanawha County, Charleston, West Virginia
VRP Project Number 15017**

Dear Mr. Long:

This work plan identifies the proposed interim site assessment activities to achieve the following objectives:

- further delineate the lateral and vertical extent of cobbles, and potentially contaminated soil and fill in the target release pathway; and
- identify the location of potential preferential pathways associated with underground piping and other structures in the vicinity of the release location.

The interim site assessment findings will be used to refine the conceptual site model, supplement the previous site assessment results, and identify complete/incomplete exposure pathways.

This work plan reflects the West Virginia Department of Environmental Protection (WVDEP) comments addressing the May 19, 2015, VRRP Interim Remediation Work Plan prepared by Arcadis U.S, Inc.

Proposed Scope of Work

Geophysical Survey

An electromagnetic (EM) geophysical survey will be performed to determine the location and extent of underground features (e.g., piping and utilities) which may represent subsurface preferential pathways in and around the release area. The attached Figure identifies the proposed target geophysical investigation area.

One or more EM geophysical method will be performed, depending on the results of initial test profiles to evaluate subsurface conditions and target features, and may include:

- EM induction using a Geonics EM-31;
- Utility location equipment;

- Time domain EM metal detection using a Geonics EM-61; and,
- Ground penetrating radar using an appropriate antenna configuration and frequency based on the soil properties and target depth.

Underground utilities and other potential preferential pathway features will be located on a site map.

Test Pit Excavation

Test pit excavations will be performed using a track excavator to further characterize the subsurface conditions in the target release pathway area extending downslope toward the Elk River.

A total of 13 test pits will be excavated to a depth of approximately 17 feet below ground surface, or until the vertical extent of cobbles has been delineated, whichever occurs first, at the locations shown on the attached Figure. The test pits will be performed in the approximately numerical sequence identified on the Figure.

The proposed test pit locations may be modified based on the initial test pit findings in order to delineate the complete lateral extent of cobble fill. Also, the test pit depths may be altered based on field conditions and actual cobble depth.

If significant perched groundwater is encountered, the groundwater will be removed and placed in the on-site frac tanks for proper treatment/disposal, to the extent feasible based on subsurface conditions.

Multiple proposed test pits are located at the estimated lateral margins of the cobble fill, as shown in the Arcadis VRRP Interim Remediation Work Plan.

Test pits will be excavated in the vicinity of the upper bench (the approximate former aboveground storage tank elevation), and in the vicinity of the lower bench (downslope interceptor trench) location. Test pits will be excavated on slopes between and below these benches, subject to access constraints and field conditions. Test pits will not be advanced if professional judgement indicates a potential for slope instability or failure.

A log of each test pit will be prepared, and will include the following information:

- Test pit GPS coordinates;
- Total test pit depth;
- Fill and soil lithology and stratigraphy;
- Vertical extent and size characterization (range in diameter) of cobbles and any associated infill matrix soil/fill;
- Field headspace screening results for each two foot depth interval of fill/soil, based on use of a photoionization detector (PID) calibrated to an isobutylene standard; and,
- Depth of uppermost soil saturation and groundwater.

Two soil samples from each test pit, as follows:

- The cobble fill with the highest PID field screening result, and
- A native soil sample collected approximately 0.5 to 1.0 feet below the cobble fill.

If no cobble fill is encountered, the soil with the highest PID field screening result will be submitted in lieu of the cobble fill sample, and a deeper native soil sample will also be collected and submitted for analysis.

All soil samples will be analyzed for 4-methyl-1-cyclohexane methanol (MCHM) and propylene glycol phenyl ether (PPH) by gas chromatography/mass spectrometry methods, and U. S. Environmental Protection Agency SW-846 Method 8270.

If no cobbles are encountered, the test pit will be advanced to a total depth of 5 to 10 feet below ground surface. Sample containers will be labeled, and a chain of custody form will accompany samples. Clean sampling tools will be used to avoid cross-contamination, and samples will be placed in one 4-ounce pre-cleaned unpreserved container, immediately placed in a cooler with ice, and submitted to ALS Environmental for analysis.

Quality control samples will be collected and submitted as follows:

- One duplicate sample for every ten samples submitted for analysis; and
- One matrix spike and matrix spike sample for every twenty samples submitted for analysis.

All analysis will be performed with Level IV deliverables.

After each test pit is completed, all excavated material will be placed back in the excavation in the approximate sequence in which they were removed, and compacted using the excavator bucket and track (weight of the machine). No investigation derived waste is expected to be generated, except perched groundwater which will be placed in one of the on-site frac tanks for proper treatment/disposal, as previously described.

If cobbles are detected at the outer perimeter of the test pit program area, additional test pit excavations will be performed to attempt to delineate the lateral cobble fill extent.

Wooden stakes, numbered to identify each test pit, will be placed at the test pit location for future reference. Following completion of the laboratory analysis, CORE will provide the results, as well as a test pit and sample location map to WVDEP along with a brief report summarizing results and conclusions. Third party data validation of the analytical data collected during this interim site assessment and the site investigation completed by Arcadis will be performed prior to submittal of the Supplemental Site Assessment Work Plan.

All field activities will be performed in accordance with the attached CORE site-specific Health and Safety Plan (identifying personnel protective equipment, spill response and containment, employee training, site control, medical monitoring, etc.) and the CORE Quality Assurance Plan.

Sampling and analysis will be performed in accordance with EPA and DEP (e.g., VRRRA Guidance Manual) protocols.

Additional Task

A professional licensed surveyor will perform a comprehensive site and photogrammetric survey with topographic relief based on two-foot contour intervals. All site features, including buildings, structures, monitoring wells, sumps, trenches, pavement, fencing, and tax parcel boundaries will be depicted.

Schedule

The tasks identified in this Work Plan will commence immediately upon receipt of DEP approval. DEP will be notified of the scheduled field activity dates. A report will be prepared and submitted to DEP within four to six weeks to identify procedures and findings. Soil sampling results will be presented in tabular format, and key sampling results will be presented in a site figure. Test pit locations and underground utility/piping/anomalies based on the geophysical survey will be identified on a site map.

Should you have any questions regarding this Work Plan or wish to discuss further, please feel free to contact me at (304) 646-7616.

Sincerely,

CORE Environmental Services, Inc.

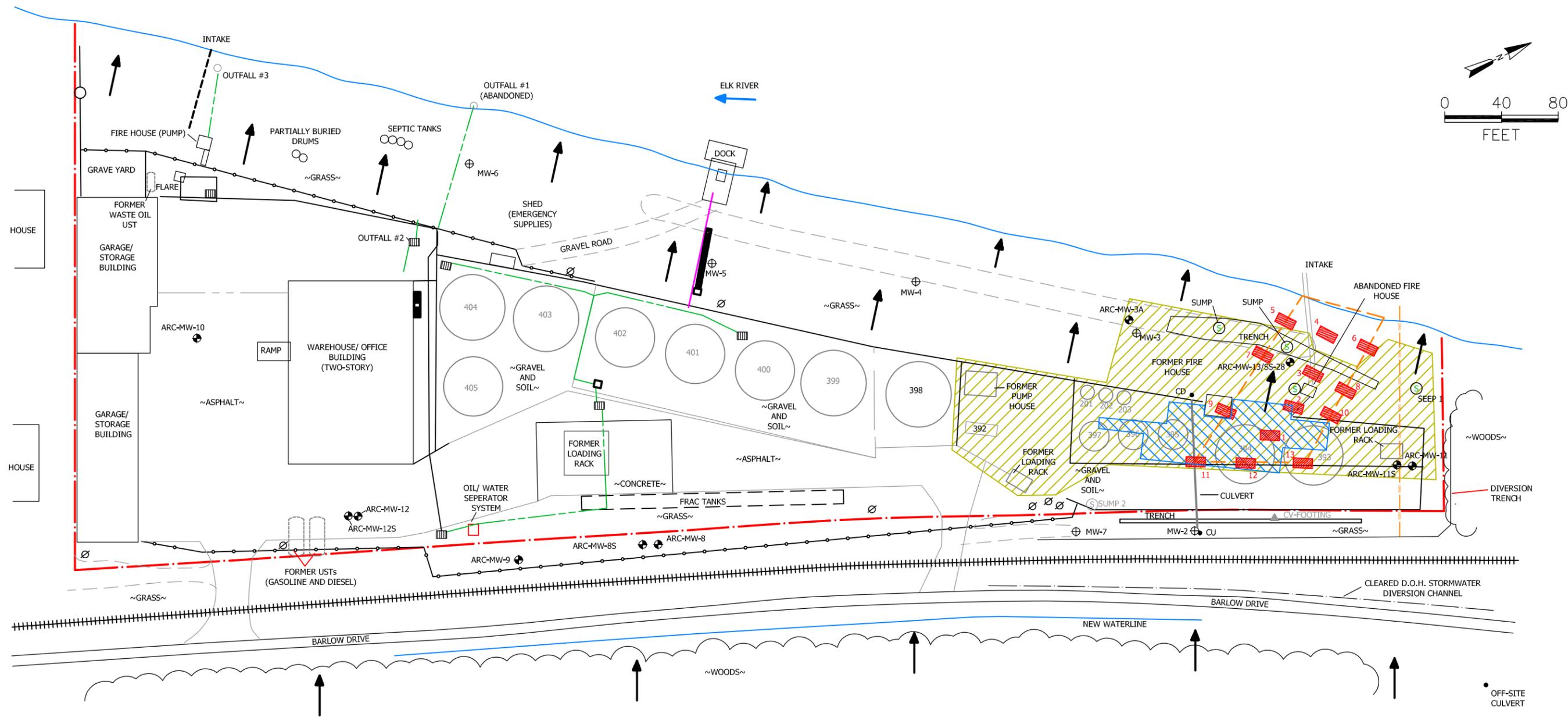


Matthew A. Ford, LRS
Senior Consultant

Enclosures

cc: Patricia Hickman – WVDEP DLR
Mark Welch – Freedom Industries
WVDEP DLR-OER File

FIGURES



LEGEND

- PROPERTY BOUNDARY
- FENCE
- RAILROAD TRACKS
- PROPANE PIPING
- SLOPE DIRECTION
- STORM SEWER LINE
- NATURAL GAS LINE
- ESTIMATED LIMITS OF COBBLE FILL
- FORMER SOIL EXCAVATION
- CATCH BASIN
- POLE
- ⊕ MONITORING WELL
- ⊕ MONITORING WELL (ARCADIS)
- ⊕ SUMP
- ⊕ CULVERT SAMPLE
- PROPOSED GEOPHYSICAL SURVEY AREA
- PROPOSED TEST PIT LOCATION

NOTES:

1. HISTORICAL SITE FEATURES ARE GRAY
2. ALL ASTs HAVE BEEN REMOVED
3. FUEL LOADING RACKS HAVE BEEN REMOVED
4. OIL LOADING RACK HAS BEEN REMOVED



TITLE:
 PROPOSED SUPPLEMENTAL SITE ASSESSMENT ACTIVITIES
 FREEDOM INDUSTRIES
 1015 BARLOW DRIVE
 CHARLESTON, WEST VIRGINIA

DWN: DF
 CHKD:
 DATE: 8/10/15

DES.:
 APPD.:
 REV.:

PROJECT NO.:
 FRE-2015-363
 FIGURE NO.:

APPENDIX A

SITE-SPECIFIC HEALTH AND SAFETY PLAN

SITE SPECIFIC HEALTH & SAFETY PLAN

Project #: FRE-2015-364

Project Name: Freedom Industries Interim Site Assessment

USE: THIS PLAN MUST BE ON SITE AT ALL TIMES - REVIEWED AND SIGNED BY EVERYONE WHO ENTERS THE WORK AREA. NO CHANGES ARE TO BE MADE TO THIS PLAN WITHOUT THE APPROVAL OF THE PROJECT MANAGER AND/OR THE HEALTH, SAFETY, AND ENVIRONMENTAL (HSE) MANAGER.

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A. SITE INFORMATION

1. **Client:** Freedom Industries, Inc.
2. **Site Name:** Freedom Industries
3. **Address/Location:** 1015 Barlow Drive, Charleston, WV
Access Entrance: Latitude: 38° 22' 6.48" North
Longitude: 81° 36' 24.18" West
4. **Date Plan Prepared:** 8/12/15
Expires: N/A
5. **Prepared by:** Jared Sommers
Title: Field Tech
6. **Major Hazards(s):** Exposure to potentially contaminated soil and groundwater, and heavy machinery.
7. **Weather Conditions:** To be determined daily in Job Safety Analysis
8. **Topography:** Benched with steep inclines

B. ON-SITE ORGANIZATION

The following personnel are assigned to carry out the job and the functions of that job. No changes are to be made without the approval of the Project Manager and noted by the HSE Manager on this plan.

TITLE	PRINT NAME	SIGNATURE	DATE
PROJECT MANAGER	Matthew A. Ford		
OPERATIONS MANAGER			
HSE MANAGER	Steve Zbur		
SITE SUPERVISOR	Sotero Svingos		
SITE SUPERVISOR ALT.	Matthew A. Ford		

CREW MEMBERS

	PRINT NAME	SIGNATURE	DATE
1.			
2.			
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C. ON-SITE CONTROL

1. **Freedom Industries, Inc.** has the responsibility of providing right-of-entries. All questions or concerns will be directed to **Freedom Industries, Inc.**

2. No unauthorized person or persons are allowed on-site. Security is the responsibility of all personnel. Report any security violations or suspicious activity immediately to the Site Supervisor.

3. The local law enforcement agency can be called for additional security needs.
 - a. Name of agency: Kanawha County Sheriff
 - b. Non-emergency phone number: 304-357-0200
 - c. Emergency phone number: **Local 9-1-1**

D. SITE CONTINGENCY/ EMERGENCY MEDICAL CARE

1. All injuries will be reported immediately to the **HSE Manager and Project Manager**. Injuries will be assessed and the nature of the injury will determine the course of action to be taken.

2. First aid equipment and supplies for minor injuries are on-site in **company vehicles or with Crew Members and the Site Supervisor**.

3. The closest minor emergency facility or doctor's office is located at:
Name: Saint Francis Hospital (1.6 miles/ 5 minutes)
Street: 333 Laidley Street
City, State, Zip: Charleston, WV 25322
Phone number: (304) 347-6500
Website:

Name:
Street:
City, State, Zip:
Phone number:
Website:

Name:
Street:
City, State, Zip:
Phone number:
Website:

4. The closest Level II Trauma Center is located at:
 - a. Name: CAMC General Hospital
 - b. Street: 501 Morris Street
 - c. City, State, Zip: Charleston, WV 25301
 - d. This facility is **1.8** miles from the work site.
 - e. Ground transportation is **5** minutes.
 - f. Is air transportation available in this area: Yes No
 - g. Flight time to this facility from time of notification is **?** minutes.

5. Emergency Medical Services (EMS) are provided by:
 - a. Name: Kanawha County Emergency Ambulance Authority (KCEAA)
 - b. Emergency Phone Number: 304-342-1107 **9-1-1 or local**
 - c. Services provided:
 - a. Advanced life support (ALS): Yes No
 - b. Basic life support (BLS): Yes No
 - d. EMT first aid by emergency medical technicians: Yes No
 - e. Emergency ground transportation will / will not be provided by this organization.

6. Information for emergency transport if not available by EMS (listed in item 4 above)
 - a. Name:

Maps with directions are provided in **Appendix A, Medical Care Directions**.

NOTES

Air Transportation shall be dispatched and initiated by ground EMS depending on the patient assessment and/or the severity of the incident.

E. ENTRY OBJECTIVES

1. The purpose of entering this worksite is to oversee the continued operation and maintenance of the interim groundwater recovery sumps by Freedom Industries, Inc.'s (Freedom) contractor to capture surface water prior to entering the Elk River; perform interim site assessment/trenching activities; and collect confirmatory soil and water samples.
2. Daily goals and tasks will be set at the morning meeting during the Job Safety Analysis (JSA) and provided in **Appendix B, Job Safety Analysis Forms** for review.
3. Objectives will be discussed at this time.
4. The work day will close with a debriefing and critique of the day's activities.

F. SAFETY HAZARDS

CORE personnel could be potentially exposed to the following hazards during each task of the project. The JSA forms provided in **Appendix B, Job Safety Analysis Forms** will be completed during the initial start of the project, at the beginning of each new job task, and reviewed and signed daily depending on the job task. Any new safety hazards observed in the field will be added, as needed, to the JSA.

HAZARDS	PREVENTATIVE MEASURES
Contaminated soil and water	Proper PPE body position, hiking poles, good housekeeping, inspect walking path prior to journey
Etiological	First Aid and CPR Training -Be alert, stay clear, advise crew members of allergies to stings/bites, etc.
Weather (Driving Conditions and Heat/Cold Stress)	Defensive Driving and Vehicles Safety Training -Journey management by determining weather/road conditions prior to driving to site -Vehicle inspections prior to use Heat/Cold Stress Training -Dress accordingly, hydrate & breaks
Heavy Equipment and traffic	Personal Protective Equipment Training -Communication with operator -Operator always has right-of-way -Set up traffic controls

Training programs and records are available upon request from the HSE Manager.

During inclement weather all warnings by the national weather service will be monitored until the warnings have expired.

G. PERSONAL PROTECTIVE EQUIPMENT (PPE)

- | | |
|---|--|
| 1. Level- A <input type="checkbox"/> | Fully encapsulated suit/ supplied air SCBA |
| 2. Level-B <input type="checkbox"/> | Coveralls (Tyvek)/ supplied air/ gloves/ safety boots |
| 3. Level-C <input type="checkbox"/> | Coveralls/ respirator/ gloves/ safety boots/ hard hat |
| 4. Level-D <input checked="" type="checkbox"/> | Work uniforms/ hard hat/ safety boots/ gloves/ safety glasses |

Note:

- NO FRC Clothing should be required due to No Flash Fire Exposure Potential.
- This should be verified by your Client Representative and Approved.
- During Construction & E&S Control Inspection Phase, High-Visibility Clothing may be utilized.

H. COMMUNICATION PROCEDURES

1. Radios will / will not be used.
2. Cell phone may be used if operational at site.
3. The following standard hand signals will be used in the event other forms of communications fail.

Hand gripping throat	Out of air
Grip partner's wrist	Leave area immediately
Hands on top of head	Need assistance
Thumbs up	Ok, I am alright, I understand
Thumbs down	No, negative

I. DECONTAMINATION

1. Decon will be established when it is determined that hazardous products are present.
2. **GROSS DECON PROCEDURES WILL BE USED IN THE EVENT OF AN EMERGENCY.** Every attempt will be made to contain run-off, unless this will pose an unreasonable risk to workers.
3. If decontamination is to be part of this operation, a separate decon-plan will be attached along with supporting documents such as: Safety Data Sheets (SDS), shipping papers, or manufacture product information.

J. EVACUATION PLAN

1. A safe area will be considered **OUTSIDE** of the work area at a minimum of **50** feet away from the hazard.
2. The assembly point will be at the access entrance within the **Company Vehicle** on the property.
3. If no vehicle is available, use natural barriers for protection.
4. A head count will be performed at each assembly area and will be reported to staff.

K. SITE MAP

1. A site-specific map of the work area will be provided in **Appendix C, Site Maps** and updated as needed.
2. Features to be shown but not limited to:
 - a. Work area
 - b. Break area
 - c. Exclusion area/hot zone
 - d. Contamination reduction zone/warm zone
 - e. Assembly points/safe haven

The project location is primarily commercial/industrial area of Kanawha County, West Virginia located off of Barlow Drive. The site is located on Barlow Drive – 1.5 miles north of the juncture of Barlow Drive and Keystone Drive. Freedom Industries is located on the left side of the road.

L. HEALTH HAZARD EVALUATION

Safety Data Sheets shall be collected and maintained in **Appendix D, Safety Data Sheets** for all chemicals that CORE personnel will be working near. Potential chemicals include petroleum products for maintenance of heavy equipment and fueling operations. The following table lists chemicals that have been added to Appendix D.

Number	Chemical
1.	Methanol
2.	Sodium Bisulfate
3.	Hydrochloric Acid
4.	Ethylene glycol
5.	Propylene glycol
6.	4-methylcyclohexanemethanol (MCHM)
7.	Propylene glycol phenyl ether (PPH)
8.	Alcohols
9.	Volatile Fatty Acids
10.	Formaldehyde
11.	Acetaldehyde
12.	Benzene
13.	Nitric Acid

Number	Chemical
14.	Sulfuric Acid

M. JOURNEY MANAGEMENT

Hazard Mitigation:

1. Complete a Pre-Trip Inspection of the vehicle.
2. Familiarize yourself with the vehicle.
3. Wear your seatbelt at all times.
4. Focus on driving ONLY.
5. Review maps and directions before getting on the road, have maps and directions close, and pull over if you have to review them.
6. Remove all distractions, cell phones etc.
7. Heavy traffic areas and construction zones should be avoided. Consider time of day when journey will take place.
8. Adjust speed as road conditions vary.
9. Avoid left turns across traffic.
10. Use familiar routes.
11. When parking, park away from high traffic areas, make sure to avoid tight parking spaces.
12. Always plan before your journey, give extra time to reach your destination.
13. Don't speed if you are running late, take your time.
14. Try to make the journey during the day; night driving is three times more dangerous than driving during the day.
15. Get plenty of rest before beginning your journey, fatigue slows reaction time, and can be very dangerous.

Mobile Equipment:

1. Only use mobile equipment if you have been authorized by management and have been trained on the piece of equipment.
2. Complete the Mobile Equipment Pre-Operational Checklist.
3. Secure all loads.
4. No passengers shall ride on mobile equipment unless equipped to accommodate.
5. Don the proper PPE.
6. Wear your seat belt at all times, if available.
7. Mobile equipment shall be driven off-road only – Public roads shall only be used if allowed by State, County, or Local laws.
8. Focus on driving ONLY.

9. Review maps and directions before getting on the road, have maps and directions close, and pull over if you have to review them.
10. Remove all distractions, cell phones etc.

N. EMERGENCY PHONE NUMBERS AND CHAIN OF COMMAND

The following emergency contacts are in order by the chain-of-command.

Name	Organization	Title	Phone Number
Matt Ford	CORE Environmental Services, Inc.	Project Manager	304-646-7616
Sotero Svingos	CORE Environmental Services, Inc.	Geologist	304-634-2416
Jared Sommers	CORE Environmental Services, Inc.	Field Technician	304-290-3280
Lance Wilcox	SPSI West, Inc.	Project Manager	330-495-6483
Gary Houseman	SPSI West, Inc.	Senior Supervisor	330-416-4086

O. ADDITIONAL COMMENTS

- This Site Specific Health and Safety Plan is intended as a contingency in the event of an emergency during the scope of work.
- It shall remain in place on the location until the completion of the work scope. The information contained within this shall be addressed with all employees at the location, as well as where the plan can be found.
- This plan shall also be accompanied by daily JSA, where mitigation techniques are identified for relevant site hazards.
- All employees have the right and are encouraged to stop work for any unsafe acts or conditions during the scope of work.

APPENDIX A

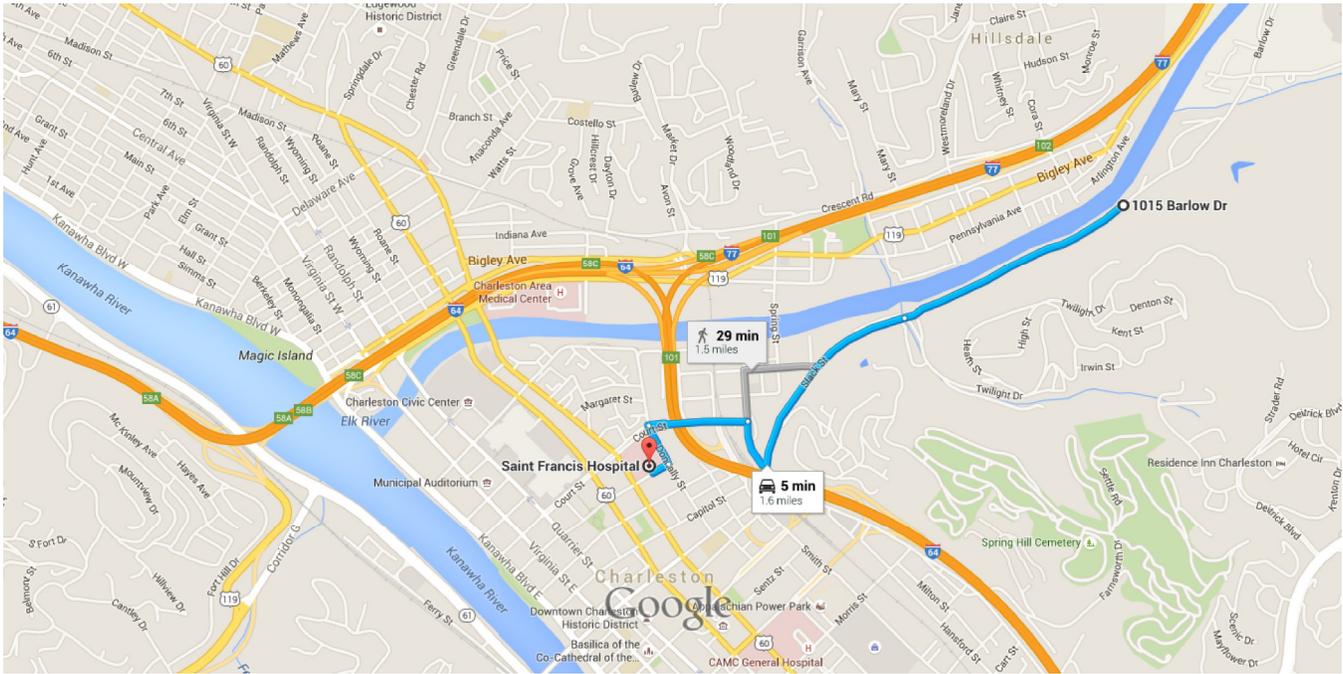
MEDICAL CARE DIRECTIONS



Google

1015 Barlow Dr, Charleston, WV 25311 to Saint Francis Hospital

Drive 1.6 miles, 5 min



○ 1015 Barlow Dr
Charleston, WV 25311

- ↑ 1. Head southwest on Barlow Dr toward Twilight Dr 0.6 mi
 - ↑ 2. Continue onto Slack St 0.5 mi
 - ↪ 3. Turn right onto Piedmont Rd 0.1 mi
 - ↵ 4. Turn left onto Court St 0.2 mi
 - ↵ 5. Turn left onto Donnally St 0.1 mi
 - ↪ 6. Turn right onto Laidley St 213 ft
- i Destination will be on the right

⊙ Saint Francis Hospital
333 Laidley Street, Charleston, WV 25322

These directions are for planning purposes only. You may find that construction projects, traffic, weather, or other events may cause conditions to differ from the map results, and you should plan your route accordingly. You must obey all signs or notices regarding your route.

Map data ©2015 Google 1000 ft 

APPENDIX B

JOB SAFETY ANALYSIS FORMS

List any hazardous materials likely to be involved in this job:
Was MSDS reviewed on each?
Project Manager Signature:

JSA PREPARATION CHECKLIST

IDENTIFY below all HAZARDS associated with the activity. LIST selected hazards in SECTION 2 of the chart on page 1.

Driving or vehicle hazards

<input type="radio"/> Weather	<input type="radio"/> Road Surface	<input type="radio"/> Construction
<input type="radio"/> Traffic	<input type="radio"/> Trailers	<input type="radio"/> Wildlife
<input type="radio"/> Abnormal Loads	<input type="radio"/> Communication	<input type="radio"/> Lighting

Lifting, pulling, prying, or bending

<input type="radio"/> Body Positioning	<input type="radio"/> Tightening/Loosening	<input type="radio"/> Pinch Points
<input type="radio"/> Slips/Falls	<input type="radio"/> Rigging/Sling/Chain Use	<input type="radio"/> Line of Fire

What hazards related to climbing up, over, down, or through piping, skids, packages, vessels, coolers, etc. will be present?

<input type="radio"/> Stepping On/Off	<input type="radio"/> Uneven Surfaces	<input type="radio"/> Slippery Surfaces
<input type="radio"/> Hot/Cold Surfaces	<input type="radio"/> Heights	<input type="radio"/> Body Positioning
<input type="radio"/> Use of Ladders		

Stored/Residual energy hazards

<input type="radio"/> Rotating Equipment	<input type="radio"/> Electrical	<input type="radio"/> Pressurized Gas
<input type="radio"/> Hot/Cold Surfaces	<input type="radio"/> Mechanical Forces	<input type="radio"/> Gravitational Forces

Hazards associated with the work area

<input type="checkbox"/> Confined Space	<input type="checkbox"/> Overhead Operations	<input type="checkbox"/> Hot/Cold Surfaces
<input type="checkbox"/> Noise	<input type="checkbox"/> Hazardous Gases	<input type="checkbox"/> Flammable Gases
<input type="checkbox"/> Trapped Pressure	<input type="checkbox"/> Rotating Equipment	<input type="checkbox"/> Operating Equipment
<input type="checkbox"/> Construction	<input type="checkbox"/> Hazardous Material	<input type="checkbox"/> Weather
<input type="checkbox"/> Special Tooling		

Hazards associated with the procedure, process, or tooling

<input type="checkbox"/> Equipment Change	<input type="checkbox"/> Rotating Equipment	<input type="checkbox"/> Electrical
<input type="checkbox"/> Gas Pressure	<input type="checkbox"/> Hot/Cold Surfaces	<input type="checkbox"/> Operating Equipment
<input type="checkbox"/> Special Tooling		

Environmental or flammable hazards

<input type="checkbox"/> Vapors from Fueling Ops	<input type="checkbox"/> Chemicals	<input type="checkbox"/> Fluids
<input type="checkbox"/> Gases	<input type="checkbox"/> Solids	<input type="checkbox"/> Hazardous Waste
<input type="checkbox"/> Emissions Release	<input type="checkbox"/> Spill Potential	

Work Permits

<input type="checkbox"/> Confined Space	<input type="checkbox"/> Hot Work	<input type="checkbox"/> Safe Work
<input type="checkbox"/> Lockout/Tagout	<input type="checkbox"/> Management of Change	<input type="checkbox"/> Ground Disturbance
<input type="checkbox"/> Pre-Lift		

IDENTIFY below ways to CONTROL HAZARDS. LIST selected controls in SECTION 3 of the chart on page 1.

<input type="checkbox"/> Body Positioning	<input type="checkbox"/> Designate Parking	<input type="checkbox"/> Housekeeping	<input type="checkbox"/> Protection/Barrier
<input type="checkbox"/> Capacities Known	<input type="checkbox"/> Disconnect Power	<input type="checkbox"/> Inspections	<input type="checkbox"/> Release Trapped Pressure
<input type="checkbox"/> Dry/Clean Surfaces	<input type="checkbox"/> Drip/Catch Pans	<input type="checkbox"/> Journey Management	<input type="checkbox"/> Restrict Access
<input type="checkbox"/> Communications Process	<input type="checkbox"/> Eliminate Ignition Source	<input type="checkbox"/> Lockout/Tagout	<input type="checkbox"/> Sampling/Monitoring
<input type="checkbox"/> Constant Monitoring	<input type="checkbox"/> Eliminate Noise	<input type="checkbox"/> MSDS	<input type="checkbox"/> Secure Equipment/Process
<input type="checkbox"/> Contact Customer	<input type="checkbox"/> Equipment Cool Down	<input type="checkbox"/> PPE	<input type="checkbox"/> Stabilize Equipment
<input type="checkbox"/> Contact PWR HSE	<input type="checkbox"/> Fire Extinguisher	<input type="checkbox"/> Observation	<input type="checkbox"/> Tag Lines
<input type="checkbox"/> Contact PWR Manager	<input type="checkbox"/> Fire Watch	<input type="checkbox"/> Proper Lifting Devices	<input type="checkbox"/> Ventilation
<input type="checkbox"/> Drink Fluids/ Rest	<input type="checkbox"/> Foot Placement	<input type="checkbox"/> Proper Lifting Technique	<input type="checkbox"/> Work Permit
<input type="checkbox"/> Delay Job	<input type="checkbox"/> Guarding	<input type="checkbox"/> Proper Tools/Quality	<input type="checkbox"/> Other (List Below)
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

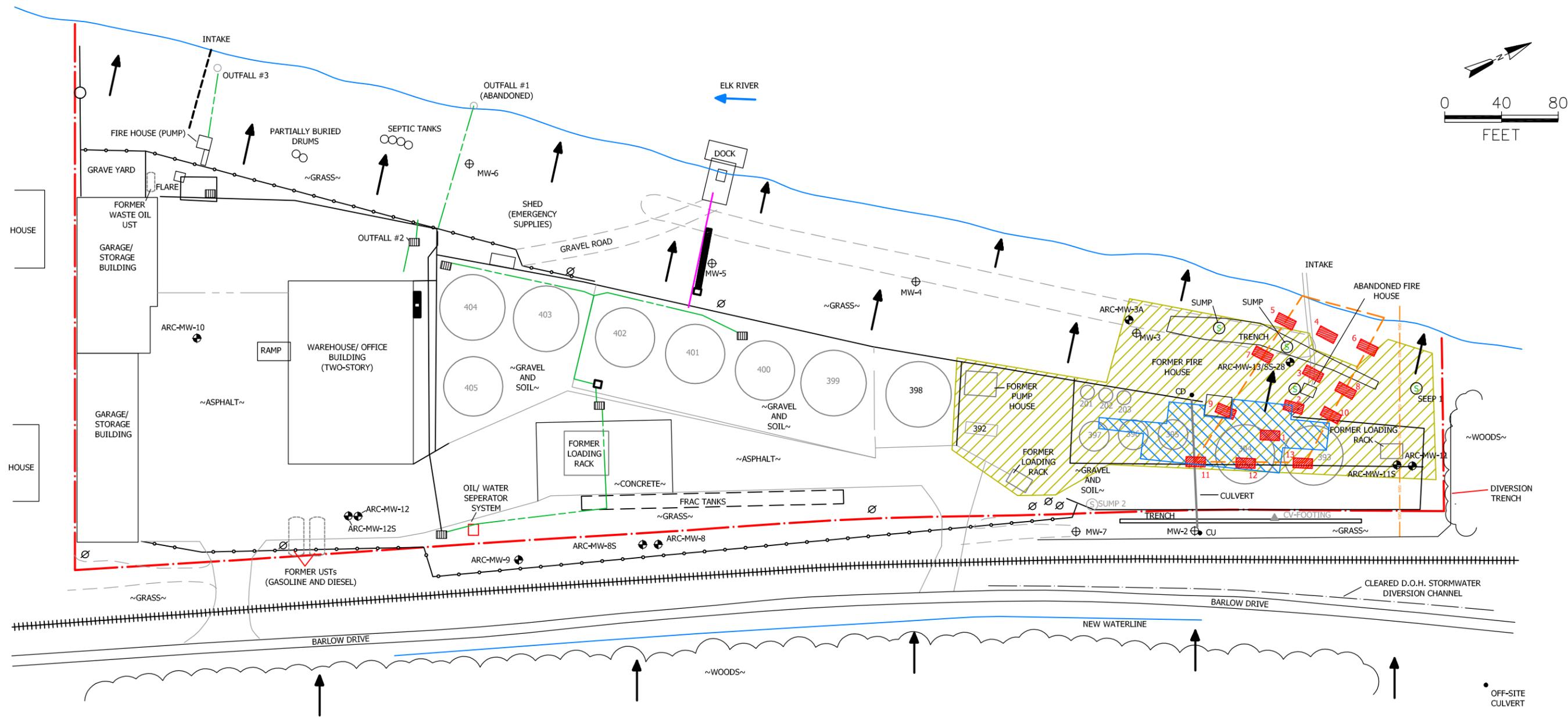
PPE: SAFETY EQUIPMENT REQUIRED (Check all that apply and make notes where appropriate)

<input type="checkbox"/> BREATHING APPARATUS:	<input type="checkbox"/> LOCK OUT / TAG OUT:
<input type="checkbox"/> COMMUNICATIONS:	<input type="checkbox"/> PROTECTIVE CLOTHING:
<input type="checkbox"/> FALL PROTECTION:	<input type="checkbox"/> RESPIRATORY PROTECTION:
<input type="checkbox"/> FIRE EXTINGUISHER:	<input type="checkbox"/> SAFETY GLASSES:
<input type="checkbox"/> GLOVES:	<input type="checkbox"/> SPECIAL EYE / FACE PROTECTION:
<input type="checkbox"/> HARD HAT:	<input type="checkbox"/> WORK VEST:
<input type="checkbox"/> HEARING PROTECTION:	<input type="checkbox"/> OTHER:
<input type="checkbox"/> LEL METER:	<input type="checkbox"/> OTHER:

SIGN IN: PERSONNEL INVOLVED IN THIS JOB MUST SIGN BELOW INDICATING THEY ARE COMFORTABLE WITH THE WORK CONDITIONS AND THIS JSA WILL BE FOLLOWED:

1.	9.
2.	10.
3.	11.
4.	12.
5.	13.
6.	14.
7.	15.
8.	16.

APPENDIX C
SITE MAPS



LEGEND

- PROPERTY BOUNDARY
- FENCE
- | RAILROAD TRACKS
- PROPANE PIPING
- ← SLOPE DIRECTION
- STORM SEWER LINE
- NATURAL GAS LINE
- ESTIMATED LIMITS OF COBBLE FILL
- FORMER SOIL EXCAVATION
- CATCH BASIN
- POLE
- ⊕ MONITORING WELL
- ⊕ MONITORING WELL (ARCADIS)
- ⊕ SUMP
- CULVERT SAMPLE
- PROPOSED GEOPHYSICAL SURVEY AREA
- PROPOSED TEST PIT LOCATION

NOTES:

1. HISTORICAL SITE FEATURES ARE GRAY
2. ALL ASTs HAVE BEEN REMOVED
3. FUEL LOADING RACKS HAVE BEEN REMOVED
4. OIL LOADING RACK HAS BEEN REMOVED



TITLE:
 PROPOSED SUPPLEMENTAL SITE ASSESSMENT ACTIVITIES
 FREEDOM INDUSTRIES
 1015 BARLOW DRIVE
 CHARLESTON, WEST VIRGINIA

DWN: DF
 CHKD:
 DATE: 8/10/15

DES.:
 APPD.:
 REV.:

PROJECT NO.:
 FRE-2015-363
 FIGURE NO.:

APPENDIX D

SAFETY DATA SHEETS

MATERIAL SAFETY DATA SHEET

ALCONOX®

Prepared to U.S. OSHA, CMA, ANSI, Canadian WHMIS, Australian WorkSafe, Japanese Industrial Standard JIS Z 7250:2000, and European Union REACH Regulations



SECTION 1 - PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME: **ALCONOX®**
CHEMICAL FAMILY NAME: Detergent.
PRODUCT USE: Critical-cleaning detergent for laboratory, healthcare and industrial applications
U.N. NUMBER: Not Applicable
U.N. DANGEROUS GOODS CLASS: Non-Regulated Material
SUPPLIER/MANUFACTURER'S NAME: Alconox, Inc.
ADDRESS: 30 Glenn St., Suite 309, White Plains, NY 10603. USA
EMERGENCY PHONE: **TOLL-FREE in USA/Canada** 800-255-3924
International calls 813-248-0585
BUSINESS PHONE: 914-948-4040
DATE OF PREPARATION: May 2011
DATE OF LAST REVISION: February 2008

SECTION 2 - HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW: This product is a white granular powder with little or no odor. Exposure can be irritating to eyes, respiratory system and skin. It is a non-flammable solid. The Environmental effects of this product have not been investigated.

US DOT SYMBOLS

Non-Regulated

CANADA (WHMIS) SYMBOLS



EUROPEAN and (GHS) Hazard Symbols



Signal Word: **Warning!**

EU LABELING AND CLASSIFICATION:

Classification of the substance or mixture according to Regulation (EC) No1272/2008 Annex 1

EC# 205-633-8 This substance is not classified in the Annex I of Directive 67/548/EEC

EC# 268-356-1 This substance is not classified in the Annex I of Directive 67/548/EEC

EC# 231-838-7 This substance is not classified in the Annex I of Directive 67/548/EEC

EC# 231-767-1 This substance is not classified in the Annex I of Directive 67/548/EEC

EC# 207-638-8 Index# 011-005-00-2

EC# 205-788-1 This substance is not classified in the Annex I of Directive 67/548/EEC

GHS Hazard Classification(s):

Eye Irritant Category 2A

Hazard Statement(s):

H319: Causes serious eye irritation

Precautionary Statement(s):

P260: Do not breath dust/fume/gas/mist/vapors/spray

P264: Wash hands thoroughly after handling

P271: Use only in well ventilated area.

P280: Wear protective gloves/protective clothing/eye protection/face protection/

Hazard Symbol(s):

[Xi] Irritant

MATERIAL SAFETY DATA SHEET

ALCONOX®

Risk Phrases:

R20: Harmful by inhalation
R36/37/38: Irritating to eyes, respiratory system and skin

Safety Phrases:

S8: Keep container dry
S22: Do not breath dust
S24/25: Avoid contact with skin and eyes

HEALTH HAZARDS OR RISKS FROM EXPOSURE:

ACUTE: Exposure to this product may cause irritation of the eyes, respiratory system and skin. Ingestion may cause gastrointestinal irritation including pain, vomiting or diarrhea.

CHRONIC: This product contains an ingredient which may be corrosive.

TARGET ORGANS:

ACUTE: Eye, respiratory System, Skin

CHRONIC: None Known

SECTION 3 - COMPOSITION and INFORMATION ON INGREDIENTS

HAZARDOUS INGREDIENTS:	CAS #	EINECS #	ICSC #	WT %	HAZARD CLASSIFICATION; RISK PHRASES
Sodium Bicarbonate	144-55-8	205-633-8	1044	33 - 43%	HAZARD CLASSIFICATION: None RISK PHRASES: None
Sodium (C10 – C16) Alkylbenzene Sulfonate	68081-81-2	268-356-1	Not Listed	10 – 20%	HAZARD CLASSIFICATION: None RISK PHRASES: None
Sodium Tripolyphosphate	7758-29-4	231-838-7	1469	5 - 15%	HAZARD CLASSIFICATION: None RISK PHRASES: None
Tetrasodium Pyrophosphate	7722-88-5	231-767-1	1140	5 - 15%	HAZARD CLASSIFICATION: None RISK PHRASES: None
Sodium Carbonate	497-19-8	207-638-8	1135	1 - 10%	HAZARD CLASSIFICATION: [Xi] Irritant RISK PHRASES: R36
Sodium Alcohol Sulfate	151-21-3	205-788-1	0502	1 – 5%	HAZARD CLASSIFICATION: None RISK PHRASES: None
Balance of other ingredients are non-hazardous or less than 1% in concentration (or 0.1% for carcinogens, reproductive toxins, or respiratory sensitizers).					

NOTE: ALL WHMIS required information is included in appropriate sections based on the ANSI Z400.1-2004 format. This product has been classified in accordance with the hazard criteria of the CPR and the MSDS contains all the information required by the CPR, EU Directives and the Japanese Industrial Standard JIS Z 7250: 2000.

SECTION 4 - FIRST-AID MEASURES

Contaminated individuals of chemical exposure must be taken for medical attention if any adverse effect occurs. Rescuers should be taken for medical attention, if necessary. Take copy of label and MSDS to health professional with contaminated individual.

EYE CONTACT: If product enters the eyes, open eyes while under gentle running water for at least 15 minutes. Seek medical attention if irritation persists.

SKIN CONTACT: Wash skin thoroughly after handling. Seek medical attention if irritation develops and persists. Remove contaminated clothing. Launder before re-use.

INHALATION: If breathing becomes difficult, remove victim to fresh air. If necessary, use artificial respiration to support vital functions. Seek medical attention if breathing difficulty continues.

INGESTION: If product is swallowed, call physician or poison control center for most current information. If professional advice is not available, do not induce vomiting. Never induce vomiting or give diluents (milk or water) to someone who is unconscious, having convulsions, or who cannot swallow. Seek medical advice. Take a copy of the label and/or MSDS with the victim to the health professional.

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: Pre-existing skin, or eye problems may be aggravated by prolonged contact.

RECOMMENDATIONS TO PHYSICIANS: Treat symptoms and reduce over-exposure.

MATERIAL SAFETY DATA SHEET

ALCONOX®

SECTION 5 - FIRE-FIGHTING MEASURES

FLASH POINT:

Not Flammable

AUTOIGNITION TEMPERATURE:

Not Applicable

FLAMMABLE LIMITS (in air by volume, %):

Lower (LEL): NA Upper (UEL): NA

FIRE EXTINGUISHING MATERIALS:

As appropriate for surrounding fire. Carbon dioxide, foam, dry chemical, halon, or water spray.

UNUSUAL FIRE AND EXPLOSION HAZARDS:

This product is non-flammable and has no known explosion hazards.

Explosion Sensitivity to Mechanical Impact:

Not Sensitive.

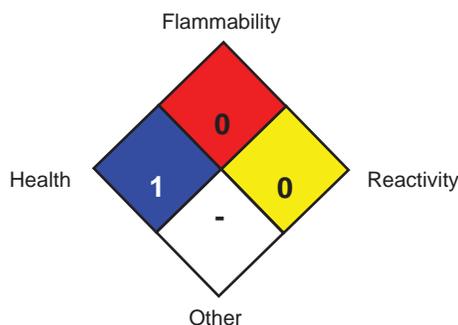
Explosion Sensitivity to Static Discharge:

Not Sensitive

SPECIAL FIRE-FIGHTING PROCEDURES:

Incipient fire responders should wear eye protection. Structural firefighters must wear Self-Contained Breathing Apparatus and full protective equipment. Isolate materials not yet involved in the fire and protect personnel. Move containers from fire area if this can be done without risk; otherwise, cool with carefully applied water spray. If possible, prevent runoff water from entering storm drains, bodies of water, or other environmentally sensitive areas.

NFPA RATING SYSTEM



HMIS RATING SYSTEM

HAZARDOUS MATERIAL IDENTIFICATION SYSTEM			
HEALTH HAZARD (BLUE)			1
FLAMMABILITY HAZARD (RED)			0
PHYSICAL HAZARD (YELLOW)			0
PROTECTIVE EQUIPMENT			
EYES	RESPIRATORY	HANDS	BODY
	See Sect 8		See Sect 8
For Routine Industrial Use and Handling Applications			

Hazard Scale: 0 = Minimal 1 = Slight 2 = Moderate 3 = Serious 4 = Severe * = Chronic hazard

SECTION 6 - ACCIDENTAL RELEASE MEASURES

SPILL AND LEAK RESPONSE: Personnel should be trained for spill response operations.

SPILLS: Contain spill if safe to do so. Prevent entry into drains, sewers, and other waterways. Sweep, shovel or vacuum spilled material and place in an appropriate container for re-use or disposal. Avoid dust generation if possible. Dispose of in accordance with applicable Federal, State, and local procedures (see Section 13, Disposal Considerations).

SECTION 7 - HANDLING and STORAGE

WORK PRACTICES AND HYGIENE PRACTICES: As with all chemicals, avoid getting this product ON YOU or IN YOU. Wash thoroughly after handling this product. Do not eat, drink, smoke, or apply cosmetics while handling this product. Avoid breathing dusts generated by this product. Use in a well-ventilated location. Remove contaminated clothing immediately.

STORAGE AND HANDLING PRACTICES: Containers of this product must be properly labeled. Store containers in a cool, dry location. Keep container tightly closed when not in use. Store away from strong acids or oxidizers.

MATERIAL SAFETY DATA SHEET

ALCONOX®

SECTION 8 - EXPOSURE CONTROLS - PERSONAL PROTECTION

EXPOSURE LIMITS/GUIDELINES:

Chemical Name	CAS#	ACGIH TWA	OSHA TWA	SWA
Sodium Bicarbonate	144-55-8	10 mg/m ³ Total Dust	15 mg/m ³ Total Dust	10 mg/m ³ Total Dust
Sodium (C10 – C16) Alkylbenzene Sulfonate	68081-81-2	10 mg/m ³ Total Dust	15 mg/m ³ Total Dust	10 mg/m ³ Total Dust
Sodium Tripolyphosphate	7758-29-4	10 mg/m ³ Total Dust	15 mg/m ³ Total Dust	10 mg/m ³ Total Dust
Tetrasodium Pyrophosphate	7722-88-5	5 mg/m ³	5 mg/m ³	5 mg/m ³
Sodium Carbonate	497-19-8	10 mg/m ³ Total Dust	15 mg/m ³ Total Dust	10 mg/m ³ Total Dust
Sodium Alcohol Sulfate	151-21-3	10 mg/m ³ Total Dust	15 mg/m ³ Total Dust	10 mg/m ³ Total Dust

Currently, International exposure limits are not established for the components of this product. Please check with competent authority in each country for the most recent limits in place.

VENTILATION AND ENGINEERING CONTROLS: Use with adequate ventilation to ensure exposure levels are maintained below the limits provided below. Use local exhaust ventilation to control airborne dust. Ensure eyewash/safety shower stations are available near areas where this product is used.

The following information on appropriate Personal Protective Equipment is provided to assist employers in complying with OSHA regulations found in 29 CFR Subpart I (beginning at 1910.132) or equivalent standard of Canada, or standards of EU member states (including EN 149 for respiratory PPE, and EN 166 for face/eye protection), and those of Japan. Please reference applicable regulations and standards for relevant details.

RESPIRATORY PROTECTION: Based on test data, exposure limits should not be exceeded under normal use conditions when using Alconox Detergent. Maintain airborne contaminant concentrations below guidelines listed above, if applicable. If necessary, use only respiratory protection authorized in the U.S. Federal OSHA Respiratory Protection Standard (29 CFR 1910.134), equivalent U.S. State standards, Canadian CSA Standard Z94.4-93, the European Standard EN149, or EU member states.

EYE PROTECTION: Safety glasses. If necessary, refer to U.S. OSHA 29 CFR 1910.133 or appropriate Canadian Standards.

HAND PROTECTION: Use chemical resistant gloves to prevent skin contact.. If necessary, refer to U.S. OSHA 29 CFR 1910.138 or appropriate Standards of Canada.

BODY PROTECTION: Use body protection appropriate to prevent contact (e.g. lab coat, overalls). If necessary, refer to appropriate Standards of Canada, or appropriate Standards of the EU, Australian Standards, or relevant Japanese Standards.

SECTION 9 - PHYSICAL and CHEMICAL PROPERTIES

PHYSICAL STATE:	Solid
APPEARANCE & ODOR:	White granular powder with little or no odor.
ODOR THRESHOLD (PPM):	Not Available
VAPOR PRESSURE (mmHg):	Not Applicable
VAPOR DENSITY (AIR=1):	Not Applicable.
BY WEIGHT:	Not Available
EVAPORATION RATE (nBuAc = 1):	Not Applicable.
BOILING POINT (C°):	Not Applicable.
FREEZING POINT (C°):	Not Applicable.
pH:	9.5 (1% aqueous solution)
SPECIFIC GRAVITY 20°C: (WATER =1)	0.85 – 1.1
SOLUBILITY IN WATER (%)	>10% w/w
COEFFICIENT OF WATER/OIL DIST.:	Not Available
VOC:	None
CHEMICAL FAMILY:	Detergent

MATERIAL SAFETY DATA SHEET

ALCONOX®

SECTION 10 - STABILITY and REACTIVITY

STABILITY: Product is stable

DECOMPOSITION PRODUCTS: When heated to decomposition this product produces Oxides of carbon (COx)

MATERIALS WITH WHICH SUBSTANCE IS INCOMPATIBLE: Strong acids and strong oxidizing agents.

HAZARDOUS POLYMERIZATION: Will not occur.

CONDITIONS TO AVOID: Contact with incompatible materials and dust generation.

SECTION 11 - TOXICOLOGICAL INFORMATION

TOXICITY DATA: Toxicity data is available for mixture:

CAS# 497-19-8 LD50 Oral (Rat)	4090 mg/kg
CAS# 497-19-8 LD50 Oral (Mouse)	6600 mg/kg
CAS# 497-19-8 LC50 Inhalation (Rat)	2300 mg/m ³ 2H
CAS# 497-19-8 LC50 Inhalation (Mouse)	1200 mg/m ³ 2H
CAS# 7758-29-4 LD50 Oral (Rat)	3120 mg/kg
CAS# 7758-29-4 LD50 Oral (Mouse)	3100 mg/kg
CAS# 7722-88-5 LD50 Oral (Rat)	4000 mg/kg

SUSPECTED CANCER AGENT: None of the ingredients are found on the following lists: FEDERAL OSHA Z LIST, NTP, CAL/OSHA, IARC and therefore is not considered to be, nor suspected to be a cancer-causing agent by these agencies.

IRRITANCY OF PRODUCT: Contact with this product can be irritating to exposed skin, eyes and respiratory system.

SENSITIZATION OF PRODUCT: This product is not considered a sensitizer.

REPRODUCTIVE TOXICITY INFORMATION: No information concerning the effects of this product and its components on the human reproductive system.

SECTION 12 - ECOLOGICAL INFORMATION

ALL WORK PRACTICES MUST BE AIMED AT ELIMINATING ENVIRONMENTAL CONTAMINATION.

ENVIRONMENTAL STABILITY: No Data available at this time.

EFFECT OF MATERIAL ON PLANTS or ANIMALS: No evidence is currently available on this product's effects on plants or animals.

EFFECT OF CHEMICAL ON AQUATIC LIFE: No evidence is currently available on this product's effects on aquatic life.

SECTION 13 - DISPOSAL CONSIDERATIONS

PREPARING WASTES FOR DISPOSAL: Waste disposal must be in accordance with appropriate Federal, State, and local regulations, those of Canada, Australia, EU Member States and Japan.

SECTION 14 - TRANSPORTATION INFORMATION

US DOT; IATA; IMO; ADR:

THIS PRODUCT IS NOT HAZARDOUS AS DEFINED BY 49 CFR 172.101 BY THE U.S. DEPARTMENT OF TRANSPORTATION.

PROPER SHIPPING NAME: Non-Regulated Material

HAZARD CLASS NUMBER and DESCRIPTION: Not Applicable

UN IDENTIFICATION NUMBER: Not Applicable

PACKING GROUP: Not Applicable.

DOT LABEL(S) REQUIRED: Not Applicable

NORTH AMERICAN EMERGENCY RESPONSE GUIDEBOOK NUMBER (2004): Not Applicable

MARINE POLLUTANT: None of the ingredients are classified by the DOT as a Marine Pollutant (as defined by 49 CFR 172.101, Appendix B)

U.S. DEPARTMENT OF TRANSPORTATION (DOT) SHIPPING REGULATIONS:

This product is not classified as dangerous goods, per U.S. DOT regulations, under 49 CFR 172.101.

TRANSPORT CANADA, TRANSPORTATION OF DANGEROUS GOODS REGULATIONS:

This product is not classified as Dangerous Goods, per regulations of Transport Canada.

INTERNATIONAL AIR TRANSPORT ASSOCIATION (IATA):

This product is not classified as Dangerous Goods, by rules of IATA:

INTERNATIONAL MARITIME ORGANIZATION (IMO) DESIGNATION:

This product is not classified as Dangerous Goods by the International Maritime Organization.

EUROPEAN AGREEMENT CONCERNING THE INTERNATIONAL CARRIAGE OF DANGEROUS GOODS BY ROAD (ADR):

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This product is not classified by the United Nations Economic Commission for Europe to be dangerous goods.

SECTION 15 - REGULATORY INFORMATION

UNITED STATES REGULATIONS

SARA REPORTING REQUIREMENTS: This product is not subject to the reporting requirements of Sections 302, 304 and 313 of Title III of the Superfund Amendments and Reauthorization Act., as follows: None

TSCA: All components in this product are listed on the US Toxic Substances Control Act (TSCA) inventory of chemicals.

SARA 311/312:

Acute Health: Yes Chronic Health: No Fire: No Reactivity: No

U.S. SARA THRESHOLD PLANNING QUANTITY: There are no specific Threshold Planning Quantities for this product. The default Federal MSDS submission and inventory requirement filing threshold of 10,000 lb (4,540 kg) may apply, per 40 CFR 370.20.

U.S. CERCLA REPORTABLE QUANTITY (RQ): None

CALIFORNIA SAFE DRINKING WATER AND TOXIC ENFORCEMENT ACT (PROPOSITION 65): None of the ingredients are on the California Proposition 65 lists.

CANADIAN REGULATIONS:

CANADIAN DSL/NDL INVENTORY STATUS: All of the components of this product are on the DSL Inventory

CANADIAN ENVIRONMENTAL PROTECTION ACT (CEPA) PRIORITIES SUBSTANCES LISTS: No component of this product is on the CEPA First Priorities Substance Lists.

CANADIAN WHMIS CLASSIFICATION and SYMBOLS: This product is categorized as a Controlled Product, Hazard Class D2B as per the Controlled Product Regulations

EUROPEAN ECONOMIC COMMUNITY INFORMATION:

EU LABELING AND CLASSIFICATION:

Classification of the mixture according to Regulation (EC) No1272/2008. See section 2 for details.

AUSTRALIAN INFORMATION FOR PRODUCT:

AUSTRALIAN INVENTORY OF CHEMICAL SUBSTANCES (AICS) STATUS: All components of this product are listed on the AICS.

STANDARD FOR THE UNIFORM SCHEDULING OF DRUGS AND POISONS: Not applicable.

JAPANESE INFORMATION FOR PRODUCT:

JAPANESE MINISTER OF INTERNATIONAL TRADE AND INDUSTRY (MITI) STATUS: The components of this product are not listed as Class I Specified Chemical Substances, Class II Specified Chemical Substances, or Designated Chemical Substances by the Japanese MITI.

INTERNATIONAL CHEMICAL INVENTORIES:

Listing of the components on individual country Chemical Inventories is as follows:

Asia-Pac:	Listed
Australian Inventory of Chemical Substances (AICS):	Listed
Korean Existing Chemicals List (ECL):	Listed
Japanese Existing National Inventory of Chemical Substances (ENCS):	Listed
Philippines Inventory of Chemicals and Chemical Substances (PICCS):	Listed
Swiss Giftliste List of Toxic Substances:	Listed
U.S. TSCA:	Listed

SECTION 16 - OTHER INFORMATION

PREPARED BY: Paul Eigbrett Global Safety Management, 10006 Cross Creek Blvd. Suite 440, Tampa, FL 33647

MATERIAL SAFETY DATA SHEET

ALCONOX®

Disclaimer: To the best of Alconox, Inc. knowledge, the information contained herein is reliable and accurate as of this date; however, accuracy, suitability or completeness is not guaranteed and no warranties of any type either express or implied are provided. The information contained herein relates only to this specific product.

ANNEX:

IDENTIFIED USES OF ALCONOX® AND DIRECTIONS FOR USE

Used to clean: Healthcare instruments, laboratory ware, vacuum equipment, tissue culture ware, personal protective equipment, sampling apparatus, catheters, tubing, pipes, radioactive contaminated articles, optical parts, electronic components, pharmaceutical apparatus, cosmetics manufacturing equipment, metal castings, forgings and stampings, industrial parts, tanks and reactors. Authorized by USDA for use in federally inspected meat and poultry plants. Passes inhibitory residue test for water analysis. FDA certified.

Used to remove: Soil, grit, grime, buffing compound, slime, grease, oils, blood, tissue, salts, deposits, particulates, solvents, chemicals, radioisotopes, radioactive contaminations, silicon oils, mold release agents.

Surfaces cleaned: Corrosion inhibited formulation recommended for glass, metal, stainless steel, porcelain, ceramic, plastic, rubber and fiberglass. Can be used on soft metals such as copper, aluminum, zinc and magnesium if rinsed promptly. Corrosion testing may be advisable.

Cleaning method: Soak, brush, sponge, cloth, ultrasonic, flow through clean-in-place. Will foam—not for spray or machine use.

Directions: Make a fresh 1% solution (2 1/2 Tbsp. per gal., 1 1/4 oz. per gal. or 10 grams per liter) in cold, warm, or hot water. If available use warm water. Use cold water for blood stains. For difficult soils, raise water temperature and use more detergent. Clean by soak, circulate, wipe, or ultrasonic method. Not for spray machines, will foam. For nonabrasive scouring, make paste. Use 2% solution to soak frozen stopcocks. To remove silver tarnish, soak in 1% solution in aluminum container. RINSE THOROUGHLY—preferably with running water. For critical cleaning, do final or all rinsing in distilled, deionized, or purified water. For food contact surfaces, rinse with potable water. Used on a wide range of glass, ceramic, plastic, and metal surfaces. Corrosion testing may be advisable.

Section 1 - Chemical Product and Company Identification

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Material Name: Benzene **CAS Number:** 71-43-2
Chemical Formula: C₆H₆
Structural Chemical Formula: C₆H₆
EINECS Number: 200-753-7
ACX Number: X1001488-9

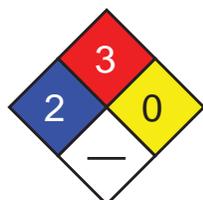
Synonyms: Benzene; BENZENE; (6)ANNULENE; BENZEEN; BENZEN; BENZIN; BENZINE; BENZOL; BENZOL 90; BENZOLE; BENZOLENE; BENZOLO; BICARBURET OF HYDROGEN; CARBON OIL; COAL NAPHTHA; CYCLOHEXATRIENE; EPA PESTICIDE CHEMICAL CODE 008801; FENZEN; MINERAL NAPHTHA; MOTOR BENZOL; NITRATION BENZENE; PHENE; PHENYL HYDRIDE; POLYSTREAM; PYROBENZOL; PYROBENZOLE

General Use: Manufacture of chemicals including styrene, dyes, and many other organic chemicals. Has been used in artificial leather, linoleum, oil cloth, airplane dopes, lacquers; as solvent for waxes, resins, oils etc. May also be a minor component of gasoline, petrol. Exposure should be minimized by use in closed systems. Handling procedures and control measures should be evaluated for exposure before commencement of use in plant operations.

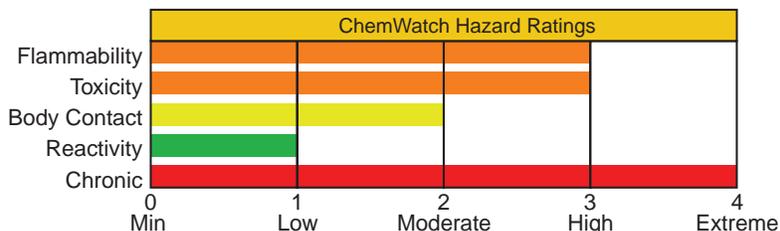
Section 2 - Composition / Information on Ingredients

Name	CAS	%
benzene	71-43-2	99.9
OSHA PEL TWA: 1 ppm; STEL: 5 ppm.	NIOSH REL TWA: 0.1 ppm; STEL: 1 ppm.	DFG (Germany) MAK Skin.
ACGIH TLV TWA: 0.5 ppm; STEL: 2.5 ppm; skin.	IDLH Level 500 ppm.	
EU OEL TWA: 1 ppm.		

Section 3 - Hazards Identification



Fire Diamond



HMIS	
3	Health
3	Flammability
0	Reactivity

ANSI Signal Word

Danger!



☆☆☆☆☆ **Emergency Overview** ☆☆☆☆☆

Colorless liquid; sweet odor. Irritating to eyes/skin/respiratory tract. Toxic. Other Acute Effects: headache, dizziness, drowsiness. Absorbed through skin. Chronic Effects: dermatitis, leukemia, bone marrow damage. Carcinogen. Reproductive effects. Flammable.

Potential Health Effects

Target Organs: blood, central nervous system (CNS), bone marrow, eyes, upper respiratory system, skin

Primary Entry Routes: inhalation, skin contact

Acute Effects

Inhalation: The vapor is discomforting to the upper respiratory tract and lungs and may be harmful if inhaled.

If exposure to highly concentrated solvent atmosphere is prolonged this may lead to narcosis, unconsciousness, even coma and possible death.

Acute effects from inhalation of high concentrations of vapor are pulmonary irritation, including coughing, with nausea; central nervous system depression - characterized by headache and dizziness, increased reaction time, fatigue and loss of coordination.

Inhalation hazard is increased at higher temperatures.

The symptoms of acute exposure to high vapor concentrations include confusion, dizziness, tightening of the leg muscles and pressure over the forehead followed by a period of excitement. If exposure continues the casualty quickly becomes stupefied and lapses into a coma with narcosis.

Effects of inhalation may include nausea, vomiting headache, dizziness, drowsiness, weakness, sometimes preceded by brief periods of exhilaration, or euphoria, irritability, malaise, confusion, ataxia, staggering, weak and rapid pulse, chest pain and tightness with breathlessness, pallor, cyanosis of the lips and fingertips and tinnitus. Severe exposures may produce blurred vision, shallow, rapid breathing, delirium, cardiac arrhythmias, unconsciousness, deep anesthesia, paralysis and coma characterized by motor restlessness, tremors and hyperreflexia (occasionally preceded by convulsions). Polyneuritis and persistent nausea, anorexia, muscular weakness, headache, drowsiness, insomnia and agitation may also occur. Two-three weeks after the exposure, nervous irritability, breathlessness and unsteady gait may still persist; cardiac distress and an unusual discoloration of the skin may be evident for up to four weeks. Hemotoxicity is not normally a feature of acute exposures although anemia, thrombocytopenia, petechial hemorrhage, and spontaneous internal bleeding have been reported. Fatal exposures may result from asphyxia, central nervous system depression, cardiac and respiratory failure and circulatory collapse; sudden ventricular fibrillation may also be fatal.

Death may be sudden or may be delayed for 24 hours. Central nervous system, respiratory or hemorrhagic complications may occur up to five days after the exposure and may be lethal; pathological findings include respiratory inflammation with edema, and lung hemorrhage, renal congestion, cerebral edema and extensive petechial hemorrhage in the brain, pleurae, pericardium, urinary tract, mucous membrane and skin.

Exposure to toxic levels has also produced chromosome damage.

Eye: The liquid is highly discomforting to the eyes, may be harmful following absorption and is capable of causing a mild, temporary redness of the conjunctiva (similar to wind-burn), temporary impairment of vision and/or other transient eye damage/ulceration.

The vapor is moderately discomforting to the eyes.

The material may produce severe irritation to the eye causing pronounced inflammation. Repeated or prolonged exposure to irritants may produce conjunctivitis.

Skin: The liquid may produce skin discomfort following prolonged contact.

Defatting and/or drying of the skin may lead to dermatitis. Open cuts, abraded or irritated skin should not be exposed to this material.

Toxic effects may result from skin absorption.

The material may cause skin irritation after prolonged or repeated exposure and may produce a contact dermatitis (nonallergic). This form of dermatitis is often characterized by skin redness (erythema) and swelling (edema) which may progress to vesiculation, scaling and thickening of the epidermis. Histologically there may be intercellular edema of the spongy layer (spongiosis) and intracellular edema of the epidermis.

Ingestion: The liquid is discomforting to the gastrointestinal tract and may be harmful if swallowed.

Ingestion may result in nausea, pain, vomiting. Vomit entering the lungs by aspiration may cause potentially lethal chemical pneumonitis.

Carcinogenicity: NTP - Class 1, Known to be a carcinogen; IARC - Group 1, Carcinogenic to humans; OSHA - Listed as a carcinogen; NIOSH - Listed as carcinogen; ACGIH - Class A2, Suspected human carcinogen; EPA - Class A, Human carcinogen; MAK - Class A1, Capable of inducing malignant tumors as shown by experience with humans.

Chronic Effects: Liquid is an irritant and may cause burning and blistering of skin on prolonged exposure.

Chronic exposure may cause headache, fatigue, loss of appetite and lassitude with incipient blood effects including anemia and blood changes.

Benzene is a myelotoxicant known to suppress bone-marrow cell proliferation and to induce hematologic disorders in humans and animals.

Signs of benzene-induced aplastic anemia include suppression of leukocytes (leukopenia), red cells (anemia), platelets (thrombocytopenia) or all three cell types (pancytopenia). Classic symptoms include weakness, purpura, and hemorrhage. The most significant toxic effect is insidious and often irreversible injury to the blood forming tissue. Leukemia may develop.

Section 4 - First Aid Measures

Inhalation: Remove to fresh air.

Lay patient down. Keep warm and rested.

If breathing is shallow or has stopped, ensure clear airway and apply resuscitation. Transport to hospital or doctor.

Eye Contact: Immediately hold the eyes open and flush continuously for at least 15 minutes with fresh running water. Ensure irrigation under eyelids by occasionally lifting the upper and lower lids.

See
DOT
ERG

Transport to hospital or doctor without delay. Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.

Skin Contact: Immediately remove all contaminated clothing, including footwear (after rinsing with water).

Wash affected areas thoroughly with water (and soap if available).

Seek medical attention in event of irritation.

Ingestion: Contact a Poison Control Center.

Do NOT induce vomiting. Give a glass of water.

After first aid, get appropriate in-plant, paramedic, or community medical support.

Note to Physicians: For acute or short-term repeated exposures to petroleum distillates or related hydrocarbons:

1. Primary threat to life from pure petroleum distillate ingestion and/or inhalation is respiratory failure.
2. Patients should be quickly evaluated for signs of respiratory distress (e.g. cyanosis, tachypnea, intercostal retraction, obtundation) and given oxygen. Patients with inadequate tidal volumes or poor arterial blood gases ($pO_2 < 50$ mm Hg or $pCO_2 > 50$ mm Hg) should be intubated.
3. Arrhythmias complicate some hydrocarbon ingestion and/or inhalation and electrocardiographic evidence of myocardial injury has been reported; intravenous lines and cardiac monitors should be established in obviously symptomatic patients. The lungs excrete inhaled solvents, so that hyperventilation improves clearance.
4. A chest x-ray should be taken immediately after stabilization of breathing and circulation to document aspiration and detect the presence of pneumothorax.
5. Epinephrine (adrenalin) is not recommended for treatment of bronchospasm because of potential myocardial sensitization to catecholamines.

Inhaled cardioselective bronchodilators (e.g. Alupent, Salbutamol) are the preferred agents, with aminophylline a second choice.

6. Lavage is indicated in patients who require decontamination; ensure use of cuffed endotracheal tube in adult patients. Consider complete blood count. Evaluate history of exposure.

Section 5 - Fire-Fighting Measures

Flash Point: -11 °C Closed Cup

Autoignition Temperature: 562 °C

LEL: 1.3% v/v

UEL: 7.1% v/v

Extinguishing Media: Foam, dry chemical powder, BCF (where regulations permit), carbon dioxide.

Water spray or fog - Large fires only.

General Fire Hazards/Hazardous Combustion Products: Liquid and vapor are highly flammable.

Severe fire hazard when exposed to heat, flame and/or oxidizers.

Vapor forms an explosive mixture with air.

Severe explosion hazard, in the form of vapor, when exposed to flame or spark. Vapor may travel a considerable distance to source of ignition.

Heating may cause expansion/decomposition with violent rupture of containers.

On combustion, may emit toxic fumes of carbon monoxide (CO).

Fire Incompatibility: Avoid contamination with oxidizing agents i.e. nitrates, oxidizing acids, chlorine bleaches, pool chlorine etc. as ignition may result.

Fire-Fighting Instructions: Contact fire department and tell them location and nature of hazard.

May be violently or explosively reactive. Wear full body protective clothing with breathing apparatus. Prevent, by any means available, spillage from entering drains or waterways. Consider evacuation.

Fight fire from a safe distance, with adequate cover.

If safe, switch off electrical equipment until vapor fire hazard removed.

Use water delivered as a fine spray to control fire and cool adjacent area.

Avoid spraying water onto liquid pools.

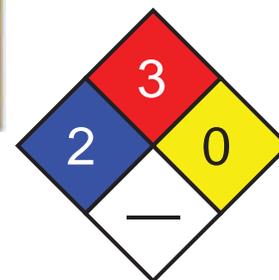
Do not approach containers suspected to be hot.

Cool fire-exposed containers with water spray from a protected location.

If safe to do so, remove containers from path of fire.

Equipment should be thoroughly decontaminated after use.

See
DOT
ERG



Fire Diamond

Section 6 - Accidental Release Measures

Small Spills: Remove all ignition sources. Clean up all spills immediately.

Avoid breathing vapors and contact with skin and eyes.

Control personal contact by using protective equipment.

Contain and absorb small quantities with vermiculite or other absorbent material. Wipe up. Collect residues in a flammable waste container.

Large Spills: Pollutant - contain spillage. Clear area of personnel and move upwind.

Contact fire department and tell them location and nature of hazard.

See
DOT
ERG

May be violently or explosively reactive. Wear breathing apparatus plus protective gloves. Prevent, by any means available, spillage from entering drains or waterways. Consider evacuation.
 No smoking, bare lights or ignition sources. Increase ventilation.
 Stop leak if safe to do so. Water spray or fog may be used to disperse/absorb vapor. Contain spill with sand, earth or vermiculite.
 Use only spark-free shovels and explosion proof equipment.
 Collect recoverable product into labeled containers for recycling.
 Absorb remaining product with sand, earth or vermiculite.
 Collect solid residues and seal in labeled drums for disposal.
 Wash area and prevent runoff into drains.
 If contamination of drains or waterways occurs, advise emergency services.
Regulatory Requirements: Follow applicable OSHA regulations (29 CFR 1910.120).

Section 7 - Handling and Storage

Handling Precautions: Avoid all personal contact, including inhalation.
 Wear protective clothing when risk of exposure occurs.
 Use in a well-ventilated area. Prevent concentration in hollows and sumps.
 DO NOT enter confined spaces until atmosphere has been checked.
 Avoid smoking, bare lights, heat or ignition sources.
 When handling, DO NOT eat, drink or smoke.
 Vapor may ignite on pumping or pouring due to static electricity.
 DO NOT use plastic buckets. Ground and secure metal containers when dispensing or pouring product. Use spark-free tools when handling.
 Avoid contact with incompatible materials.
 Keep containers securely sealed. Avoid physical damage to containers.
 Always wash hands with soap and water after handling.
 Work clothes should be laundered separately.
 Use good occupational work practices. Observe manufacturer's storing and handling recommendations. Atmosphere should be regularly checked against established exposure standards to ensure safe working conditions.
Recommended Storage Methods: Metal can; metal drum. Packing as recommended by manufacturer.
 Check all containers are clearly labeled and free from leaks.
Storage Requirements: Store in original containers in approved flame-proof area.
 No smoking, bare lights, heat or ignition sources.
 DO NOT store in pits, depressions, basements or areas where vapors may be trapped. Keep containers securely sealed.
 Store away from incompatible materials in a cool, dry well ventilated area.
 Protect containers against physical damage and check regularly for leaks.
 Observe manufacturer's storing and handling recommendations.
Regulatory Requirements: Follow applicable OSHA regulations.

Section 8 - Exposure Controls / Personal Protection

Engineering Controls: Use in a well-ventilated area. Local exhaust ventilation usually required.
 If risk of overexposure exists, wear NIOSH-approved respirator.
 Correct fit is essential to obtain adequate protection. NIOSH-approved self contained breathing apparatus (SCBA) may be required in some situations.
 Provide adequate ventilation in warehouse or closed storage area.
Personal Protective Clothing/Equipment:
Eyes: Chemical goggles. Full face shield.
 Contact lenses pose a special hazard; soft lenses may absorb irritants and all lenses concentrate them.
Hands/Feet: Nitrile gloves; Neoprene gloves.
 Safety footwear.
 Do NOT use this product to clean the skin.
Respiratory Protection:
 Exposure Range >1 to 10 ppm: Air Purifying, Negative Pressure, Half Mask
 Exposure Range >10 to 100 ppm: Air Purifying, Negative Pressure, Full Face
 Exposure Range >100 to 1000 ppm: Supplied Air, Constant Flow/Pressure Demand, Full Face
 Exposure Range >1000 to unlimited ppm: Self-contained Breathing Apparatus, Pressure Demand, Full Face
 Cartridge Color: black
Note: must change cartridge at beginning of each shift
Other: Overalls. Eyewash unit. Barrier cream. Skin cleansing cream.
Glove Selection Index:
 PE/EVAL/PE Best selection
 PVA Best selection
 TEFLON Best selection

VITON	Best selection
VITON/NEOPRENE	Best selection
NITRILE+PVC	Poor to dangerous choice for other than short-term immersion
BUTYL	Poor to dangerous choice for other than short-term immersion
NITRILE	Poor to dangerous choice for other than short-term immersion
NEOPRENE.....	Poor to dangerous choice for other than short-term immersion
PVC.....	Poor to dangerous choice for other than short-term immersion
NATURAL RUBBER.....	Poor to dangerous choice for other than short-term immersion
BUTYL/NEOPRENE	Poor to dangerous choice for other than short-term immersion

Section 9 - Physical and Chemical Properties

Appearance/General Info: Clear, highly flammable liquid; floats on water. Characteristic aromatic odor. Highly volatile. Mixes with alcohol, chloroform, ether, carbon disulfide, carbon tetrachloride, glacial acetic acid, acetone and oils.

Physical State: Liquid

pH: Not applicable

Odor Threshold: 4.68 ppm

pH (1% Solution): Not applicable.

Vapor Pressure (kPa): 9.95 at 20 °C

Boiling Point: 80.1 °C (176 °F)

Vapor Density (Air=1): 2.77

Freezing/Melting Point: 5.5 °C (41.9 °F)

Formula Weight: 78.12

Volatile Component (% Vol): 100

Specific Gravity (H₂O=1, at 4 °C): 0.879 at 20 °C

Water Solubility: 0.18 g/100 g of water at 25 °C

Evaporation Rate: Fast

Section 10 - Stability and Reactivity

Stability/Polymerization/Conditions to Avoid: Product is considered stable. Hazardous polymerization will not occur.

Storage Incompatibilities: Avoid reaction with oxidizing agents.

Section 11 - Toxicological Information

Toxicity

Oral (man) LD₅₀: 50 mg/kg

Oral (rat) LD₅₀: 930 mg/kg

Inhalation (rat) LC₅₀: 10000 ppm/7h

Inhalation (human) LC₅₀: 2000 ppm/5m

Inhalation (man) TC₅₀: 150 ppm/1y - I

Inhalation (human) TC₅₀: 100 ppm

Reproductive effector in rats

Irritation

Skin (rabbit): 20 mg/24 hr - mod

Eye (rabbit): 2 mg/24 hr - SEVERE

See RTECS CY 1400000, for additional data.

Section 12 - Ecological Information

Environmental Fate: If released to soil, it will be subject to rapid volatilization near the surface and that which does not evaporate will be highly to very highly mobile in the soil and may leach to groundwater. It may be subject to biodegradation based on reported biodegradation of 24% and 47% of the initial 20 ppm in a base-rich para-brownish soil in 1 and 10 weeks, respectively. It may be subject to biodegradation in shallow, aerobic groundwaters, but probably not under anaerobic conditions. If released to water, it will be subject to rapid volatilization; the half-life for evaporation in a wind-wave tank with a moderate wind speed of 7.09 m/sec was 5.23 hours; the estimated half-life for volatilization from a model river one meter deep flowing 1 m/sec with a wind velocity of 3 m/sec is estimated to be 2.7 hours at 20 °C. It will not be expected to significantly adsorb to sediment, bioconcentrate in aquatic organisms or hydrolyze. It may be subject to biodegradation based on a reported biodegradation half-life of 16 days in an aerobic river die-away test. In a marine ecosystem biodegradation occurred in 2 days after an acclimation period of 2 days and 2 weeks in the summer and spring, respectively, whereas no degradation occurred in winter. According to one experiment, it has a half-life of 17 days due to photodegradation which could contribute to removal in situations of cold water, poor nutrients, or other conditions less conducive to microbial degradation. If released to the atmosphere, it will exist predominantly in the vapor phase. Gas-phase will not be subject to direct photolysis but it will react with photochemically produced hydroxyl radicals with a half-life of 13.4 days calculated using an experimental rate constant for the reaction. The reaction time in polluted atmospheres which contain nitrogen oxides or sulfur dioxide is accelerated with the half-life being reported as 4-6 hours. Products of photooxidation include phenol, nitrophenols, nitrobenzene, formic acid, and peroxyacetyl nitrate. It is fairly soluble in water and is removed from the atmosphere in rain.

Ecotoxicity: LC₅₀ Clawed toad (3-4 wk after hatching) 190 mg/l/48 hr /Conditions of bioassay not specified; LC₅₀ Morone saxatilis (bass) 5.8 to 10.9 ppm/96 hr /Conditions of bioassay not specified; LC₅₀ Poecilia reticulata (guppy) 63 ppm/14 days /Conditions of bioassay not specified; LC₅₀ Salmo trutta (brown trout yearlings) 12 mg/l/1 hr (static bioassay); LD₅₀ Lepomis macrochirus (bluegill sunfish) 20 mg/l/24 to 48 hr /Conditions of bioassay not specified; LC₁₀₀ Tetrahymena pyriformis (ciliate) 12.8 mmole/l/24 hr /Conditions of bioassay not specified; LC₅₀ Cancer magister (crab larvae) stage 1, 108 ppm/96 hr /Conditions of bioassay not specified; LC₅₀ Crangon franciscorum (shrimp) 20 ppm/96 hr /Conditions of bioassay not specified

Henry's Law Constant: 5.3 x10⁻³

BCF: eels 3.5

Biochemical Oxygen Demand (BOD): 1.2 lb/lb, 10 days

Octanol/Water Partition Coefficient: log K_{ow} = 2.13

Soil Sorption Partition Coefficient: K_{oc} = woodburn silt loam 31 to 143

Section 13 - Disposal Considerations

Disposal: Consult manufacturer for recycling options and recycle where possible.

Follow applicable federal, state, and local regulations.

Incinerate residue at an approved site.

Recycle containers where possible, or dispose of in an authorized landfill.

Section 14 - Transport Information

DOT Hazardous Materials Table Data (49 CFR 172.101):

Shipping Name and Description: Benzene

ID: UN1114

Hazard Class: 3 - Flammable and combustible liquid

Packing Group: II - Medium Danger

Symbols:

Label Codes: 3 - Flammable Liquid

Special Provisions: IB2, T4, TP1

Packaging: Exceptions: 150 **Non-bulk:** 202 **Bulk:** 242

Quantity Limitations: Passenger aircraft/rail: 5 L **Cargo aircraft only:** 60 L

Vessel Stowage: Location: B **Other:** 40



Section 15 - Regulatory Information

EPA Regulations:

RCRA 40 CFR: Listed U019 Toxic Waste, Ignitable Waste

CERCLA 40 CFR 302.4: Listed per CWA Section 311(b)(4), per RCRA Section 3001, per CWA Section 307(a), per CAA Section 112 10 lb (4.535 kg)

SARA 40 CFR 372.65: Listed

SARA EHS 40 CFR 355: Not listed

TSCA: Listed

Section 16 - Other Information

Disclaimer: Judgments as to the suitability of information herein for the purchaser's purposes are necessarily the purchaser's responsibility. Although reasonable care has been taken in the preparation of such information, Genium Group, Inc. extends no warranties, makes no representations, and assumes no responsibility as to the accuracy or suitability of such information for application to the purchaser's intended purpose or for consequences of its use.

SAFETY DATA SHEET

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

1.1 Product identifier

Product name: Crude MCHM

Product No.: EAN 972790. 18717-00, P1871700, P18717EA, P18717ET, P18717YZ

1.2 Relevant identified uses of the substance or mixture and uses advised against

Identified uses: Industrial chemical. gasoline blending

Uses advised against: None known.

1.3 Details of the supplier of the safety data sheet

Manufacturer / Supplier

Eastman Chemical Company
200 South Wilcox Drive
Kingsport, TN 37660-5280 US
+14232292000

Visit our website at www.EASTMAN.com or email emnmsds@eastman.com

1.4 Emergency telephone number:

For emergency health, safety, and environmental information, call 1-423-229-4511 or 1-423-229-2000.

For emergency transportation information, in the United States: call CHEMTREC at 800-424-9300 or call 423-229-2000.

SECTION 2: Hazards identification

WARNING!
HARMFUL IF SWALLOWED
CAUSES SKIN AND EYE IRRITATION
AT ELEVATED TEMPERATURES, VAPOR MAY CAUSE IRRITATION OF EYES AND RESPIRATORY TRACT

SECTION 3: Composition/information on ingredients

3.1 / 3.2 Substances / Mixtures

General information:

Chemical name	Concentration	Additional identification	Notes
4-methylcyclohexanemethanol	68 - 89%	CAS-No.: 34885-03-5 EC No.: 609-038-8	
4-(methoxymethyl)cyclohexanemethanol	4 - 22%	CAS-No.: 98955-27-2	

water	4 - 10%	CAS-No.: 7732-18-5 EC No.: 231-791-2	
methyl 4-methylcyclohexanecarboxylate	5%	CAS-No.: 51181-40-9	
dimethyl 1,4-cyclohexanedicarboxylate	1%	CAS-No.: 94-60-0 EC No.: 202-347-5	
methanol	1%	CAS-No.: 67-56-1 EC No.: 200-659-6 INDEX No.: 603-001-00-X	#
1,4-cyclohexanedimethanol	1 - 2%	CAS-No.: 105-08-8 REACH Registration No.: 01-2119448337-34-0000 01-2119448337-34-0002	#

* All concentrations are percent by weight unless ingredient is a gas. Gas concentrations are in percent by volume.

This substance has workplace exposure limit(s).

PBT: persistent, bioaccumulative and toxic substance.

vPvB: very persistent and very bioaccumulative substance.

SECTION 4: First aid measures

4.1 Description of first aid measures

Inhalation: Treat symptomatically. Move to fresh air. Get medical attention if symptoms persist.

Eye contact: Immediately flush with plenty of water for at least 15 minutes. If easy to do, remove contact lenses. Get medical attention. In case of irritation from airborne exposure, move to fresh air. Get medical attention if symptoms persist.

Skin contact: Immediately flush with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Get medical attention immediately. Wash contaminated clothing before reuse. Destroy or thoroughly clean contaminated shoes.

Ingestion: Call a physician or poison control center immediately. Only induce vomiting at the instruction of medical personnel. Never give anything by mouth to an unconscious person. Not relevant, due to the form of the product.

4.2 Most important symptoms and effects, both acute and delayed: No data available.

4.3 Indication of any immediate medical attention and special treatment needed

Hazards: No data available.

Treatment: Treat symptomatically.

SECTION 5: Firefighting measures

General fire hazards: None known.

5.1 Extinguishing media

Suitable extinguishing media: Water spray. Dry chemical. Carbon Dioxide. Alcohol foam.

Unsuitable extinguishing media: None known.

5.2 Special hazards arising from the substance or mixture:

None known.

5.3 Advice for firefighters

Special Fire Fighting Procedures: Fight fire from a protected location.

Special protective equipment for fire-fighters: Self-contained breathing apparatus and full protective clothing must be worn in case of fire.

SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures: Wear appropriate personal protective equipment.

6.2 Environmental precautions: Avoid release to the environment.

6.3 Methods and material for containment and cleaning up: Absorb spill with vermiculite or other inert material, then place in a container for chemical waste. Large Spillages: Flush spill area with water spray. Prevent runoff from entering drains, sewers, or streams. Dike for later disposal.

Notification Procedures: In the event of a spill or accidental release, notify relevant authorities in accordance with all applicable regulations.

SECTION 7: Handling and storage:

7.1 Precautions for safe handling: Avoid breathing vapor from heated material. Avoid contact with eyes, skin, and clothing. Do not taste or swallow. Use only with adequate ventilation. Wash thoroughly after handling.

7.2 Conditions for safe storage, including any incompatibilities: Keep container closed. Keep away from food, drink and animal feedingstuffs.

7.3 Specific end use(s): Industrial chemical. gasoline blending

SECTION 8: Exposure controls/personal protection**8.1 Control parameters****Occupational exposure limits**

If exposure limits have not been established, maintain airborne levels to an acceptable level.

Chemical name	Type	Exposure Limit values	Source
methanol	TWA	200 ppm	US. ACGIH Threshold Limit Values (01 2010)
	STEL	250 ppm	US. ACGIH Threshold Limit Values (01 2010)
	PEL	200 ppm 260 mg/m ³	US. OSHA Table Z-1 Limits for Air Contaminants (29 CFR 1910.1000) (02 2006)

Biological limit values

Chemical name	Exposure Limit values	Source
methanol (methanol: Sampling time: End of shift.)	15 mg/l (Urine)	ACGIH BEL (01 2010)

8.2 Exposure controls**Appropriate engineering controls:**

Good general ventilation (typically 10 air changes per hour) should be used. Ventilation rates should be matched to conditions. If applicable, use process enclosures, local exhaust ventilation, or other engineering controls to maintain airborne levels below recommended exposure limits. If exposure limits have not been established, maintain airborne levels to an acceptable level.

Individual protection measures, such as personal protective equipment

General information: Eye bath. Safety shower. Washing facilities.

Eye/face protection: Wear safety glasses with side shields (or goggles). Wear a full-face respirator, if needed.

Skin protection

Hand protection: Wear chemical-resistant gloves, footwear, and protective clothing appropriate for the risk of exposure. Contact health and safety professional or manufacturer for specific information.

Other: No data available.

Respiratory Protection: If engineering controls do not maintain airborne concentrations below recommended exposure limits (where applicable) or to an acceptable level (in countries where exposure limits have not been established), an approved respirator must be worn. In the United States of America, if respirators are used, a program should be instituted to assure compliance with OSHA Standard 63 FR 1152, January 8, 1998. Respirator type: Air-purifying respirator with an appropriate, government approved (where applicable), air-purifying filter, cartridge or canister. Contact health and safety professional or manufacturer for specific information.

Hygiene measures: Observe good industrial hygiene practices.

Environmental Controls: No data available.

SECTION 9: Physical and chemical properties

9.1 Information on basic physical and chemical properties

Appearance

Physical State:	Liquid
Form:	Liquid
Color:	Colorless
Odor:	Alcohol
Odor Threshold:	No data available.
pH:	No data available.
Freezing Point:	0 °C
Boiling Point:	180 °C
Flash Point:	112.8 °C (Setaflash Closed Cup)
Evaporation Rate:	No data available.
Flammability (solid, gas):	No data available.
Flammability Limit - Upper (%)-:	No data available.
Flammability Limit - Lower (%)-:	No data available.
Vapor pressure:	No data available.
Vapor density (air=1):	No data available.
Relative density:	< 1 (estimated)
Solubility(ies)	
Solubility in Water:	Appreciable
Solubility (other):	No data available.
Partition coefficient (n-octanol/water):	No data available.
Autoignition Temperature:	No data available.
Decomposition Temperature:	Thermal stability not tested. Low stability hazard expected at normal operating temperatures.
Viscosity:	No data available.
Explosive properties:	No data available.
Oxidizing properties:	No data available.

SECTION 10: Stability and reactivity

10.1 Reactivity:	Materials containing similar structural groups are normally stable.
10.2 Chemical stability:	Not fully evaluated.
10.3 Possibility of hazardous reactions:	None known.
10.4 Conditions to avoid:	Excessive heat.

10.5 Incompatible materials: Strong oxidizing agents.

10.6 Hazardous decomposition products: Carbon Dioxide. Carbon Monoxide.

SECTION 11: Toxicological information

Information on likely routes of exposure

- Inhalation:** At elevated temperatures, vapor may cause irritation of eyes and respiratory tract.
- Ingestion:** Harmful if swallowed.
- Skin contact:** Causes skin irritation.
- Eye contact:** Causes serious eye irritation.

11.1 Information on toxicological effects

Acute Toxicity

Oral

Product: Oral LD-50: (Rat): 825 mg/kg

Dermal

Product: Dermal LD-50: (Rat): > 2,000 mg/kg

Inhalation

Product: No data available.

Specified substance(s)

- 4-methylcyclohexanemethanol No data available.
- 4-(methoxymethyl)cyclohexanemethanol No data available.
- water No data available.
- methyl 4-methylcyclohexanecarboxylate No data available.
- dimethyl 1,4-cyclohexanedicarboxylate No data available.
- methanol No data available.
- 1,4-cyclohexanedimethanol LC50 (Rat, 6 h): > 3 mg/l (highest concentration tested)

Repeated dose toxicity

Product: No data available.

Specified substance(s)

- 4-methylcyclohexanemethanol No data available.
- 4- No data available.

(methoxymethyl)cyclohexanemethanol	
water	No data available.
methyl 4-methylcyclohexanecarboxylate	No data available.
dimethyl 1,4-cyclohexanedicarboxylate	No data available.
methanol	No data available.
1,4-cyclohexanedimethanol	NOEL - No Observable Effect Level (Rat, in drinking water, 90 d): 8000 mg/l

Skin corrosion/irritation:

Product: (Rabbit, 24 h): strong

Serious eye damage/eye irritation:

Product: (Rabbit): moderate

Respiratory or skin sensitization:

Product: Skin Sensitization:, (Guinea Pig) - Not a skin sensitizer.

Germ cell mutagenicity

In vitro

Product: No data available.

Specified substance(s)

4-methylcyclohexanemethanol	No data available.
4-(methoxymethyl)cyclohexanemethanol	No data available.
water	No data available.
methyl 4-methylcyclohexanecarboxylate	No data available.
dimethyl 1,4-cyclohexanedicarboxylate	No data available.
methanol	No data available.
1,4-cyclohexanedimethanol	Mutagenicity - Bacterial, : negative +/- activation Mutagenicity - Mammalian, : negative +/- activation Chromosomal abberation, : negative +/- activation

In vivo

Product: No data available.

Specified substance(s)

4-methylcyclohexanemethanol	No data available.
4-(methoxymethyl)cyclohexanemethanol	No data available.
water	No data available.

methyl 4-methylcyclohexanecarboxylate	No data available.
dimethyl 1,4-cyclohexanedicarboxylate	No data available.
methanol	No data available.
1,4-cyclohexanedimethanol	No data available.

Carcinogenicity

Product: No data available.

Specified substance(s)

4-methylcyclohexanemethanol	No data available.
4-(methoxymethyl)cyclohexanemethanol	No data available.
water	No data available.
methyl 4-methylcyclohexanecarboxylate	No data available.
dimethyl 1,4-cyclohexanedicarboxylate	No data available.
methanol	No data available.
1,4-cyclohexanedimethanol	No data available.

Reproductive toxicity

Product: No data available.

Specified substance(s)

4-methylcyclohexanemethanol	No data available.
4-(methoxymethyl)cyclohexanemethanol	No data available.
water	No data available.
methyl 4-methylcyclohexanecarboxylate	No data available.
dimethyl 1,4-cyclohexanedicarboxylate	No data available.
methanol	No data available.
1,4-cyclohexanedimethanol	No data available.

Specific target organ toxicity - single exposure

Product: No data available.

Specified substance(s)

4-methylcyclohexanemethanol	No data available.
4-(methoxymethyl)cyclohexanemethanol	No data available.

water	No data available.
methyl 4-methylcyclohexanecarboxylate	No data available.
dimethyl 1,4-cyclohexanedicarboxylate	No data available.
methanol	No data available.
1,4-cyclohexanedimethanol	No data available.

Specific target organ toxicity - repeated exposure

Product: No data available.

Specified substance(s)

4-methylcyclohexanemethanol	No data available.
4-(methoxymethyl)cyclohexanemethanol	No data available.
water	No data available.
methyl 4-methylcyclohexanecarboxylate	No data available.
dimethyl 1,4-cyclohexanedicarboxylate	No data available.
methanol	No data available.
1,4-cyclohexanedimethanol	No data available.

Aspiration hazard

Product: No data available.

Specified substance(s)

4-methylcyclohexanemethanol	No data available.
4-(methoxymethyl)cyclohexanemethanol	No data available.
water	No data available.
methyl 4-methylcyclohexanecarboxylate	No data available.
dimethyl 1,4-cyclohexanedicarboxylate	No data available.
methanol	No data available.
1,4-cyclohexanedimethanol	No data available.

Other adverse effects: No data available.

SECTION 12: Ecological information

12.1 Toxicity

Acute toxicity

Fish

Product: LC-50 (Fathead Minnow, 96 h): 57.4 mg/l
 NOEC: (Fathead Minnow, 96 h): 25 mg/l

Aquatic invertebrates

Product: EC-50 (daphnid, 48 h): 98.1 mg/l
 NOEC: (daphnid, 48 h): 40 mg/l

Chronic Toxicity

Fish

Product: No data available.

Specified substance(s)

4- methylcyclohexanemethanol No data available.
 4- (methoxymethyl)cyclohexanemethanol No data available.
 water No data available.
 methyl 4- methylcyclohexanecarboxylate No data available.
 dimethyl 1,4- cyclohexanedicarboxylate No data available.
 methanol No data available.
 1,4-cyclohexanedimethanol No data available.

Aquatic invertebrates

Product: No data available.

Specified substance(s)

4- methylcyclohexanemethanol No data available.
 4- (methoxymethyl)cyclohexanemethanol No data available.
 water No data available.
 methyl 4- methylcyclohexanecarboxylate No data available.
 dimethyl 1,4- cyclohexanedicarboxylate No data available.
 methanol No data available.
 1,4-cyclohexanedimethanol No data available.

Toxicity to Aquatic Plants

Product: No data available.

Specified substance(s)

4- methylcyclohexanemethanol No data available.
 4- (methoxymethyl)cyclohexanemethanol No data available.

emethanol	
water	No data available.
methyl 4-methylcyclohexanecarboxylate	No data available.
dimethyl 1,4-cyclohexanedicarboxylate	No data available.
methanol	No data available.
1,4-cyclohexanedimethanol	EC-50 (Alga, 72 h): > 122.9 mg/l (only concentration tested) NOEC: (Alga, 72 h): >= 122.9 mg/l (only concentration tested)

12.2 Persistence and degradability

Biodegradation

Product: No data available.

Specified substance(s)

4-methylcyclohexanemethanol	No data available.
4-(methoxymethyl)cyclohexanemethanol	No data available.
water	No data available.
methyl 4-methylcyclohexanecarboxylate	No data available.
dimethyl 1,4-cyclohexanedicarboxylate	No data available.
methanol	No data available.
1,4-cyclohexanedimethanol	99.2 % (28 d, Ready Biodegradability: DOC Die Away Test) Readily biodegradable

Biological Oxygen Demand:

Product
BOD-5: 70 mg/g
BOD-20: 1,300 mg/g

Chemical Oxygen Demand:

Product 2,450 mg/g

BOD/COD ratio

Product No data available.

Specified substance(s)

4-methylcyclohexanemethanol	No data available.
4-(methoxymethyl)cyclohexanemethanol	No data available.
water	No data available.
methyl 4-methylcyclohexanecarboxylate	No data available.
dimethyl 1,4-cyclohexanedicarboxylate	No data available.
methanol	No data available.

1,4-cyclohexanedimethanol No data available.

12.3 Bioaccumulative potential

Product: No data available.

Specified substance(s)

4- No data available.

methylcyclohexanemethanol No data available.

4- No data available.

(methoxymethyl)cyclohexan
emethanol

water No data available.

methyl 4- No data available.

methylcyclohexanecarboxyla
te

dimethyl 1,4- No data available.

cyclohexanedicarboxylate

methanol No data available.

1,4-cyclohexanedimethanol No data available.

12.4 Mobility in soil:

No data available.

Known or predicted distribution to environmental compartments

4-methylcyclohexanemethanol No data available.

4- No data available.

(methoxymethyl)cyclohexanem
ethanol

water No data available.

methyl 4- No data available.

methylcyclohexanecarboxylate

dimethyl 1,4- No data available.

cyclohexanedicarboxylate

methanol No data available.

1,4-cyclohexanedimethanol 0.499 - 1.6 (QSAR model)

12.5 Results of PBT and vPvB assessment:

No data available.

4-methylcyclohexanemethanol No data available.

4- No data available.

(methoxymethyl)cyclohexanem
ethanol

water No data available.

methyl 4- No data available.

methylcyclohexanecarboxylate

dimethyl 1,4- No data available.

cyclohexanedicarboxylate

methanol No data available.

1,4-cyclohexanedimethanol Not fulfilling PBT
(persistent/bioaccumulative/toxic) criteria

12.6 Other adverse effects: No data available.

SECTION 13: Disposal considerations

13.1 Waste treatment methods

General information: No data available.

Disposal Methods: Dispose of waste and residues in accordance with local authority requirements. Mix with compatible chemical which is less flammable and incinerate. Since emptied containers retain product residue, follow label warnings even after container is emptied. Residual vapors may explode on ignition; do not cut, drill, grind, or weld on or near this container.

SECTION 14: Transport information

Important Note: Shipping descriptions may vary based on mode of transport, quantities, package size, and/or origin and destination. Consult your company's Hazardous Materials/Dangerous Goods expert for information specific to your situation.

DOT

Class not regulated

IMDG - International Maritime Dangerous Goods Code

Class not regulated

IATA

Class not regulated

SECTION 15: Regulatory information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture:

This product has been classified in accordance with hazard criteria of the Controlled Products Regulations and the MSDS contains all the information required by the Controlled Products Regulations.

WHMIS (Canada) Status: controlled

WHMIS (Canada) Hazard Classification: D/2/B

SARA 311-312 Hazard Classification(s):

immediate (acute) health hazard

US EPCRA (SARA Title III) Section 313 - Toxic Chemical List

METHANOL

OSHA: hazardous**TSCA (US Toxic Substances Control Act):** All components of this product are listed on the TSCA inventory. Any impurities present in this product are exempt from listing.**DSL (Canadian Domestic Substances List) and CEPA (Canadian Environmental Protection Act):** One or more components of this product are not listed on the DSL. In Canada, its use is restricted to research and development purposes only.**MITI (Japanese Handbook of Existing and New Chemical Substances):** One or more components or reactants of this product are not listed in the Handbook. In Japan, its use is restricted to research and development purposes only.**ECL (Korean Toxic Substances Control Act):** One or more components of this product are not listed on the Korean inventory. In Korea, its use is restricted to research and development purposes only.**SECTION 16: Other information****HMIS® Hazard Ratings:** Health - 2, Flammability - 1, Chemical Reactivity - 0

HMIS® rating involves data interpretations that may vary from company to company. They are intended only for rapid, general identification of the magnitude of the specific hazard. To deal adequately with the safe handling of this material, all the information contained in this MSDS must be considered.

Revision Information: Not relevant.**Key literature references and sources for data:** No data available.**Training information:** No data available.**Issue Date:** 08/18/2011**SDS No:****Disclaimer:** This information is provided without warranty. The information is believed to be correct. This information should be used to make an independent determination of the methods to safeguard workers and the environment.

Section 1 - Chemical Product and Company Identification

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Material Name: Hydrochloric Acid
Chemical Formula: ClH
Structural Chemical Formula: HCl
EINECS Number: 231-595-7
ACX Number: X1002202-3

CAS Number: 7647-01-0

Synonyms: 4-D BOWL SANITIZER; ACIDE CHLORHYDRIQUE; ACIDO CLORHIDRICO; ACIDO CLORIDRICO; ANHYDROUS HYDROCHLORIC ACID; ANHYDROUS HYDROGEN CHLORIDE; AQUEOUS HYDROGEN CHLORIDE; BOWL CLEANER; CHLOORWATERSTOF; CHLOROHYDRIC ACID; CHLOROWODOR; CHLORURE D'HYDROGENE; CHLORURE D'HYDROGENE ANHYDRE; CHLORURO DE HIDROGENO; CHLORWASSERSTOFF; CLORURO DE HIDROGENO ANHIDRO; EMULSION BOWL CLEANER; EPA PESTICIDE CHEMICAL CODE 045901; HYDROCHLORIC ACID; HYDROCHLORIC ACID GAS; HYDROCHLORIDE; HYDROGEN CHLORIDE; HYDROGEN CHLORIDE (HCL); HYGEIA CREME MAGIC BOWL CLEANER; MURIATIC ACID; MURIATIC ACID); NOW SOUTH SAFTI-SOL BRAND CONCENTRATED BOWL CLEANSE WITHMAGIC ACTIO; PERCLEEN BOWL AND URINAL CLEANER; SPIRITS OF SALT; VARLEY'S OCEAN BLUE SCENTED TOILET BOWL CLEANER; VARLEY POLY-PAK BOWL CREME; WHITE EMULSION BOWL CLEANER; WUEST BOWL CLEANER SUPER CONCENTRATED

General Use: Hydrogen chloride is used to produce pharmaceutical hydrochlorides; vinyl chloride from acetylene; alkyl chlorides from olefins and arsenious chloride from arsenious oxide; electronic grade for etching semiconductor crystals. Used in the chlorination of rubber; in organic reactions involving isomerization, polymerization and alkylation; as a catalyst and condensing agent; for making chlorine where economical; in the separation of cotton from wool and cotton de-linting; as flux in the babbitt type of metal alloy; etching semi-conductor crystals.

Hydrochloric acid is used for pickling and heavy duty cleaning of metal parts; rust and scale removal. The production of chlorides; neutralizing bases; a laboratory reagent. For hydrolyzing starch and proteins in preparations for food. As a catalyst and solvent in organic synthesis. As "spirits of salts" for cleaning of lime and masonry from new brickwork. As flux or flux component for soldering; manufacture of "killed spirits".

Section 2 - Composition / Information on Ingredients

Name	CAS	%
hydrogen chloride	7647-01-0	> 99.0

OSHA PEL
 Ceiling: 5 ppm, 7 mg/m³.

NIOSH REL
 Ceiling: 5 ppm (7 mg/m³).

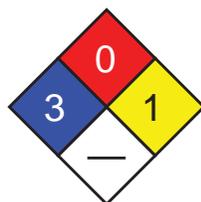
DFG (Germany) MAK
 TWA: 5 ppm; PEAK: 5 ppm.

ACGIH TLV
 Ceiling: 2 ppm.

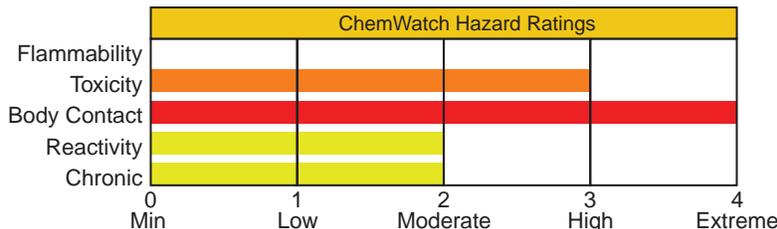
IDLH Level
 50 ppm.

EU OEL
 TWA: 5 ppm; STEL: 10 ppm.

Section 3 - Hazards Identification

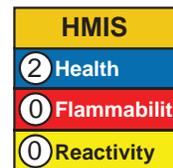


Fire Diamond



ANSI Signal Word

Danger!



☆☆☆☆☆ **Emergency Overview** ☆☆☆☆☆

Colorless gas; characteristic suffocating, pungent odor. Corrosive. Stored as compressed gas which may cause frostbite. Chronic Effects: erosion of teeth.

Potential Health Effects

Target Organs: eyes, skin, respiratory system, liver (in animals)

Primary Entry Routes: inhalation, skin contact, eye contact

Acute Effects

Inhalation: The vapor is extremely discomforting to the upper respiratory tract, may cause severe mucous membrane damage and may be harmful if inhaled.

Inhalation of quantities of liquid mist may be extremely hazardous, even lethal due to spasm, extreme irritation of larynx and bronchi, chemical pneumonitis and pulmonary edema.

A single severe exposure may cause coughing and choking; bleeding of nose, inflammation and occasionally ulceration of the nose, throat and larynx. Fluid on the lungs followed by generalized lung damage may follow. Breathing of vapor may aggravate asthma and inflammatory or fibrotic pulmonary disease.

High concentrations cause necrosis of the tracheal and bronchial epithelium, pulmonary edema, atelectasis and emphysema and damage to the pulmonary blood vessels and liver.

Inhalation hazard is increased at higher temperatures.

The vapor from heated material is extremely discomforting to the upper respiratory tract and lungs if inhaled.

Continued severe exposure can result in pulmonary edema and corrosion of tissues in the nose and throat.

Eye: Hydrogen Chloride: The vapor is extremely discomforting to the eyes and is capable of causing pain and severe conjunctivitis. Corneal injury may develop, with possible permanent impairment of vision, if not promptly and adequately treated.

The material may be irritating to the eye, with prolonged contact causing inflammation. Repeated or prolonged exposure to irritants may produce conjunctivitis.

Hydrochloric Acid: Eye contact is extremely painful and may cause rapid corneal damage. The liquid is extremely corrosive to the eyes and is capable of causing severe damage with loss of sight.

The vapor is highly discomforting and may be corrosive to the eyes. The vapor from heated material is extremely discomforting to the eyes.

Skin: The material is corrosive to the skin and may cause chemical burns.

Toxic effects may result from skin absorption. Bare unprotected skin should not be exposed to this material. The material may accentuate any pre-existing skin condition.

The vapor is discomforting to the skin.

Ingestion: Considered an unlikely route of entry in commercial/industrial environments.

The liquid is extremely corrosive if swallowed and is capable of causing burns to mouth, throat, esophagus, with extreme discomfort, pain and may be fatal if swallowed in quantity. Ingestion may result in nausea, abdominal irritation, pain and vomiting.

Carcinogenicity: NTP - Not listed; IARC - Group 3, Not classifiable as to carcinogenicity to humans; OSHA - Not listed; NIOSH - Not listed; ACGIH - Not listed; EPA - Not listed; MAK - Not listed.

Chronic Effects: Chronic exposure may cause discoloration or erosion of the teeth, bleeding of the nose and gums; and ulceration of the nasal mucous membranes.

Repeated exposures of animals to concentrations of about 34 ppm produced no immediate toxic effects.

Workers exposed to hydrochloric acid suffered from gastritis and a number of cases of chronic bronchitis have also been reported.

Repeated or prolonged exposure to dilute solutions may cause dermatitis. Repeated exposure to low vapor concentrations can cause skin tenderness, bleeding of the nose and gums, chronic bronchitis, gastritis.

Section 4 - First Aid Measures

Inhalation: Remove to fresh air.

Lay patient down. Keep warm and rested.

If breathing is shallow or has stopped, ensure clear airway and apply resuscitation. Transport to hospital or doctor.

Eye Contact: Immediately hold the eyes open and flush continuously for at least 15 minutes with fresh running water. Ensure irrigation under eyelids by occasionally lifting the upper and lower lids.

Transport to hospital or doctor without delay. Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.

Skin Contact: Immediately flush body and clothes with large amounts of water, using safety shower if available.

Quickly remove all contaminated clothing, including footwear.

Wash affected areas with water (and soap if available) for at least 15 minutes. Transport to hospital or doctor.

Ingestion: Contact a Poison Control Center. Rinse mouth out with plenty of water. Do NOT induce vomiting. Give a glass of water.

After first aid, get appropriate in-plant, paramedic, or community medical support.

Note to Physicians: For acute or short-term repeated exposures to strong acids:

1. Airway problems may arise from laryngeal edema and inhalation exposure.

Treat with 100% oxygen initially.

2. Respiratory distress may require cricothyroidotomy if endotracheal intubation is contraindicated by excessive swelling.



See
DOT
ERG

3. Intravenous lines should be established immediately in all cases where there is evidence of circulatory compromise.
 4. Strong acids produce a coagulation necrosis characterized by formation of a coagulum (eschar) as a result of the desiccating action of the acid on proteins in specific tissues.

INGESTION:

1. Immediate dilution (milk or water) within 30 minutes post-ingestion is recommended.
2. Do not attempt to neutralize the acid since exothermic reaction may extend the corrosive injury.
3. Be careful to avoid further vomiting since re-exposure of the mucosa to the acid is harmful. Limit fluids to one or two glasses in an adult.
4. Charcoal has no place in acid management.
5. Some authors suggest the use of lavage within 1 hour of ingestion.

SKIN:

1. Skin lesions require copious saline irrigation. Treat chemical burns as thermal burns with non-adherent gauze and wrapping.
2. Deep second-degree burns may benefit from topical silver sulfadiazine.

EYE:

1. Eye injuries require retraction of the eyelids to ensure thorough irrigation of the conjunctival cul-de-sacs. Irrigation should last at least 20-30 minutes. Do not use neutralizing agents or any other additives. Several liters of saline are required.
2. Cycloplegic drops (1% cyclopentolate for short-term use or 5% homatropine for longer term use), antibiotic drops, vasoconstrictive agents, or artificial tears may be indicated dependent on the severity of the injury.
3. Steroid eye drops should only be administered with the approval of a consulting ophthalmologist.

Section 5 - Fire-Fighting Measures

Flash Point: Nonflammable

Autoignition Temperature: Not applicable

LEL: Not applicable

UEL: Not applicable

Extinguishing Media: Water spray or fog; foam;

Bromochlorodifluoromethane (BCF) (where regulations permit); Dry agent; Carbon dioxide.

General Fire Hazards/Hazardous Combustion Products: Noncombustible liquid. Will not burn, but heat produces highly toxic fumes/vapors.

Heating may cause expansion or decomposition leading to violent rupture of containers.

Decomposes on heating and produces toxic fumes of hydrogen chloride. Decomposition may produce toxic fumes of chlorine.

Reacts with metals producing flammable/explosive hydrogen gas. Contact with moisture or water may generate heat causing ignition. Reacts vigorously with alkalis. Moderate fire hazard when in contact with reducing agents.

Fire Incompatibility: Reacts with metals producing flammable/explosive hydrogen gas.

Avoid reactions with metals, metal oxides, hydroxides, amines, carbonates, alkaline materials, acetic anhydride, cyanides, sulphides, sulphites, phosphides, acetylides, borides, carbides, silicides, vinyl acetate, formaldehyde and potassium permanganate, unsaturated organics, metal acetylides, sulphuric acid.

Note: Compatibility with plastics should be confirmed prior to use.

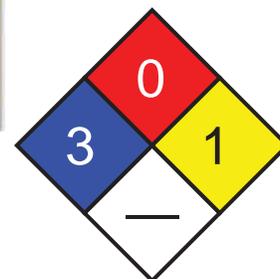
Fire-Fighting Instructions: Contact fire department and tell them location and nature of hazard.

Wear full body protective clothing with breathing apparatus. Prevent, by any means available, spillage from entering drains or waterways. Consider evacuation. Cool fire-exposed containers with water spray from a protected location.

If safe to do so, remove containers from path of fire. Equipment should be thoroughly decontaminated after use.

Water spray or fog may be used to disperse vapor. Do not approach cylinders suspected to be hot. If safe to do so, stop flow of gas.

See
DOT
ERG



Fire Diamond

Section 6 - Accidental Release Measures

Small Spills: DO NOT touch the spill material. Clean up all spills immediately. Wear fully protective PVC clothing and breathing apparatus. Contain and absorb spill with sand, earth, inert material or vermiculite. Use soda ash or slaked lime to neutralize. Collect residues and place in labeled plastic containers with vented lids. Clear area of personnel and move upwind. Avoid breathing vapors and contact with skin and eyes. Do not exert excessive pressure on valve; do not attempt to operate damaged valve. Water spray or fog may be used to disperse vapor.

See
DOT
ERG

Large Spills: Contact fire department and tell them location and nature of hazard. Clear area of personnel and move upwind. Wear full body protective clothing with breathing apparatus. Prevent, by any means available, spillage from entering drains or waterways. Consider evacuation. Stop leak if safe to do so. Remove leaking cylinders to a safe place if possible. Release pressure under safe, controlled conditions by opening the valve. Do not exert excessive pressure on valve; do not attempt to operate damaged valve. Shut off all possible sources of ignition and increase ventilation. Water spray or fog may be used to disperse vapor. Use soda ash or slaked lime to neutralize.

Collect and seal in labeled drums for disposal. Wash spill area with large quantities of water. If contamination of

drains or waterways occurs, advise emergency services. After clean-up operations, decontaminate and launder all protective clothing and equipment before storing and reusing. DO NOT touch the spill material. Contain and absorb spill with sand, earth, inert material or vermiculite.

DO NOT USE WATER OR NEUTRALIZING AGENTS INDISCRIMINATELY ON LARGE SPILLS.

Regulatory Requirements: Follow applicable OSHA regulations (29 CFR 1910.120).

Section 7 - Handling and Storage

Handling Precautions: Avoid generating and breathing mist and vapor, breathing vapors and contact with skin and eyes.

Avoid physical damage to containers. Use in a well-ventilated area. Wear protective clothing and gloves when handling containers. Handle and open container with care.

WARNING: To avoid violent reaction, ALWAYS add material to water and NEVER water to material. When handling, DO NOT eat, drink or smoke. Always wash hands with soap and water after handling. Work clothes should be laundered separately. Use good occupational work practices. Observe manufacturer's storing and handling recommendations.

Atmosphere should be regularly checked against established exposure standards to ensure safe working conditions are maintained.

Local exhaust ventilation may be required for safe working, i.e. to keep exposures below required standards; otherwise, PPE is required.

Keep dry. Reacts violently with water.

Transport containers on a trolley. Avoid sources of heat. DO NOT transfer gas from one cylinder to another.

Recommended Storage Methods: Packaging as recommended by manufacturer. Check that containers are clearly labeled.

Cylinder. Ensure the use of equipment rated for cylinder pressure. Ensure the use of compatible materials of construction. Valve protection cap to be in place until cylinder is secured, connected. Cylinder must be properly secured either in use or in storage. Cylinder valve must be closed when not in use or when empty. Segregate full from empty cylinders. **WARNING:** Suckback into cylinder may result in rupture. Use back-flow preventive device in piping.

Hydrochloric acid: Packs of 2.5 litres or less require a child-resistant closure. Glass container or Plastic carboy or Polylined drum.

Regulatory Requirements: Follow applicable OSHA regulations.

Section 8 - Exposure Controls / Personal Protection

Engineering Controls: If risk of overexposure exists, wear air supplied breathing apparatus. Provide adequate ventilation in warehouse or closed storage areas. Use in a well-ventilated area. Local exhaust ventilation may be required for safe working, i. e. , to keep exposures below required standards; otherwise, PPE is required.

If risk of inhalation or overexposure exists, wear NIOSH-approved respirator or work in fume hood. Hydrogen chloride vapors will not be adequately absorbed by organic vapor respirators.

Personal Protective Clothing/Equipment:

Eyes: Chemical goggles. Full face shield.

DO NOT wear contact lenses. Contact lenses pose a special hazard; soft contact lenses may absorb irritants and all lenses concentrate them.

Hands/Feet: Neoprene gloves; rubber gloves. Nitrile gloves.

Safety footwear. Rubber boots.

Hydrochloric acid: Barrier cream and Neoprene gloves or Elbow length PVC gloves. Nitrile gloves.

PVC boots or PVC safety gumboots.

Respiratory Protection:

Exposure Range >5 to <50 ppm: Air Purifying, Negative Pressure, Half Mask

Exposure Range 50 to unlimited ppm: Self-contained Breathing Apparatus, Pressure Demand, Full Face

Cartridge Color: white

Other: Ensure there is ready access to a safety shower; Eyewash unit.

Acid-resistant overalls. Full protective suit. Operators should be trained in procedures for safe use of this material.

Glove Selection Index:

BUTYL Best selection

BUTYL/NEOPRENE Best selection

HYPALON Best selection

NEOPRENE..... Best selection

NEOPRENE/NATURAL..... Best selection

NITRILE+PVC Best selection

PE/EVAL/PE Best selection

SARANEX-23 Best selection

VITON/NEOPRENE Best selection

PVC..... Best selection

NITRILE	Best selection
NATURAL RUBBER.....	Satisfactory; may degrade after 4 hours continuous immersion
NATURAL+NEOPRENE.....	Satisfactory; may degrade after 4 hours continuous immersion
NAT+NEOPR+NITRILE	Poor to dangerous choice for other than short-term immersion

Section 9 - Physical and Chemical Properties

Appearance/General Info: Hydrogen chloride: Colorless, corrosive gas. Pungent suffocating odor. White fumes in moist air. Soluble in methanol, ethanol, ether and benzene.

Hydrochloric acid: Clear to light yellow (orange tint for inhibited grades) fuming corrosive liquid with sharp, suffocating odor.

Physical State: Hydrogen chloride: Compressed gas;

Hydrochloric acid: Liquid

Odor Threshold: 0.26 to 0.3 ppm

Vapor Pressure (kPa): < 24.8 at 25 °C

Vapor Density (Air=1): 1.268 at 20 °C

Formula Weight: 36.461

Specific Gravity (H₂O=1, at 4 °C): < 1.19 at 20 °C

Evaporation Rate: Slow

pH: Hydrochloric acid: < 1

Boiling Point: -85 °C (-121 °F)

Freezing/Melting Point: -114.44 °C (-173.992 °F)

Volatile Component (% Vol): 100

Decomposition Temperature (°C): Not applicable

Water Solubility: 56.1 g/100 cc hot water at 60 °C

Section 10 - Stability and Reactivity

Stability/Polymerization/Conditions to Avoid: Decomposes in the presence of moisture to produce corrosive acid. May generate sufficient heat to ignite combustible materials. Presence of heat source and direct sunlight (ultra-violet radiation). Product is considered stable under normal handling conditions. Hazardous polymerization will not occur.

Storage Incompatibilities: Hydrogen chloride: Segregate from most common metals and their alloys, alkalis, unsaturated organics, fluorine, metal carbides, metal acetylides, potassium permanganate and sulfuric acid.

Compatibility with plastics should be confirmed prior to use.

Hydrochloric acid: Segregate from alkalis, oxidizing agents and chemicals readily decomposed by acids, i.e. cyanides, sulfides, carbonates. Avoid storage with metals, metal oxides, hydroxides, amines, carbonates, alkaline materials, acetic anhydride, cyanides, sulphides, sulphites, phosphides, acetylides, borides, carbides, silicides, vinyl acetate, formaldehyde and potassium permanganate. Reacts with zinc, brass, galvanized iron, aluminum, copper and copper alloys.

Section 11 - Toxicological Information

Toxicity

Inhalation (human) LC_{Lo}: 1300 ppm/30 m

Inhalation (human) LC_{Lo}: 3000 ppm/5 m

Inhalation (rat) LC₅₀: 3124 ppm/60 m

Inhalation (rat) LC₅₀: 4701 ppm/30 m

Oral (rat) LD₅₀: 900 mg/kg

Irritation

Eye (rabbit): 5 mg/30 s - mild

See RTECS MW 4025000, for additional data.

Section 12 - Ecological Information

Environmental Fate: No data found.

Ecotoxicity: TL_m Gambusia affinis (mosquito fish) 282 ppm/96 hr (fresh water) /Conditions of bioassay not specified; Lethal Lepomis macrochirus (bluegill sunfish) 3.6 mg/l/48 hr /Conditions of bioassay not specified; LC₅₀ Cockle 330 to 1,000 mg/l/48 hr /Conditions of bioassay not specified; LC₅₀ Carassius auratus (goldfish) 178 mg/l (1 to 2 hr survival time) /Conditions of bioassay not specified; LC₅₀ Shore crab 240 mg/l/48 hr /Conditions of bioassay not specified; LC₅₀ Shrimp 100 to 330 ppm/48 hr (salt water) /Conditions of bioassay not specified; LC₁₀₀ Trout 10 mg/l 24 hr /Conditions of bioassay not specified

Biochemical Oxygen Demand (BOD): none

Section 13 - Disposal Considerations

Disposal: Recycle wherever possible. Consult manufacturer for recycling options. Treat and neutralize at an effluent treatment plant. Bury residue in an authorized landfill. Decontaminate empty containers with a lime slurry. Return empty containers to supplier or bury empty containers at an authorized landfill.

Return empty cylinders to supplier.

Section 14 - Transport Information

DOT Hazardous Materials Table Data (49 CFR 172.101):

Note: This material has multiple possible HMT entries. Choose the appropriate one based on state and condition of specific material when shipped.

Shipping Name and Description: Hydrogen chloride, anhydrous

ID: UN1050

Hazard Class: 2.3 - Poisonous gas

Packing Group:

Symbols:

Label Codes: 2.3 - Poison Gas, 8 - Corrosive

Special Provisions: 3

Packaging: **Exceptions:** None **Non-bulk:** 304 **Bulk:** None

Quantity Limitations: **Passenger aircraft/rail:** Forbidden **Cargo aircraft only:** Forbidden

Vessel Stowage: **Location:** D **Other:** 40



Shipping Name and Description: Hydrochloric acid

ID: UN1789

Hazard Class: 8 - Corrosive material

Packing Group: II - Medium Danger

Symbols:

Label Codes: 8 - Corrosive

Special Provisions: A3, A6, B3, B15, IB2, N41, T8, TP2, TP12

Packaging: **Exceptions:** 154 **Non-bulk:** 202 **Bulk:** 242

Quantity Limitations: **Passenger aircraft/rail:** 1 L **Cargo aircraft only:** 30 L

Vessel Stowage: **Location:** C **Other:**



Shipping Name and Description: Hydrochloric acid

ID: UN1789

Hazard Class: 8 - Corrosive material

Packing Group: III - Minor Danger

Symbols:

Label Codes: 8 - Corrosive

Special Provisions: IB3, T4, TP1, TP12

Packaging: **Exceptions:** 154 **Non-bulk:** 203 **Bulk:** 241

Quantity Limitations: **Passenger aircraft/rail:** 5 L **Cargo aircraft only:** 60 L

Vessel Stowage: **Location:** C **Other:**



Section 15 - Regulatory Information

EPA Regulations:

RCRA 40 CFR: Not listed

CERCLA 40 CFR 302.4: Listed per CWA Section 311(b)(4) 5000 lb (2268 kg)

SARA 40 CFR 372.65: Listed

SARA EHS 40 CFR 355: Listed

RQ: 5000 lb

TPQ: 500 lb

TSCA: Listed

Section 16 - Other Information

Disclaimer: Judgments as to the suitability of information herein for the purchaser's purposes are necessarily the purchaser's responsibility. Although reasonable care has been taken in the preparation of such information, Genium Group, Inc. extends no warranties, makes no representations, and assumes no responsibility as to the accuracy or suitability of such information for application to the purchaser's intended purpose or for consequences of its use.

Section 1 - Chemical Product and Company Identification

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Material Name: Isobutene

CAS Number: 115-11-7

Chemical Formula: C₄H₈

Structural Chemical Formula: (CH₃)₂C=CH₂

EINECS Number: 204-066-3

ACX Number: X1003822-9

Synonyms: Isobutene; ISOBUTYLENE; ASYM-DIMETHYLETHYLENE; GAMMA-BUTYLENE; 1,1-DIMETHYLETHYLENE; ISO-BUTENE; ISOBUTENE; ISOPROPYLIDENEMETHYLENE; LIQUEFIED PETROLEUM GAS; 2-METHYL-1-PROPENE; 2-METHYLPROPENE; 2-METHYLPROPYLENE; 1-PROPENE,2-METHYL-; PROPENE,2-METHYL-; UNSYM. DIMETHYLETHYLENE

General Use: Production of butene polymers used as adhesives, tackifiers, oil additives.

Butyl rubbers, copolymer resins with butadiene, acrylates and methacrylates.

Also to produce anti-oxidants for foods, food supplements, plastics and in production of isooctane and high-octane aviation gasoline.

Used in closed pressurized systems, fitted with safety relief valve.

Vented gas is flammable, denser than air and will spread. Vent path must not contain ignition sources, pilot lights, bare flames.

Section 2 - Composition / Information on Ingredients

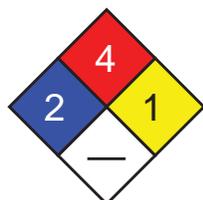
Name	CAS	%
isobutene	115-11-7	>99

OSHA PEL

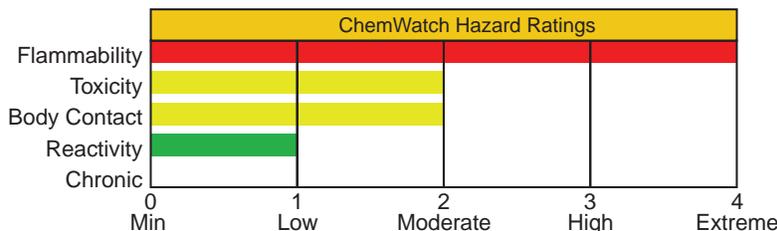
NIOSH REL

ACGIH TLV

Section 3 - Hazards Identification



Fire Diamond



HMIS	
1	Health
4	Flammability
0	Reactivity

ANSI Signal Word
Danger!



☆☆☆☆☆ **Emergency Overview** ☆☆☆☆☆

Colorless gas. Acute Effects: Simple asphyxiant which can displace available oxygen; initial symptoms: rapid respiration, air hunger, diminished mental alertness, impaired muscular coordination. Can form explosive mixtures in air. Flammable.

Potential Health Effects

Target Organs: None reported

Primary Entry Routes: inhalation

Acute Effects

Inhalation: The gas is a simple asphyxiant (precludes access to oxygen) and is harmful if exposure is prolonged and inhalation may cause loss of consciousness.

Acute effects from inhalation of high concentrations of gas / vapor are pulmonary irritation, including coughing, with nausea; central nervous system depression - characterized by headache and dizziness, increased reaction time, fatigue and loss of coordination.

If exposure to highly concentrated atmosphere of gas is prolonged this may lead to narcosis, unconsciousness, even coma, and unless resuscitated, death.

Iso-butene is a simple asphyxiant and may have a narcotic action.

Material is highly volatile and may quickly form concentrated atmosphere in confined or unventilated area. Vapor is heavier than air and may displace and replace air in breathing zone, acting as a simple asphyxiant. This may happen with little warning of overexposure.

Hydrocarbons may sensitize the heart to adrenalin and other circulatory catecholamines; as a result cardiac arrhythmias and ventricular fibrillation may occur. Abrupt collapse may produce traumatic injury.

Central nervous system (CNS) depression may be evident early. Symptoms of moderate poisoning may include giddiness, headache, dizziness and nausea.

Serious poisonings may result in respiratory depression and may be fatal.

The paraffin gases C1-4 are practically non-toxic below their lower flammability limits (18000-50000 ppm). Above this level, incidental effects include CNS depression and irritation but these are reversible upon cessation of the exposure. The C3 and iso-C5 hydrocarbons show increasing narcotic properties; branching of the chain also enhances the effect.

The C4 hydrocarbons appear to be more highly neurotoxic than the C3 and C5 members. Several fatalities due to voluntary inhalation of butane have been reported, possibly due to central, respiratory and circulatory effects resulting from anesthesia, laryngeal edema, chemical pneumonia or the combined effects of cardiac toxicity and increased sympathomimetic effects.

Inhalation of petroleum gases may produce narcosis, due in part to olefinic impurities. Displacement of oxygen in the air may cyanosis.

If present in sufficient quantity these gases may reduce the oxygen level to below 18% producing asphyxiation.

Symptoms include rapid respiration, mental dullness, lack of coordination, poor judgement, nausea and vomiting.

The onset of cyanosis may lead to unconsciousness and death.

Eye: The liquid is highly discomforting and may cause severe cold burns and is capable of causing pain and severe conjunctivitis.

Corneal injury may develop, with possible permanent impairment of vision, if not promptly and adequately treated.

The gas is regarded as non-irritating to the eyes.

Skin: Vaporizing liquid causes rapid cooling and contact may cause cold burns, frostbite. The liquid is discomforting to the skin and may rapidly cause severe cold burns.

Bare unprotected skin should not be exposed to this material.

There is no evidence of skin absorption but contact may cause frostbite,

Ingestion: Overexposure is unlikely in this form.

Considered an unlikely route of entry in commercial/industrial environments.

The liquid is highly discomforting if swallowed and may cause severe cold burns.

Carcinogenicity: NTP - Not listed; IARC - Not listed; OSHA - Not listed; NIOSH - Not listed; ACGIH - Not listed; EPA - Not listed; MAK - Not listed.

Chronic Effects: Chronic overexposure may produce dermatitis.

Section 4 - First Aid Measures

Inhalation: Avoid becoming a casualty and remove to fresh air.

Lay patient down. If breathing is shallow or has stopped, ensure clear airway and apply resuscitation.

If available, medical oxygen should be administered by trained personnel.

Transport to hospital or doctor, without delay.

Eye Contact: Immediately hold the eyes open and flush continuously for at least 15 minutes with fresh running water. Ensure irrigation under eyelids by occasionally lifting the upper and lower lids.

Transport to hospital or doctor without delay. Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.

Skin Contact: In case of cold burns (frost-bite): Bathe the affected area immediately in cold water for 10 to 15 minutes, immersing if possible and without rubbing.

Do not apply hot water or radiant heat. Apply a clean, dry dressing.

Transport to hospital or doctor.

Ingestion: Contact a Poison Control Center. DO NOT induce vomiting. Observe the patient carefully. Never give liquid to a person showing signs of being sleepy or with reduced awareness; i.e. becoming unconscious. Give water (or milk) to rinse out mouth. Then provide liquid slowly and as much as casualty can comfortably drink. Transport to hospital or doctor without delay.

After first aid, get appropriate in-plant, paramedic, or community medical support.

Note to Physicians: For acute or short-term repeated exposures to petroleum distillates or related hydrocarbons:

1. Primary threat to life from pure petroleum distillate ingestion and/or inhalation is respiratory failure.

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2. Patients should be quickly evaluated for signs of respiratory distress (e.g. cyanosis, tachypnea, intercostal retraction, obtundation) and given oxygen. Patients with inadequate tidal volumes or poor arterial blood gases ($pO_2 < 50$ mm Hg or $pCO_2 > 50$ mm Hg) should be intubated.
3. Arrhythmias complicate some hydrocarbon ingestion and/or inhalation and electrocardiographic evidence of myocardial injury has been reported; intravenous lines and cardiac monitors should be established in obviously symptomatic patients. The lungs excrete inhaled solvents, so that hyperventilation improves clearance.
4. A chest x-ray should be taken immediately after stabilization of breathing and circulation to document aspiration and detect the presence of pneumothorax.
5. Epinephrine (adrenalin) is not recommended for treatment of bronchospasm because of potential myocardial sensitization to catecholamines.
- Inhaled cardioselective bronchodilators (e.g. Alupent, Salbutamol) are the preferred agents, with aminophylline a second choice.
6. Lavage is indicated in patients who require decontamination; ensure use of cuffed endotracheal tube in adult patients.

Section 5 - Fire-Fighting Measures

Flash Point: -76.111 °C

Autoignition Temperature: 465 °C

LEL: 1.8% v/v

UEL: 9.6% v/v

Extinguishing Media: Water spray or fog; dry chemical powder.

Carbon dioxide.

Foam.

General Fire Hazards/Hazardous Combustion Products: Flammable gas. Liquid and vapor are highly flammable.

Dangerous hazard when exposed to heat, flame and oxidizers.

Gas may form explosive mixtures with air over a wide area.

Decomposes on heating and produces toxic fumes of carbon monoxide (CO) and carbon dioxide (CO₂).

Fire Incompatibility: Avoid contamination with oxidizing agents i.e. nitrates, oxidizing acids, chlorine bleaches, pool chlorine etc. as ignition may result.

Fire-Fighting Instructions: Contact fire department and tell them location and nature of hazard.

May be violently or explosively reactive. Wear full body protective clothing with breathing apparatus. Prevent, by any means available, spillage from entering drains or waterways. Consider evacuation.

Do not extinguish burning gas. If safe to do so, stop flow of gas.

If flow of gas cannot be stopped, leave gas to burn.

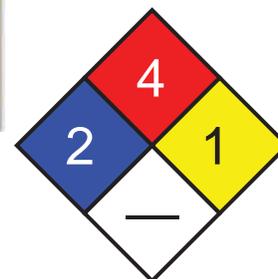
Cool fire-exposed containers with water spray from a protected location.

Do not approach cylinders suspected to be hot.

If safe to do so, remove containers from path of fire.

Fight fire from a safe distance, with adequate cover.

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Section 6 - Accidental Release Measures

Small Spills: Avoid breathing vapor and any contact with liquid or gas. Protective equipment including respirator should be used. Do NOT enter confined spaces where gas may have accumulated. Shut off all sources of possible ignition and increase ventilation. Clear area of personnel. Stop leak only if safe to do so. Remove leaking cylinders to safe place. Release pressure under safe controlled conditions by opening valve. Keep area clear of personnel until gas has dispersed.

Large Spills: DO NOT touch the spill material. Shut off all possible sources of ignition and increase ventilation. Restrict access to area. Clear area of personnel and move upwind.

May be violently or explosively reactive. Wear full body protective clothing with breathing apparatus. Prevent, by any means available, spillage from entering drains or waterways. Consider evacuation.

Avoid spraying water onto liquid pools.

Use extreme caution to avoid a violent reaction.

Stop leak if safe to do so.

DO NOT enter confined places where gas may have collected. Remove leaking cylinders to a safe place. Fit vent pipes. Release pressure under safe, controlled conditions by opening valve. Burn issuing gas at vent pipes.

Do not exert excessive pressure on valve; do not attempt to operate damaged valve.

Keep area clear of personnel until gas has dispersed

Regulatory Requirements: Follow applicable OSHA regulations (29 CFR 1910.120).

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Section 7 - Handling and Storage

Handling Precautions: Use good occupational work practices. Use in a well-ventilated area.

Obtain a work permit before attempting any repairs.
 Do not attempt repair work on lines, vessels under pressure.
 Atmospheres must be tested and O.K. before work resumes after leakage.
 Wear protective clothing and gloves when handling containers.
 No smoking, bare lights, heat or ignition sources.
 Use spark-free tools when handling. Ground all lines and equipment.
 Prevent concentration in hollows and sumps. DO NOT enter confined spaces until atmosphere has been checked.
 Gas may travel a considerable distance to source of ignition.
 Vapor may ignite on pumping or pouring due to static electricity.
 Avoid physical damage to containers.
 DO NOT transfer gas from one cylinder to another.
 Natural gases contain a contaminant, radon-222, a naturally occurring radioactive gas. During subsequent processing, radon tends to concentrate in liquified petroleum streams and in product streams having similar boiling points. Industry experience indicates that the commercial product may contain small amounts of radon-222 and its radioactive decay products (radon daughters). The actual concentration of radon-222 and radioactive daughters in process equipment (IE lines, filters, pumps and reactor units) may reach significant levels and produce potentially damaging levels of gamma radiation. A potential external radiation hazard exists at or near any pipe, valve or vessel containing a radon enriched stream or containing internal deposits of radioactive material. Field studies, however, have not shown that conditions exist that expose the worker to cumulative exposures in excess of general population limits. Equipment containing gamma-emitting decay products should be presumed to be internally contaminated with alpha- emitting decay products which may be hazardous if inhaled or ingested.
 During maintenance operations that require the opening of contaminated process equipment, the flow of gas should be stopped and a four hour delay enforced to allow gamma-radiation to drop to background levels. Protective equipment (including high efficiency particulate respirators (P3) suitable for radionucleotides or supplied air) should be worn by personnel entering a vessel or working on contaminated process equipment to prevent skin contamination or inhalation of any residue containing alpha-radiation.
 Airborne contamination may be minimized by handling scale and/or contaminated materials in a wet state.

Recommended Storage Methods: Packaging as recommended by manufacturer.

Check that containers are clearly labeled.
 Cylinder fitted with valve protector cap.
 Ensure the use of equipment rated for cylinder pressure.
 Ensure the use of compatible materials of construction.
 Cylinder valve must be closed when not in use or when empty.
 Cylinder must be properly secured either in use or in storage.
 WARNING: Suckback into cylinder may result in rupture.
 Use back-flow preventive device in piping.

Regulatory Requirements: Follow applicable OSHA regulations.

Section 8 - Exposure Controls / Personal Protection

Engineering Controls: Use in a well-ventilated area if gas concentrations are high: or If risk of overexposure exists, wear NIOSH-approved respirator.
 Correct fit is essential to obtain adequate protection.
 Used in closed pressurized systems; fitted with temperature and pressure safety relief valves which are vented to allow safe dispersal.
 Provide adequate ventilation in warehouse or closed storage areas.

Personal Protective Clothing/Equipment:

Eyes: Safety glasses with side shields; or as required, chemical goggles.

Contact lenses pose a special hazard; soft lenses may absorb irritants and all lenses concentrate them.

Hands/Feet: Protective gloves eg. leather gloves or gloves with leather facing. Neoprene rubber gloves.

Safety footwear.

Other: Operators should be trained in correct use & maintenance of respirators Ensure that there is ready access to breathing apparatus.

Protective overalls, closely fitted at neck and wrist. Eye-wash unit.

IN CONFINED SPACES:

1. Non-sparking protective boots.
2. Static-free clothing.
3. Ensure availability of lifeline.

Staff should be trained in all aspects of rescue work.

Ensure there is ready access to an emergency shower.

Section 9 - Physical and Chemical Properties

Appearance/General Info: Easily liquified flammable gas or colorless highly volatile liquid. Packed as liquid under pressure and remains liquid only under pressure. Sudden release of pressure or leakage may result in rapid vaporization with generation of large volume of highly flammable / explosive gas. Strong gasoline odor. Floats and boils on water giving a flammable / explosive, visible cloud. Soluble in alcohol, ether, benzene and sulphuric acid.

Physical State: Liquefied gas

pH: Not applicable

Odor Threshold: 1.3 to 3.0 mg/m³

pH (1% Solution): Not applicable.

Vapor Pressure (kPa): 182 kPa at 10 °C

Boiling Point: -6.9 °C (20 °F)

Vapor Density (Air=1): 2.01

Freezing/Melting Point: -140.35 °C (-220.63 °F)

Formula Weight: 56.11

Volatile Component (% Vol): 100

Specific Gravity (H₂O=1, at 4 °C): 0.59

Water Solubility: Practically insoluble in water

Evaporation Rate: Very rapid

Section 10 - Stability and Reactivity

Stability/Polymerization/Conditions to Avoid: Product is considered stable. Hazardous polymerization will not occur.

Storage Incompatibilities: Avoid contact with oxidizing agents.

The interaction of alkenes and alkynes with nitrogen oxides and oxygen may produce explosive addition products; these may form at very low temperatures and explode on heating to higher temperatures (the addition products from 1,3-butadiene and cyclopentadiene form rapidly at -150 °C and ignite or explode on warming to -35 to -15 C). These derivatives ("pseudo- nitrosites") were formerly used to characterize terpene hydrocarbons.

Exposure to air must be kept to a minimum so as to limit the build-up of peroxides which will concentrate in bottoms if the product is distilled.

The product must not be distilled to dryness if the peroxide concentration is substantially above 10 ppm (as active oxygen) since explosive decomposition may occur. Distillate must be immediately inhibited to prevent peroxide formation. The effectiveness of the antioxidant is limited once the peroxide levels exceed 10 ppm as active oxygen. Addition of more inhibitor at this point is generally ineffective.

Prior to distillation it is recommended that the product should be washed with aqueous ferrous ammonium sulfate to destroy peroxides; the washed product should be immediately re-inhibited.

A range of exothermic decomposition energies for double bonds is given as 40-90 kJ/mol. The relationship between energy of decomposition and processing hazards has been the subject of discussion; it is suggested that values of energy released per unit of mass, rather than on a molar basis (J/g) be used in the assessment. For example, in "open vessel processes" (with man-hole size openings, in an industrial setting), substances with exothermic decomposition energies below 500 J/g are unlikely to present a danger, whilst those in "closed vessel processes" (opening is a safety valve or bursting disk) present some danger where the decomposition energy exceeds 150 J/g.

Avoid reactions with oxidizing agents, organic acids, inorganic acids halogenated compounds, polymerizable esters, oxygen, cyanohydrins and molten sulphur.

Section 11 - Toxicological Information

Toxicity

Inhalation (rat) LC₅₀: 620000 mg/m³/4h

Irritation

Nil reported

See RTECS UD 0890000, for additional data.

Section 12 - Ecological Information

Environmental Fate: No data found.

Ecotoxicity: No data found.

BCF: no food chain concentration potential

Biochemical Oxygen Demand (BOD): none

Section 13 - Disposal Considerations

Disposal: Consult manufacturer for recycling options.

Discharge to burning flare. Return empty cylinders to supplier.

Section 14 - Transport Information

DOT Hazardous Materials Table Data (49 CFR 172.101):

Note: This material has multiple possible HMT entries. Choose the appropriate one based on state and condition of specific material when shipped.

Shipping Name and Description: Isobutylene *see also* Petroleum gases, liquefied

ID: UN1055

Hazard Class: 2.1 - Flammable gas

Packing Group:

Symbols:

Label Codes: 2.1 - Flammable Gas

Special Provisions: 19, T50

Packaging: **Exceptions:** 306 **Non-bulk:** 304 **Bulk:** 314, 315

Quantity Limitations: **Passenger aircraft/rail:** Forbidden **Cargo aircraft only:** 150 kg

Vessel Stowage: **Location:** E **Other:** 40



Shipping Name and Description: Petroleum gases, liquefied *or* Liquefied petroleum gas

ID: UN1075

Hazard Class: 2.1 - Flammable gas

Packing Group:

Symbols:

Label Codes: 2.1 - Flammable Gas

Special Provisions: T50

Packaging: **Exceptions:** 306 **Non-bulk:** 304 **Bulk:** 314, 315

Quantity Limitations: **Passenger aircraft/rail:** Forbidden **Cargo aircraft only:** 150 kg

Vessel Stowage: **Location:** E **Other:**



Section 15 - Regulatory Information

EPA Regulations:

RCRA 40 CFR: Not listed

CERCLA 40 CFR 302.4: Not listed

SARA 40 CFR 372.65: Not listed

SARA EHS 40 CFR 355: Not listed

TSCA: Listed

Section 16 - Other Information

Disclaimer: Judgments as to the suitability of information herein for the purchaser's purposes are necessarily the purchaser's responsibility. Although reasonable care has been taken in the preparation of such information, Genium Group, Inc. extends no warranties, makes no representations, and assumes no responsibility as to the accuracy or suitability of such information for application to the purchaser's intended purpose or for consequences of its use.

Section 1 - Chemical Product and Company Identification

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Material Name: Nitric Acid **CAS Number:** 7697-37-2
Chemical Formula: HNO₃
Structural Chemical Formula: HNO₃
EINECS Number: 231-714-2
ACX Number: X1002177-5
Synonyms: ACIDE NITRIQUE; ACIDO NITRICO; AQUA FORTIS; AZOTIC ACID; AZOTOWY KWAS; ENGRAVER'S ACID; ENGRAVERS ACID; HYDROGEN NITRATE; KYSELINA DUSICNE; NITAL; NITRIC ACID; NITRIC ACID OTHER THAN RED FUMING WITH >70% NITRIC ACID; NITRIC ACID OTHER THAN RED FUMING WITH NOT >70% NITRICACID; NITROUS FUMES; NITRYL HYDROXIDE; RED FUMING NITRIC ACID (RFNA); SALPETERSAURE; SALPETERZUUROPLOSSINGEN; WHITE FUMING NITRIC ACID (WFNA)
General Use: Manufacture of organic and inorganic nitrates and nitro compounds for fertilizers, dye intermediates and many organic chemicals.
 Used for etching and cleaning metals.
 Operators should be trained in procedures for safe use of this material.

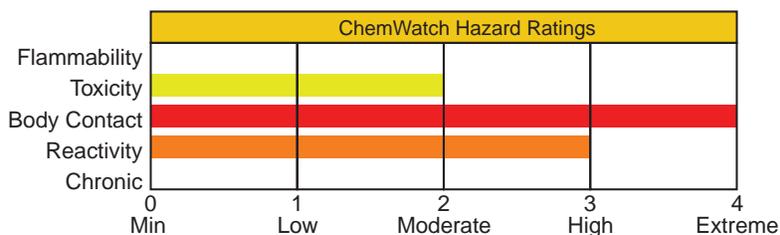
Section 2 - Composition / Information on Ingredients

Name	CAS	%
nitric acid	7697-37-2	>95
OSHA PEL TWA: 2 ppm; 5 mg/m ³ .	NIOSH REL TWA: 2 ppm (5 mg/m ³); STEL: 4 ppm (10 mg/m ³).	DFG (Germany) MAK TWA: 2 ppm; PEAK: 2 ppm.
ACGIH TLV TWA: 2 ppm; STEL: 4 ppm.	IDLH Level 25 ppm.	
EU OEL STEL: 2.6 mg/m ³ (1 ppm).		

Section 3 - Hazards Identification



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HMIS	
3	Health
0	Flammability
2	Reactivity

ANSI Signal Word

Danger!



Corrosive

☆☆☆☆☆ **Emergency Overview** ☆☆☆☆☆

Clear to yellow fuming liquid; acrid, suffocating odor. Corrosive. Other Acute Effects: lung damage. Chronic Effects: tooth erosion, bronchitis. Strong oxidizer.

Potential Health Effects

Target Organs: eyes, skin, respiratory system, teeth

Primary Entry Routes: inhalation, ingestion, skin contact, eye contact

Acute Effects

Inhalation: The vapor is extremely discomforting and corrosive to the upper respiratory tract and lungs and the material presents a hazard from a single acute exposure or from repeated exposures over long periods.

Inhalation hazard is increased at higher temperatures.

Reactions may occur following a single acute exposure or may only appear after repeated exposures.

Reactions may not occur on exposure but response may be delayed with symptoms only appearing many hours later. The material may produce respiratory tract irritation which produces an inflammatory response involving the recruitment and activation of many cell types, mainly derived from the vascular system. Unlike most organs the lung can respond to a chemical insult or agent by first trying to remove or neutralize the irritant and then repairing the damage. The repair process, which initially developed to protect mammalian lungs from foreign matter and antigens, may however, cause further damage the lungs when activated by hazardous chemicals. The result is often the impairment of gas exchange, the primary function of the lungs.

Inhalation of nitric acid mist or fumes at 2 to 25 ppm over an 8 hour period may cause pulmonary irritation and symptoms of lung damage.

Only several minutes of exposure to concentrated atmosphere i.e. 200 ppm may cause severe pulmonary damage and even fatality. Death may be delayed for several days.

Exposure to nitric acid fumes (with concurrent inhalation of nitrogen dioxide and nitric oxide) may elicit prompt irritation of the upper respiratory tract leading to coughing, gagging, chest pain, dyspnea, cyanosis if concentrations are sufficiently high and duration of exposure sufficiently long, pulmonary edema.

Eye: The liquid is extremely corrosive to the eyes and contact may cause rapid tissue destruction and is capable of causing severe damage with loss of sight.

The vapor is extremely discomforting to the eyes and is capable of causing pain and severe conjunctivitis.

Corneal injury may develop, with possible permanent impairment of vision, if not promptly and adequately treated.

The material may produce moderate eye irritation leading to inflammation.

Repeated or prolonged exposure to irritants may produce conjunctivitis.

Eye contact with concentrated acid may give no pain, whilst diluted solution causes intense pain and both can cause permanent eye damage or blindness. Burns may result in shrinkage of the eyeball, symblepharon (adhesions between tarsal and bulbar conjunctivae), permanent corneal opacification, and visual impairment leading to blindness.

Skin: The liquid is extremely corrosive to the skin and contact may cause tissue destruction with severe burns.

Bare unprotected skin should not be exposed to this material.

The vapor is highly discomforting to the skin.

The material may cause skin irritation after prolonged or repeated exposure and may produce a contact dermatitis (nonallergic). This form of dermatitis is often characterized by skin redness (erythema) and swelling (edema) which may progress to vesiculation, scaling and thickening of the epidermis. Histologically there may be intercellular edema of the spongy layer (spongiosis) and intracellular edema of the epidermis.

Skin contact causes yellow discoloration of the skin, blisters and scars that may not heal. The skin may be stained bright-yellow or yellowish brown due to the formation of xanthoproteic acid. Dilute solutions may harden the epithelium without producing overt corrosion.

Ingestion: Considered an unlikely route of entry in commercial/industrial environments.

The material is extremely corrosive if swallowed and is capable of causing burns to mouth, throat, esophagus, with extreme discomfort, pain and may be fatal.

Even a small amount causes severe corrosion of the stomach, burning pain, vomiting and shock, possibly causing non-healing scarring of the gastrointestinal tract and stomach. Death may be delayed 12 hours to 14 days or to several months. Such late fatalities are attributed to a chemical lobular pneumonitis secondary to aspiration. Survivors show stricture of the gastric mucosa and subsequent pernicious anemia.

Carcinogenicity: NTP - Not listed; IARC - Not listed; OSHA - Not listed; NIOSH - Not listed; ACGIH - Not listed; EPA - Not listed; MAK - Not listed.

Chronic Effects: Prolonged or repeated overexposure to low concentrations of vapor may cause chronic bronchitis, corrosion of teeth, even chemical pneumonitis.

Section 4 - First Aid Measures

Inhalation: Remove to fresh air.

Lay patient down. Keep warm and rested.

If available, administer medical oxygen by trained personnel.

If breathing is shallow or has stopped, ensure clear airway and apply resuscitation. Transport to hospital or doctor, without delay.

Eye Contact: Immediately hold the eyes open and flush continuously for at least 15 minutes with fresh running water. Ensure irrigation under eyelids by occasionally lifting the upper and lower lids.

Transport to hospital or doctor without delay. Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.

Immediately transport to hospital or doctor. DO NOT delay.

Skin Contact: Immediately flush body and clothes with large amounts of water, using safety shower if available.

Quickly remove all contaminated clothing, including footwear.

Wash affected areas with water (and soap if available) for at least 15 minutes. Transport to hospital or doctor. DO NOT delay.

Ingestion: Contact a Poison Control Center.

Do NOT induce vomiting. Give a glass of water.

Immediately transport to hospital or doctor. DO NOT delay.

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After first aid, get appropriate in-plant, paramedic, or community medical support.

Note to Physicians: For acute or short-term repeated exposures to strong acids:

1. Airway problems may arise from laryngeal edema and inhalation exposure. Treat with 100% oxygen initially.
2. Respiratory distress may require cricothyroidotomy if endotracheal intubation is contraindicated by excessive swelling.
3. Intravenous lines should be established immediately in all cases where there is evidence of circulatory compromise.
4. Strong acids produce a coagulation necrosis characterized by formation of a coagulum (eschar) as a result of the desiccating action of the acid on proteins in specific tissues.

INGESTION:

1. Immediate dilution (milk or water) within 30 minutes post-ingestion is recommended.
2. Do not attempt to neutralize the acid since exothermic reaction may extend the corrosive injury.
3. Be careful to avoid further vomiting since re-exposure of the mucosa to the acid is harmful. Limit fluids to one or two glasses in an adult.
4. Charcoal has no place in acid management.
5. Some authors suggest the use of lavage within 1 hour of ingestion.

SKIN:

1. Skin lesions require copious saline irrigation. Treat chemical burns as thermal burns with non-adherent gauze and wrapping.
2. Deep second-degree burns may benefit from topical silver sulfadiazine.

EYE:

1. Eye injuries require retraction of the eyelids to ensure thorough irrigation of the conjunctival cul-de-sacs. Irrigation should last at least 20-30 minutes. Do not use neutralizing agents or any other additives. Several liters of saline are required.
2. Cycloplegic drops (1% cyclopentolate for short-term use or 5% homatropine for longer term use), antibiotic drops, vasoconstrictive agents, or artificial tears may be indicated dependent on the severity of the injury.
3. Steroid eye drops should only be administered with the approval of a consulting ophthalmologist.

Section 5 - Fire-Fighting Measures

Flash Point: Nonflammable

Autoignition Temperature: Not applicable

LEL: Not applicable

UEL: Not applicable

Extinguishing Media: Water spray or fog; foam, dry chemical powder, or BCF (where regulations permit).
Carbon dioxide.

General Fire Hazards/Hazardous Combustion Products: Will not burn but increases intensity of fire.

Heating may cause expansion or decomposition leading to violent rupture of containers.

Heat affected containers remain hazardous.

Contact with combustibles such as wood, paper, oil or finely divided metal may cause ignition, combustion or violent decomposition.

May emit irritating, poisonous or corrosive fumes.

Decomposes on heating and produces toxic fumes of nitrogen oxides (NO_x) and nitric acid.

Fire Incompatibility: Oxidizing agents as a class are not necessarily combustible themselves, but can increase the risk and intensity of fire in many other substances.

Reacts vigorously with water and alkali.

Avoid reaction with organic materials/compounds, powdered metals, reducing agents and hydrogen sulfide (H₂S) as ignition may result.

Reacts with metals producing flammable/explosive hydrogen gas.

Fire-Fighting Instructions: Contact fire department and tell them location and nature of hazard.

May be violently or explosively reactive. Wear full body protective clothing with breathing apparatus. Prevent, by any means available, spillage from entering drains or waterways. Consider evacuation.

Fight fire from a safe distance, with adequate cover.

Extinguishers should be used only by trained personnel.

Use water delivered as a fine spray to control fire and cool adjacent area.

Avoid spraying water onto liquid pools.

Do not approach containers suspected to be hot.

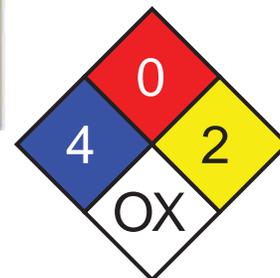
Cool fire-exposed containers with water spray from a protected location.

If safe to do so, remove containers from path of fire.

If fire gets out of control withdraw personnel and warn against entry.

Equipment should be thoroughly decontaminated after use.

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Section 6 - Accidental Release Measures

Small Spills: Dangerous levels of nitrogen oxides may form during spills of nitric acid.

Wear fully protective PVC clothing and breathing apparatus.

Clean up all spills immediately. No smoking, bare lights, ignition sources.

Avoid all contact with any organic matter including fuel, solvents, sawdust, paper or cloth and other incompatible materials, as ignition may result.

Avoid breathing dust or vapors and all contact with skin and eyes.

Control personal contact by using protective equipment.

Contain and absorb spill with dry sand, earth, inert material or vermiculite. DO NOT use sawdust as fire may result.

Scoop up solid residues and seal in labeled drums for disposal.

Neutralize/decontaminate area.

Use soda ash or slaked lime to neutralize.

Large Spills: DO NOT touch the spill material. Restrict access to area.

Clear area of personnel and move upwind. Contact fire department and tell them location and nature of hazard.

May be violently or explosively reactive. Wear full body protective clothing with breathing apparatus. Prevent, by any means available, spillage from entering drains or waterways. Consider evacuation.

No smoking, flames or ignition sources. Increase ventilation.

Contain spill with sand, earth or other clean, inert materials.

NEVER use organic absorbents such as sawdust, paper, cloth; as fire may result. Avoid any contamination by organic matter.

Use spark-free and explosion-proof equipment.

Collect any recoverable product into labeled containers for possible recycling. DO NOT mix fresh with recovered material.

Collect residues and seal in labeled drums for disposal.

Wash area and prevent runoff into drains. Decontaminate equipment and launder all protective clothing before storage and reuse.

If contamination of drains or waterways occurs advise emergency services.

DO NOT USE WATER OR NEUTRALIZING AGENTS INDISCRIMINATELY ON LARGE SPILLS.

Regulatory Requirements: Follow applicable OSHA regulations (29 CFR 1910.120).



Section 7 - Handling and Storage

Handling Precautions: Avoid generating and breathing mist. Do not allow clothing wet with material to stay in contact with skin.

Avoid all personal contact, including inhalation.

Wear protective clothing when risk of exposure occurs.

Use in a well-ventilated area.

WARNING: To avoid violent reaction, ALWAYS add material to water and NEVER water to material.

Avoid smoking, bare lights or ignition sources.

Avoid contact with incompatible materials.

When handling, DO NOT eat, drink or smoke.

Keep containers securely sealed when not in use. Avoid physical damage to containers. Always wash hands with soap and water after handling. Work clothes should be laundered separately.

Launder contaminated clothing before reuse.

Use good occupational work practices. Observe manufacturer's storing and handling recommendations. Atmosphere should be regularly checked against established exposure standards to ensure safe working conditions are maintained.

Recommended Storage Methods: Stainless steel drum. Check that containers are clearly labeled.

Packaging as recommended by manufacturer.

Regulatory Requirements: Follow applicable OSHA regulations.

Section 8 - Exposure Controls / Personal Protection

Engineering Controls: Use in a well-ventilated area.

Local exhaust ventilation may be required for safe working, i. e. , to keep exposures below required standards; otherwise, PPE is required.

If risk of overexposure exists, wear NIOSH-approved respirator.

Correct fit is essential to obtain adequate protection.

In confined spaces where there is inadequate ventilation, wear full-face air supplied breathing apparatus.

Personal Protective Clothing/Equipment:

Eyes: Chemical goggles. Full face shield.

DO NOT wear contact lenses. Contact lenses pose a special hazard; soft contact lenses may absorb irritants and all lenses concentrate them.

Hands/Feet: Bare unprotected skin should not be exposed to this material. Impervious, gauntlet length gloves i.e., butyl rubber gloves or Neoprene rubber gloves or wear chemical protective gloves, e.g. PVC.

Wear safety footwear or safety gumboots, e.g. Rubber.

Respiratory Protection:

Exposure Range >2 to <25 ppm: Supplied Air, Constant Flow/Pressure Demand, Half Mask

Exposure Range 25 to unlimited ppm: Self-contained Breathing Apparatus, Pressure Demand, Full Face

Other: Operators should be trained in procedures for safe use of this material.

Acid-resistant overalls or Rubber apron or PVC apron.

Ensure there is ready access to an emergency shower.

Ensure that there is ready access to eye wash unit.

Ensure that there is ready access to breathing apparatus.

Glove Selection Index:

BUTYL Best selection

HYPALON Best selection

NEOPRENE..... Best selection

NEOPRENE/NATURAL..... Best selection

PE/EVAL/PE Best selection

SARANEX-23 Best selection

NATURAL RUBBER..... Satisfactory; may degrade after 4 hours continuous immersion

NATURAL+NEOPRENE..... Satisfactory; may degrade after 4 hours continuous immersion

PVC..... Poor to dangerous choice for other than short-term immersion

NITRILE+PVC Poor to dangerous choice for other than short-term immersion

Section 9 - Physical and Chemical Properties

Appearance/General Info: Clear, colorless to slightly yellow liquid. Sharp strong odor.

CAUTION: exothermic dilution hazard.

HIGHLY CORROSIVE. Corrosive to most metals. Powerful oxidizing agent.

Darkens to brownish color on aging and exposure to light.

Physical State: Liquid

Odor Threshold: 0.75 to 2.50 mg/m³

Vapor Pressure (kPa): 8.26

Vapor Density (Air=1): 1.5

Formula Weight: 63.02

Specific Gravity (H₂O=1, at 4 °C): 1.3-1.42

pH: < 1

pH (1% Solution): 1

Boiling Point: 83 °C (181 °F) at 760 mm Hg

Freezing/Melting Point: -42 °C (-43.6 °F)

Volatile Component (% Vol): 100 (nominal)

Decomposition Temperature (°C): Not applicable

Water Solubility: Soluble in all proportions

Section 10 - Stability and Reactivity

Stability/Polymerization/Conditions to Avoid: Presence of heat source and direct sunlight. Storage in unsealed containers. Hazardous polymerization will not occur.

Storage Incompatibilities: Segregate from reducing agents, finely divided combustible materials, combustible materials, sawdust, metals and powdered metals.

Avoid contamination of water, foodstuffs, feed or seed.

Segregate from alkalis, oxidizing agents and chemicals readily decomposed by acids, i.e. cyanides, sulfides, carbonates.

Section 11 - Toxicological Information

Toxicity

Oral (human) LD₅₀: 430 mg/kg

Inhalation (rat) LC₅₀: 2500 ppm/1 hr

Unreported (man) LD₅₀: 110 mg/kg

Irritation

Nil reported

See RTECS QU 5775000, for additional data.

Section 12 - Ecological Information

Environmental Fate: No data found.

Ecotoxicity: LC₅₀ Starfish 100-300 mg/l/48 hr /Aerated water conditions; LC₅₀ Shore crab 180 mg/l/48 hr /Static, aerated water conditions; LC₅₀ Cockle 330-1000 mg/l/48 hr /Aerated water conditions

BCF: no food chain concentration potential

Biochemical Oxygen Demand (BOD): none

Section 13 - Disposal Considerations

Disposal: Recycle wherever possible. Special hazards may exist - specialist advice may be required.
 Consult manufacturer for recycling options.
 Follow applicable federal, state, and local regulations.
 Treat and neutralize at an approved treatment plant.
 Decontaminate empty containers. Observe all label safeguards until containers are cleaned and destroyed.
 Puncture containers to prevent reuse and bury at an authorized landfill.

Section 14 - Transport Information

DOT Hazardous Materials Table Data (49 CFR 172.101):

Note: This material has multiple possible HMT entries. Choose the appropriate one based on state and condition of specific material when shipped.

Shipping Name and Description: Nitric acid *other than red fuming, with more than 70 percent nitric acid*

ID: UN2031

Hazard Class: 8 - Corrosive material

Packing Group: I - Great Danger

Symbols:

Label Codes: 8 - Corrosive, 5.1 - Oxidizer

Special Provisions: B47, B53, T10, TP2, TP12, TP13

Packaging: **Exceptions:** None **Non-bulk:** 158 **Bulk:** 243

Quantity Limitations: **Passenger aircraft/rail:** Forbidden **Cargo aircraft only:** 2.5 L

Vessel Stowage: **Location:** D **Other:** 44, 66, 89, 90, 110, 111



Shipping Name and Description: Nitric acid *other than red fuming, with not more than 70 percent nitric acid*

ID: UN2031

Hazard Class: 8 - Corrosive material

Packing Group: II - Medium Danger

Symbols:

Label Codes: 8 - Corrosive

Special Provisions: B2, B47, B53, IB2, T8, TP2, TP12

Packaging: **Exceptions:** None **Non-bulk:** 158 **Bulk:** 242

Quantity Limitations: **Passenger aircraft/rail:** Forbidden **Cargo aircraft only:** 30 L

Vessel Stowage: **Location:** D **Other:**



Shipping Name and Description: Nitric acid, red fuming

ID: UN2032

Hazard Class: 8 - Corrosive material

Packing Group: I - Great Danger

Symbols: + - Override definitions

Label Codes: 8 - Corrosive, 5.1 - Oxidizer, 6.1 - Poison *or* Poison Inhalation Hazard *if inhalation hazard, Zone A or B*

Special Provisions: 2, B9, B32, B74, T20, TP2, TP12, TP13, TP38, TP45

Packaging: **Exceptions:** None **Non-bulk:** 227 **Bulk:** 244

Quantity Limitations: **Passenger aircraft/rail:** Forbidden **Cargo aircraft only:** Forbidden

Vessel Stowage: **Location:** D **Other:**



Section 15 - Regulatory Information

EPA Regulations:

RCRA 40 CFR: Not listed

CERCLA 40 CFR 302.4: Listed per CWA Section 311(b)(4) 1000 lb (453.5 kg)

SARA 40 CFR 372.65: Listed

SARA EHS 40 CFR 355: Listed

RQ: 1000 lb

TPQ: 1000 lb

TSCA: Listed

Section 16 - Other Information

Disclaimer: Judgments as to the suitability of information herein for the purchaser's purposes are necessarily the purchaser's responsibility. Although reasonable care has been taken in the preparation of such information, Genium Group, Inc. extends no warranties, makes no representations, and assumes no responsibility as to the accuracy or suitability of such information for application to the purchaser's intended purpose or for consequences of its use.



Material Safety Data Sheet

The Dow Chemical Company

Product Name: DOWANOL™ PPH Glycol Ether

Issue Date: 02/11/2013

Print Date: 12 Feb 2013

The Dow Chemical Company encourages and expects you to read and understand the entire (M)SDS, as there is important information throughout the document. We expect you to follow the precautions identified in this document unless your use conditions would necessitate other appropriate methods or actions.

1. Product and Company Identification

Product Name

DOWANOL™ PPH Glycol Ether

COMPANY IDENTIFICATION

The Dow Chemical Company
2030 Willard H. Dow Center
Midland, MI 48674
United States

Customer Information Number:

800-258-2436

EMERGENCY TELEPHONE NUMBER

24-Hour Emergency Contact:

989-636-4400

Local Emergency Contact:

989-636-4400

2. Hazards Identification

Emergency Overview

Color: colourless

Physical State: Liquid.

Odor: Very slight

Hazards of product:

WARNING! Causes eye irritation. Isolate area.

OSHA Hazard Communication Standard

This product is a "Hazardous Chemical" as defined by the OSHA Hazard Communication Standard, 29 CFR 1910.1200.

Potential Health Effects

Eye Contact: May cause severe eye irritation. May cause slight corneal injury.

Skin Contact: Prolonged contact may cause slight skin irritation with local redness.

Skin Absorption: Prolonged skin contact is unlikely to result in absorption of harmful amounts.

Inhalation: At room temperature, vapors are minimal due to low volatility. Vapor from heated material or mist may be hazardous on single exposure. For respiratory irritation and narcotic effects: No relevant data found.

®(TM)*Trademark

Ingestion: Low toxicity if swallowed. Small amounts swallowed incidentally as a result of normal handling operations are not likely to cause injury; however, swallowing larger amounts may cause injury.

Aspiration hazard: Based on physical properties, not likely to be an aspiration hazard.

Birth Defects/Developmental Effects: Has caused birth defects in laboratory animals only at doses toxic to the mother.

3. Composition Information

Component	CAS #	Amount
Propylene glycol phenyl ether	770-35-4	> 99.5 %

4. First-aid measures

Description of first aid measures

General advice: First Aid responders should pay attention to self-protection and use the recommended protective clothing (chemical resistant gloves, splash protection). If potential for exposure exists refer to Section 8 for specific personal protective equipment.

Inhalation: Move person to fresh air; if effects occur, consult a physician.

Skin Contact: Wash skin with plenty of water.

Eye Contact: Immediately flush eyes with water; remove contact lenses, if present, after the first 5 minutes, then continue flushing eyes for at least 15 minutes. Obtain medical attention without delay, preferably from an ophthalmologist. Suitable emergency eye wash facility should be immediately available.

Ingestion: If swallowed, seek medical attention. Do not induce vomiting unless directed to do so by medical personnel.

Most important symptoms and effects, both acute and delayed

Aside from the information found under Description of first aid measures (above) and Indication of immediate medical attention and special treatment needed (below), no additional symptoms and effects are anticipated.

Indication of immediate medical attention and special treatment needed

No specific antidote. Treatment of exposure should be directed at the control of symptoms and the clinical condition of the patient.

5. Fire Fighting Measures

Suitable extinguishing media

Water fog or fine spray. Dry chemical fire extinguishers. Carbon dioxide fire extinguishers. Foam. Alcohol resistant foams (ATC type) are preferred. General purpose synthetic foams (including AFFF) or protein foams may function, but will be less effective. Water fog, applied gently may be used as a blanket for fire extinguishment.

Extinguishing Media to Avoid: Do not use direct water stream. May spread fire.

Special hazards arising from the substance or mixture

Hazardous Combustion Products: During a fire, smoke may contain the original material in addition to combustion products of varying composition which may be toxic and/or irritating. Combustion products may include and are not limited to: Carbon monoxide. Carbon dioxide.

Unusual Fire and Explosion Hazards: Violent steam generation or eruption may occur upon application of direct water stream to hot liquids.

Advice for firefighters

Fire Fighting Procedures: Keep people away. Isolate fire and deny unnecessary entry. Do not use direct water stream. May spread fire. Burning liquids may be moved by flushing with water to protect personnel and minimize property damage. Water fog, applied gently may be used as a blanket for fire extinguishment.

Special Protective Equipment for Firefighters: Wear positive-pressure self-contained breathing apparatus (SCBA) and protective fire fighting clothing (includes fire fighting helmet, coat, trousers, boots, and gloves). If protective equipment is not available or not used, fight fire from a protected location or safe distance.

6. Accidental Release Measures

Personal precautions, protective equipment and emergency procedures: Isolate area. Keep unnecessary and unprotected personnel from entering the area. Use appropriate safety equipment. For additional information, refer to Section 8, Exposure Controls and Personal Protection. Refer to Section 7, Handling, for additional precautionary measures.

Environmental precautions: Prevent from entering into soil, ditches, sewers, waterways and/or groundwater. See Section 12, Ecological Information.

Methods and materials for containment and cleaning up: Small spills: Absorb with materials such as: Sand. Vermiculite. Collect in suitable and properly labeled containers. Large spills: Contain spilled material if possible. Pump into suitable and properly labeled containers. See Section 13, Disposal Considerations, for additional information.

7. Handling and Storage

Handling

General Handling: Do not get in eyes. Avoid contact with skin and clothing. Wash thoroughly after handling. Keep container closed. Use with adequate ventilation. See Section 8, EXPOSURE CONTROLS AND PERSONAL PROTECTION.

Other Precautions: Spills of these organic materials on hot fibrous insulations may lead to lowering of the autoignition temperatures possibly resulting in spontaneous combustion.

Storage

Store in the following material(s): Carbon steel. Stainless steel. Phenolic lined steel drums. Do not store in: Aluminum. Copper. Galvanized iron. Galvanized steel.

Shelf life: Use within, Metal drums. 24 Months

Bulk 6 Months

8. Exposure Controls / Personal Protection

Exposure Limits

None established

Personal Protection

Eye/Face Protection: Use chemical goggles.

Skin Protection: Wear clean, body-covering clothing.

Hand protection: Use gloves chemically resistant to this material when prolonged or frequently repeated contact could occur. Examples of preferred glove barrier materials

include: Butyl rubber. Ethyl vinyl alcohol laminate ("EVAL"). Examples of acceptable glove barrier materials include: Natural rubber ("latex"). Neoprene. Nitrile/butadiene rubber ("nitrile" or "NBR"). Polyvinyl chloride ("PVC" or "vinyl"). NOTICE: The selection of a specific glove for a particular application and duration of use in a workplace should also take into account all relevant workplace factors such as, but not limited to: Other chemicals which may be handled, physical requirements (cut/puncture protection, dexterity, thermal protection), potential body reactions to glove materials, as well as the instructions/specifications provided by the glove supplier.

Respiratory Protection: Respiratory protection should be worn when there is a potential to exceed the exposure limit requirements or guidelines. If there are no applicable exposure limit requirements or guidelines, wear respiratory protection when adverse effects, such as respiratory irritation or discomfort have been experienced, or where indicated by your risk assessment process. Use an approved air-purifying respirator when vapors are generated at increased temperatures or when dust or mist is present. The following should be effective types of air-purifying respirators: Organic vapor cartridge with a particulate pre-filter.

Ingestion: Use good personal hygiene. Do not consume or store food in the work area. Wash hands before smoking or eating.

Engineering Controls

Ventilation: Use local exhaust ventilation, or other engineering controls to maintain airborne levels below exposure limit requirements or guidelines. If there are no applicable exposure limit requirements or guidelines, general ventilation should be sufficient for most operations. Local exhaust ventilation may be necessary for some operations.

9. Physical and Chemical Properties

Appearance

Physical State	Liquid.
Color	colourless
Odor	Very slight
Odor Threshold	No test data available
pH	No test data available
Melting Point	11 °C (52 °F) <i>Literature</i>
Freezing Point	11 °C (52 °F) <i>Literature</i>
Boiling Point (760 mmHg)	241.2 °C (466.2 °F) <i>Literature</i> .
Flash Point - Closed Cup	115 °C (239 °F) <i>Literature</i>
Evaporation Rate (Butyl Acetate = 1)	No test data available
Flammability (solid, gas)	No
Flammable Limits In Air	Lower: 0.8 %(V) <i>Literature</i> Upper: Not determined
Vapor Pressure	0.01 hPa @ 20 °C <i>Literature</i>
Vapor Density (air = 1)	5.27 <i>Literature</i>
Specific Gravity (H2O = 1)	1.060 20 °C/20 °C <i>ASTM D4052</i>
Solubility in water (by weight)	15.1 g/l @ 20 °C <i>Literature</i>
Partition coefficient, n-octanol/water (log Pow)	1.41 <i>Measured</i>
Autoignition Temperature	1,013 hPa 480 °C (896 °F) <i>Literature</i>
Decomposition Temperature	No test data available
Dynamic Viscosity	22.7 mPa.s @ 25 °C <i>Literature</i>
Kinematic Viscosity	21.4 mm ² /s <i>Literature</i>
Explosive properties	Not explosive
Oxidizing properties	No
Liquid Density	8.83 lb/gal @ 25 °C <i>Literature</i>
Molecular Weight	No test data available
Surface tension	67.8 mN/m @ 20 °C <i>Literature</i>

Henry's Law Constant (H) 4.41E-07 atm*m³/mole; 25 °C Estimated.

10. Stability and Reactivity

Reactivity

No dangerous reaction known under conditions of normal use.

Chemical stability

|| Thermally stable at typical use temperatures.

Possibility of hazardous reactions

|| Polymerization will not occur.

|| **Conditions to Avoid:** Do not distill to dryness. Product can oxidize at elevated temperatures.

|| **Incompatible Materials:** Avoid contact with: Strong acids. Strong bases. Strong oxidizers.

Hazardous decomposition products

|| Decomposition products depend upon temperature, air supply and the presence of other materials.
|| Decomposition products can include and are not limited to: Aldehydes. Ketones. Organic acids.

11. Toxicological Information

Acute Toxicity

Ingestion

|| LD50, rat > 2,000 mg/kg

Dermal

|| LD50, rat > 2,000 mg/kg

Inhalation

|| No deaths occurred following exposure to a saturated atmosphere. , 4 h, Aerosol, rat 5.4 mg/l

Eye damage/eye irritation

|| May cause severe eye irritation. May cause slight corneal injury.

Skin corrosion/irritation

|| Prolonged contact may cause slight skin irritation with local redness.

Sensitization

Skin

|| Did not cause allergic skin reactions when tested in guinea pigs.

Respiratory

|| No relevant data found.

Repeated Dose Toxicity

|| Based on available data, repeated exposures are not anticipated to cause additional significant adverse effects.

Chronic Toxicity and Carcinogenicity

|| No relevant data found.

Developmental Toxicity

|| Has caused birth defects in laboratory animals only at doses toxic to the mother.

Reproductive Toxicity

|| In animal studies, did not interfere with reproduction.

Genetic Toxicology

|| In vitro genetic toxicity studies were negative. Animal genetic toxicity studies were predominantly negative.

12. Ecological Information

Toxicity

Material is practically non-toxic to aquatic organisms on an acute basis (LC50/EC50/EL50/LL50 >100 mg/L in the most sensitive species tested).

Fish Acute & Prolonged Toxicity

LC50, Pimephales promelas (fathead minnow), static test, 96 h: 280 mg/l

Aquatic Invertebrate Acute Toxicity

LC50, Daphnia magna (Water flea), static test, 48 h, survival: 370 mg/l

Aquatic Plant Toxicity

EC50, Desmodesmus subspicatus (green algae), static test, Growth rate inhibition, 72 h: > 100 mg/l

Persistence and Degradability

Material is readily biodegradable. Passes OECD test(s) for ready biodegradability. Biodegradation rate may increase in soil and/or water with acclimation.

OECD Biodegradation Tests:

Biodegradation	Exposure Time	Method	10 Day Window
72 %	28 d	OECD 301F Test	fail

Indirect Photodegradation with OH Radicals

Rate Constant	Atmospheric Half-life	Method
3.72E-11 cm ³ /s	3.5 h	Estimated.

Theoretical Oxygen Demand: 2.31 mg/mg

Bioaccumulative potential

Bioaccumulation: Bioconcentration potential is low (BCF < 100 or Log Pow < 3).

Partition coefficient, n-octanol/water (log Pow): 1.41 Measured

Mobility in soil

Mobility in soil: Potential for mobility in soil is very high (Koc between 0 and 50).

Partition coefficient, soil organic carbon/water (Koc): 19 - 21 Estimated.

Henry's Law Constant (H): 4.41E-07 atm*m³/mole; 25 °C Estimated.

13. Disposal Considerations

DO NOT DUMP INTO ANY SEWERS, ON THE GROUND, OR INTO ANY BODY OF WATER. All disposal practices must be in compliance with all Federal, State/Provincial and local laws and regulations. Regulations may vary in different locations. Waste characterizations and compliance with applicable laws are the responsibility solely of the waste generator. AS YOUR SUPPLIER, WE HAVE NO CONTROL OVER THE MANAGEMENT PRACTICES OR MANUFACTURING PROCESSES OF PARTIES HANDLING OR USING THIS MATERIAL. THE INFORMATION PRESENTED HERE PERTAINS ONLY TO THE PRODUCT AS SHIPPED IN ITS INTENDED CONDITION AS DESCRIBED IN MSDS SECTION: Composition Information. FOR UNUSED & UNCONTAMINATED PRODUCT, the preferred options include sending to a licensed, permitted: Incinerator or other thermal destruction device.

14. Transport Information

DOT Non-Bulk

NOT REGULATED

DOT Bulk

NOT REGULATED

IMDG

NOT REGULATED

ICAO/IATA

NOT REGULATED

This information is not intended to convey all specific regulatory or operational requirements/information relating to this product. Additional transportation system information can be obtained through an authorized sales or customer service representative. It is the responsibility of the transporting organization to follow all applicable laws, regulations and rules relating to the transportation of the material.

15. Regulatory Information**OSHA Hazard Communication Standard**

This product is a "Hazardous Chemical" as defined by the OSHA Hazard Communication Standard, 29 CFR 1910.1200.

Superfund Amendments and Reauthorization Act of 1986 Title III (Emergency Planning and Community Right-to-Know Act of 1986) Sections 311 and 312

Immediate (Acute) Health Hazard	Yes
Delayed (Chronic) Health Hazard	No
Fire Hazard	No
Reactive Hazard	No
Sudden Release of Pressure Hazard	No

Superfund Amendments and Reauthorization Act of 1986 Title III (Emergency Planning and Community Right-to-Know Act of 1986) Section 313

To the best of our knowledge, this product does not contain chemicals at levels which require reporting under this statute.

Pennsylvania (Worker and Community Right-To-Know Act): Pennsylvania Hazardous Substances List and/or Pennsylvania Environmental Hazardous Substance List:

To the best of our knowledge, this product does not contain chemicals at levels which require reporting under this statute.

Pennsylvania (Worker and Community Right-To-Know Act): Pennsylvania Special Hazardous Substances List:

To the best of our knowledge, this product does not contain chemicals at levels which require reporting under this statute.

California Proposition 65 (Safe Drinking Water and Toxic Enforcement Act of 1986)

This product contains no listed substances known to the State of California to cause cancer, birth defects or other reproductive harm, at levels which would require a warning under the statute.

US. Toxic Substances Control Act

All components of this product are on the TSCA Inventory or are exempt from TSCA Inventory requirements under 40 CFR 720.30

CEPA - Domestic Substances List (DSL)

All substances contained in this product are listed on the Canadian Domestic Substances List (DSL) or are not required to be listed.

16. Other Information

Product Literature

Additional information on this product may be obtained by calling your sales or customer service contact. Ask for a product brochure.

Hazard Rating System

NFPA	Health	Fire	Reactivity
	1	1	0

Recommended Uses and Restrictions

Identified uses

Solvent for consumer and industrial applications.

Revision

Identification Number: 82587 / 0000 / Issue Date 02/11/2013 / Version: 3.0

Most recent revision(s) are noted by the bold, double bars in left-hand margin throughout this document.

Legend

N/A	Not available
W/W	Weight/Weight
OEL	Occupational Exposure Limit
STEL	Short Term Exposure Limit
TWA	Time Weighted Average
ACGIH	American Conference of Governmental Industrial Hygienists, Inc.
DOW IHG	Dow Industrial Hygiene Guideline
WEEL	Workplace Environmental Exposure Level
HAZ_DES	Hazard Designation
Action Level	A value set by OSHA that is lower than the PEL which will trigger the need for activities such as exposure monitoring and medical surveillance if exceeded.

The Dow Chemical Company urges each customer or recipient of this (M)SDS to study it carefully and consult appropriate expertise, as necessary or appropriate, to become aware of and understand the data contained in this (M)SDS and any hazards associated with the product. The information herein is provided in good faith and believed to be accurate as of the effective date shown above. 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 his activities comply with all federal, state, provincial or local laws. The information presented here pertains only to the product as shipped. Since conditions for use of the product are not under the control of the manufacturer, it is the buyer's/user's duty to determine the conditions necessary for the safe use of this product. Due to the proliferation of sources for information such as manufacturer-specific (M)SDSs, we are not and cannot be responsible for (M)SDSs obtained from any source other than ourselves. If you have obtained an (M)SDS from another source or if you are not sure that the (M)SDS you have is current, please contact us for the most current version.

Section 1 - Chemical Product and Company Identification

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Material Name: Sulfuric Acid **CAS Number:** 7664-93-9
Chemical Formula: H₂O₄S
Structural Chemical Formula: H₂SO₄
EINECS Number: 231-639-5
ACX Number: X1002217-4
Synonyms: ACIDE SULFURIQUE; ACIDO SOLFORICO; ACIDO SULFURICO; BATTERY ACID; BOV; DIHYDROGEN SULFATE; DIPPING ACID; ELECTROLYTE ACID; EPA PESTICIDE CHEMICAL CODE 078001; HYDROGEN SULFATE; MATTLING ACID; OIL OF VITRIOL; SCHWEFELSAEURELOESUNGEN; SULFURIC ACID; SULFURIC ACID (AQUEOUS); SULFURIC ACID, SPENT; SULPHURIC ACID; VITRIOL BROWN OIL; ZWAVELZUROPLOSSINGEN
General Use: The manufacture of superphosphate fertilizer, inorganic and petro-chemicals, explosives and pigments. Component of heavy duty metal cleaners, pickles. In manufacture of rayon, cellulose film. As battery electrolyte and also in electroplating processes.

Section 2 - Composition / Information on Ingredients

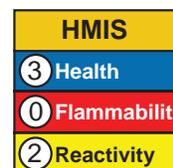
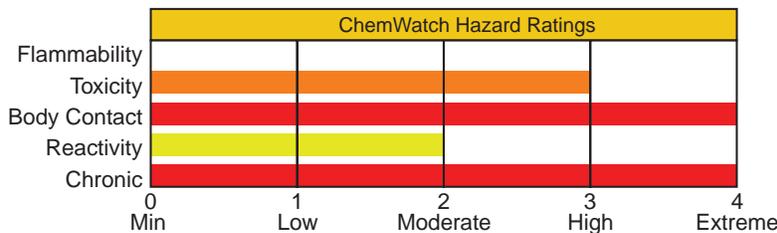
Name	CAS	%
sulfuric acid	7664-93-9	>51
water	7732-18-5	remainder

OSHA PEL TWA: 1 mg/m ³ .	NIOSH REL TWA: 1 mg/m ³ .	DFG (Germany) MAK TWA: 0.1 mg/m ³ ; PEAK: 0.1 mg/m ³ ; Ceiling: 0.2 mg/m ³ ; measured as inhalable fraction of the aerosol.
ACGIH TLV TWA: 1 mg/m ³ ; STEL: 3 mg/m ³ ; A2 = as contained in strong inorganic acid mists.	IDLH Level 15 mg/m ³ .	

Section 3 - Hazards Identification



Fire Diamond



ANSI Signal Word
Danger!



☆☆☆☆☆ **Emergency Overview** ☆☆☆☆☆

Colorless to dark-brown, oily, odorless liquid. Corrosive. Other Acute Effects: blindness. Chronic Effects: tooth erosion, GI disturbances, dermatitis. Reaction with water produces excessive heat.

Potential Health Effects

Target Organs: respiratory system, eyes, skin, teeth
Primary Entry Routes: inhalation, skin contact, eye contact
Acute Effects
Inhalation: The vapor is extremely discomforting to the upper respiratory tract and is capable of causing severe mucous membrane irritation, upper respiratory tract inflammation. Exposure to high concentrations causes bronchitis and is characterized by the onset of hemorrhagic pulmonary edema.

Mists are highly irritating to eyes, mucous membranes and respiratory tract and high mist concentrations may lead to pulmonary edema.

Eye: HIGHLY CORROSIVE The liquid is extremely corrosive to the eyes and any contact may cause rapid tissue destruction and is capable of causing severe damage with loss of sight.

The mist is highly corrosive and contact may cause rapid tissue destruction.

The vapor is extremely discomforting to the eyes.

The material may produce severe irritation to the eye causing pronounced inflammation. Repeated or prolonged exposure to irritants may produce conjunctivitis.

Skin: HIGHLY CORROSIVE. The liquid is extremely corrosive to the skin and any contact may cause rapid tissue destruction with severe burns.

The mist is highly discomforting to the skin and may cause deep ulceration to body tissue.

Topical application of a 10% solution to skin on the scapula or waist produces only negligible evidence of irritation.

Ingestion: HIGHLY CORROSIVE and Considered toxic by all exposure routes.

The liquid is extremely corrosive and may rapidly cause severe burns to the gastrointestinal tract and may be fatal if swallowed in quantity.

Considered an unlikely route of entry in commercial/industrial environments.

Carcinogenicity: NTP - Not listed; IARC - Group 1, Carcinogenic to humans; OSHA - Not listed; NIOSH - Not listed; ACGIH - Class A2, Suspected human carcinogen; EPA - Not listed; MAK - Not listed.

Chronic Effects: Repeated minor exposure to mists can cause erosion of teeth and inflammation of the upper respiratory tract leading to chronic bronchitis.

Repeated skin contact with dilute solutions may cause dermatitis.

Lungs of sulfuric acid plant workers appear to be less affected than the lungs of workers exposed to "dust".

There is evidence that the corrosion of tooth enamel occurs at 1 mg/m³ but that acclimatized workers could tolerate three to four times that level. Forming room workers in a battery factory exposed to 3 to 16 mg/m³ sulfuric acid mist concentrations exhibited the most serious signs of erosion whilst charging room workers exposed to 0.08 to 2.5 mg/m³ were affected to a lesser degree.

Workers chronically exposed to sulfuric acid mists may show various skin lesions, tracheobronchitis, stomatitis, conjunctivitis and gastritis.

Increased risk of laryngeal cancer is associated with chronic exposures.

Section 4 - First Aid Measures

Inhalation: Remove to fresh air.

Lay patient down. Keep warm and rested.

If available, administer medical oxygen by trained personnel.

If breathing is shallow or has stopped, ensure clear airway and apply resuscitation. Transport to hospital or doctor, without delay.

See
DOT
ERG

Eye Contact: Immediately hold the eyes open and flush continuously for at least 15 minutes with fresh running water. Ensure irrigation under eyelids by occasionally lifting the upper and lower lids.

Transport to hospital or doctor without delay. Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.

Skin Contact: Immediately flush body and clothes with large amounts of water, using safety shower if available.

Quickly remove all contaminated clothing, including footwear.

Wash affected areas with water (and soap if available) for at least 15 minutes. Transport to hospital or doctor.

DO NOT attempt to neutralize burns with alkaline solutions.

Ingestion: Rinse mouth out with plenty of water.

Contact a Poison Control Center.

Do NOT induce vomiting. Give a glass of water.

After first aid, get appropriate in-plant, paramedic, or community medical support.

Note to Physicians: For acute or short-term repeated exposures to strong acids:

1. Airway problems may arise from laryngeal edema and inhalation exposure.

Treat with 100% oxygen initially.

2. Respiratory distress may require cricothyroidotomy if endotracheal intubation is contraindicated by excessive swelling.

3. Intravenous lines should be established immediately in all cases where there is evidence of circulatory compromise.

4. Strong acids produce a coagulation necrosis characterized by formation of a coagulum (eschar) as a result of the desiccating action of the acid on proteins in specific tissues.

INGESTION:

1. Immediate dilution (milk or water) within 30 minutes post-ingestion is recommended.

2. Do not attempt to neutralize the acid since exothermic reaction may extend the corrosive injury.

3. Be careful to avoid further vomiting since re-exposure of the mucosa to the acid is harmful. Limit fluids to one or two glasses in an adult.

4. Charcoal has no place in acid management.

5. Some authors suggest the use of lavage within 1 hour of ingestion.

SKIN:

- 1.Skin lesions require copious saline irrigation. Treat chemical burns as thermal burns with non-adherent gauze and wrapping.
- 2.Deep second-degree burns may benefit from topical silver sulfadiazine.

EYE:

- 1.Eye injuries require retraction of the eyelids to ensure thorough irrigation of the conjunctival cul-de-sacs. Irrigation should last at least 20-30 minutes. Do not use neutralizing agents or any other additives. Several liters of saline are required.
- 2.Cycloplegic drops (1% cyclopentolate for short-term use or 5% homatropine for longer term use), antibiotic drops, vasoconstrictive agents, or artificial tears may be indicated dependent on the severity of the injury.
- 3.Steroid eye drops should only be administered with the approval of a consulting ophthalmologist.

Section 5 - Fire-Fighting Measures

Flash Point: Nonflammable

Autoignition Temperature: Not applicable

LEL: Not applicable

UEL: Not applicable

Extinguishing Media: Use extinguishing media suitable for surrounding area. Water spray or fog, from a safe distance only.

General Fire Hazards/Hazardous Combustion Products: HIGHLY CORROSIVE.

Noncombustible liquid. Reacts vigorously with water.

Heating may cause expansion or decomposition leading to violent rupture of containers.

Contact with readily oxidizable organic material may cause ignition /fire.

Reacts with metals producing flammable/explosive hydrogen gas.

Decomposes on heating and produces acrid and toxic fumes of sulfur oxides (SO_x).

Fire Incompatibility: Reacts with mild steel, galvanized steel/zinc producing hydrogen gas which may form an explosive mixture with air.

Contact with readily oxidizable organic material may cause ignition /fire.

Avoid any contamination of this material as it is very reactive and any contamination is potentially hazardous.

Fire-Fighting Instructions: Contact fire department and tell them location and nature of hazard.

May be violently or explosively reactive. Wear full body protective clothing with breathing apparatus. Prevent, by any means available, spillage from entering drains or waterways. Consider evacuation.

Use water delivered as a fine spray to control fire and cool adjacent area.

Avoid spraying water onto liquid pools.

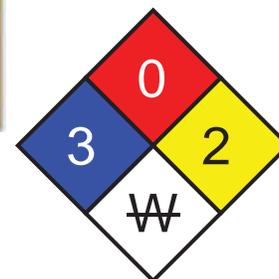
Do not approach containers suspected to be hot.

Cool fire-exposed containers with water spray from a protected location.

If safe to do so, remove containers from path of fire.

Equipment should be thoroughly decontaminated after use.

See
DOT
ERG



Fire Diamond

Section 6 - Accidental Release Measures

Small Spills: Clean up all spills immediately.

Avoid breathing vapors and contact with skin and eyes.

Control personal contact by using protective equipment.

Contain and absorb spill with sand, earth, inert material or vermiculite.

Wipe up. Place in a suitable labeled container for waste disposal.

Use soda ash or slaked lime to neutralize.

Large Spills: DO NOT touch the spill material. Clear area of personnel and move upwind.

Contact fire department and tell them location and nature of hazard.

May be violently or explosively reactive. Wear full body protective clothing with breathing apparatus. Prevent, by any means available, spillage from entering drains or waterways. Consider evacuation.

Stop leak if safe to do so.

Contain spill with sand, earth or vermiculite.

Collect recoverable product into labeled containers for recycling.

Neutralize/decontaminate residue.

Collect solid residues and seal in labeled drums for disposal.

Wash area and prevent runoff into drains.

After clean-up operations, decontaminate and launder all protective clothing and equipment before storing and reusing.

If contamination of drains or waterways occurs, advise emergency services.

DO NOT USE WATER OR NEUTRALIZING AGENTS INDISCRIMINATELY ON LARGE SPILLS.

Regulatory Requirements: Follow applicable OSHA regulations (29 CFR 1910.120).

See
DOT
ERG

Section 7 - Handling and Storage

Handling Precautions: Avoid generating and breathing mist. Avoid all personal contact, including inhalation.

Wear protective clothing when risk of exposure occurs.

Use in a well-ventilated area.

WARNING: To avoid violent reaction, ALWAYS add material to water and NEVER water to material.

Avoid smoking, bare lights or ignition sources.

Avoid contact with incompatible materials.

When handling, DO NOT eat, drink or smoke.

Keep containers securely sealed when not in use. Avoid physical damage to containers. Always wash hands with soap and water after handling. Work clothes should be laundered separately.

Launder contaminated clothing before reuse.

Use good occupational work practices. Observe manufacturer's storing and handling recommendations. Atmosphere should be regularly checked against established exposure standards to ensure safe working conditions are maintained.

Recommended Storage Methods: Glass carboy. Glass container is suitable for laboratory quantities.

Plastic carboy. Polylined drum.

Check that containers are clearly labeled.

Packaging as recommended by manufacturer.

DO NOT use mild steel or galvanized containers.

Regulatory Requirements: Follow applicable OSHA regulations.

Section 8 - Exposure Controls / Personal Protection

Engineering Controls: Use in a well-ventilated area.

General exhaust is adequate under normal operating conditions.

Local exhaust ventilation may be required in special circumstances.

If risk of overexposure exists, wear NIOSH-approved respirator. Correct fit is essential to ensure adequate protection.

Provide adequate ventilation in warehouses and enclosed storage areas.

Personal Protective Clothing/Equipment:

Eyes: Chemical goggles. Full face shield.

Contact lenses pose a special hazard; soft lenses may absorb irritants and all lenses concentrate them.

Hands/Feet: Wear chemical protective gloves, eg. PVC.

Wear safety footwear or safety gumboots, eg. Rubber.

Respiratory Protection:

Exposure Range >1 to 10 mg/m³: Air Purifying, Negative Pressure, Half Mask

Exposure Range >10 to <15 mg/m³: Air Purifying, Negative Pressure, Full Face

Exposure Range 15 to unlimited mg/m³: Self-contained Breathing Apparatus, Pressure Demand, Full Face

Cartridge Color: white with dust/mist prefilter (use P100 or consult supervisor for appropriate dust/mist prefilter)

Other: Overalls. PVC apron. PVC protective suit may be required if exposure severe.

Eyewash unit. Ensure there is ready access to a safety shower.

Glove Selection Index:

NATURAL RUBBER..... Best selection

NATURAL+NEOPRENE..... Best selection

NEOPRENE..... Best selection

NEOPRENE/NATURAL..... Best selection

NITRILE..... Best selection

PE..... Best selection

PVC..... Best selection

SARANEX-23 Best selection

Section 9 - Physical and Chemical Properties

Appearance/General Info: Colorless, oily, dense, HIGHLY CORROSIVE liquid. Faint acid odor.

Material is a powerful oxidizing and dehydrating agent causing rapid human tissue destruction on contact.

Concentrated acid is very exothermic (generates heat) when mixed with water.

DANGER: Adding water to acid will cause violent steam explosion, scattering corrosive acid. Always add acid slowly to water.

Mixes with alcohol in all proportions. Available in technical, pure and analytical grades

Physical State: Liquid

Evaporation Rate: Non Vol. at 38 °C

Odor Threshold: 1.0 mg/m³

pH: < 1

Vapor Pressure (kPa): 0.133 at 146 °C

pH (1% Solution): 1

Vapor Density (Air=1): 3.40

Boiling Point: About 290 °C (554 °F)

Formula Weight: 98.07

Freezing/Melting Point: 10.36 °C (50.648 °F)

Specific Gravity (H₂O=1, at 4 °C): 1.6-1.84 at 15 °C

Decomposition Temperature (°C): 340

Water Solubility: Soluble in water

Section 10 - Stability and Reactivity

Stability/Polymerization/Conditions to Avoid: Product is considered stable. Hazardous polymerization will not occur.

Storage Incompatibilities: Segregate from alkalis, oxidizing agents and chemicals readily decomposed by acids, i.e. cyanides, sulfides, carbonates.

Reacts vigorously with water and alkali.

Contact with readily oxidizable organic material may cause ignition /fire.

Avoid contamination of water, foodstuffs, feed or seed.

Section 11 - Toxicological Information

Toxicity

Oral (rat) LD₅₀: 2140 mg/kg

Inhalation (rat) LC₅₀: 510 mg/m³/2h

Inhalation (human) TC_{Lo}: 3 mg/m³/24w

Irritation

Eye (rabbit): 1.38 mg SEVERE

Eye (rabbit): 5 mg/30sec SEVERE

See RTECS WS 5600000, for additional data.

Section 12 - Ecological Information

Environmental Fate: No data found.

Ecotoxicity: TL_m Lepomis macrochirus (bluegill) 24.5 ppm/24 hr fresh water /Conditions of bioassay not specified; LC₅₀ Flounder 100 to 330 mg/l/48 hr aerated water /Conditions of bioassay not specified; LC₅₀ Shrimp 80 to 90 mg/l/48 hr aerated water /Conditions of bioassay not specified; LC₅₀ Prawn 42.5 ppm/48 hr salt water /Conditions of bioassay not specified

BCF: no food chain concentration potential

Biochemical Oxygen Demand (BOD): none

Section 13 - Disposal Considerations

Disposal: Recycle wherever possible or consult manufacturer for recycling options.

Follow applicable federal, state, and local regulations.

Treat and neutralize at an effluent treatment plant.

Use soda ash or slaked lime to neutralize.

Recycle containers, otherwise dispose of in an authorized landfill.

Bury residue in an authorized landfill.

Section 14 - Transport Information

DOT Hazardous Materials Table Data (49 CFR 172.101):

Shipping Name and Description: Sulfuric acid with more than 51 percent acid

ID: UN1830

Hazard Class: 8 - Corrosive material

Packing Group: II - Medium Danger

Symbols:

Label Codes: 8 - Corrosive

Special Provisions: A3, A7, B3, B83, B84, IB2, N34, T8, TP2, TP12

Packaging: Exceptions: 154 **Non-bulk:** 202 **Bulk:** 242

Quantity Limitations: Passenger aircraft/rail: 1 L **Cargo aircraft only:** 30 L

Vessel Stowage: Location: C **Other:** 14



Section 15 - Regulatory Information

EPA Regulations:

RCRA 40 CFR: Not listed

CERCLA 40 CFR 302.4: Listed per CWA Section 311(b)(4) 1000 lb (453.5 kg)

SARA 40 CFR 372.65: Listed

SARA EHS 40 CFR 355: Listed

RQ: 1000 lb

TPQ: 1000 lb

TSCA: Listed

Section 16 - Other Information

Disclaimer: Judgments as to the suitability of information herein for the purchaser's purposes are necessarily the purchaser's responsibility. Although reasonable care has been taken in the preparation of such information, Genium Group, Inc. extends no warranties, makes no representations, and assumes no responsibility as to the accuracy or suitability of such information for application to the purchaser's intended purpose or for consequences of its use.



MATERIAL SAFETY DATA SHEET

1. Product and Company Identification

Material name	METHANOL
Version #	08
Revision date	03-19-2012
CAS #	67-56-1
Product Codes	J.T.Baker: 5217, 5370, 5595, 5794, 5811, 5842, 9049, 9063, 9065, 9066, 9067, 9069, 9070, 9072, 9073, 9076, 9077, 9091, 9093, 9096, 9097, 9098, 9193, 9263, 9423, 9424, 9830, 9863, XL319 Macron: 12210, 3004, 3016, 3017, 3041, 72690, 8814, 8818, 8820, 8888, H080, H488, H603, V184, V465, V571
Synonym(s)	Wood alcohol * Carbinol
Manufacturer	Avantor Performance Materials, Inc.
Address	3477 Corporate Parkway Suite #200 Center Valley, PA 18034 US
Customer Service	855-282-6867
24 Hour Emergency	908-859-2151
Chemtrec	800-424-9300

2. Hazards Identification

Emergency overview	DANGER – POISON Flammable liquid and vapor. May be fatal or cause blindness if swallowed. Cannot be made nonpoisonous. Harmful if inhaled or absorbed through skin. Causes skin and eye irritation. High vapor concentrations may cause drowsiness and irritation of the eyes or respiratory tract. May cause harm to the unborn child. Prolonged exposure may cause chronic effects.
OSHA regulatory status	This product is considered hazardous under 29 CFR 1910.1200 (Hazard Communication).
Potential health effects	
Routes of exposure	Inhalation. Skin contact. Eye contact. Ingestion.
Eyes	Causes eye irritation. High vapor/aerosol concentrations may be irritating.
Skin	Causes skin irritation. Prolonged or repeated contact with skin may cause redness, itching, irritation and eczema/chapping.
Inhalation	May cause irritation of respiratory tract. Toxic effects exerted upon nervous system, particularly the optic nerve. Once absorbed into the body, it is very slowly eliminated. Symptoms of overexposure may include headache, drowsiness, nausea, vomiting, blurred vision, blindness, coma and death. A person may get better but then worse again up to 30 hours later.
Ingestion	Poison - may be fatal if swallowed. Even small amounts (30-250 ml methanol) may be fatal. Symptoms are stomach ache, nausea, vomiting, dullness, visual disorder and blindness.
Target organs	Eyes. Skin. Central nervous system. Liver.
Chronic effects	In serious cases absorption of methanol in the body may lead to damage to the eyesight. May cause adverse reproductive effects - such as birth defects, miscarriages, or infertility based on animal data. May cause central nervous system disorder (e.g., narcosis involving a loss of coordination, weakness, fatigue, mental confusion and blurred vision) and/or damage. Frequent or prolonged contact may defat and dry the skin, leading to discomfort and dermatitis.
Potential environmental effects	The product components are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.

3. Composition / Information on Ingredients

Components	CAS #	Percent
METHANOL	67-56-1	99 - 100

4. First Aid Measures

First aid procedures

- Eye contact** Immediately flush with plenty of water for at least 15 minutes. If easy to do, remove contact lenses. Get medical attention.
- Skin contact** Immediately flush with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Get medical attention immediately. Wash contaminated clothing before reuse. Destroy or thoroughly clean contaminated shoes.
- Inhalation** Move to fresh air. If breathing is difficult, give oxygen. If breathing stops, provide artificial respiration. Get medical attention.
- Ingestion** Call a physician or poison control center immediately. Do not induce vomiting. If vomiting occurs, keep head low so that stomach content doesn't get into the lungs.

Notes to physician

Symptoms may be delayed. Treat symptomatically.

General advice

Ensure that medical personnel are aware of the material(s) involved, and take precautions to protect themselves. Show this safety data sheet to the doctor in attendance.

5. Fire Fighting Measures

Flammable properties

HIGHLY FLAMMABLE! Vapors may cause a flash fire or ignite explosively. Vapors may travel considerable distance to a source of ignition and flash back. Heat may cause the containers to explode.

Extinguishing media

Suitable extinguishing media

Water spray. Foam. Dry powder. Carbon dioxide (CO₂).

Unsuitable extinguishing media

Do not use water jet as an extinguisher, as this will spread the fire.

Protection of firefighters

Specific hazards arising from the chemical

Can be ignited easily and burns vigorously. Vapor from the solvent may accumulate in container headspace resulting in flammability hazard.

Protective equipment and precautions for firefighters

Firefighters must use standard protective equipment including flame retardant coat, helmet with face shield, gloves, rubber boots, and in enclosed spaces, SCBA. Withdraw immediately in case of rising sound from venting safety device or any discoloration of tanks due to fire. Move containers from fire area if you can do so without risk. For massive fire in cargo area, use unmanned hose holder or monitor nozzles, if possible. If not, withdraw and let fire burn out. Some of these materials, if spilled, may evaporate leaving a flammable residue. Cool containers exposed to flames with water until well after the fire is out.

Special protective equipment for fire-fighters

As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear.

Specific methods

In the event of fire and/or explosion do not breathe fumes. Use water spray to cool unopened containers.

Hazardous combustion products

Carbon monoxide and carbon dioxide.

6. Accidental Release Measures

Personal precautions

Wear appropriate protective equipment and clothing during clean-up. Keep unnecessary personnel away. Keep upwind. Keep out of low areas. Ventilate closed spaces before entering them. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing. Local authorities should be advised if significant spillages cannot be contained.

Environmental precautions

Prevent further leakage or spillage if safe to do so. Do not contaminate water. Avoid discharge into drains, water courses or onto the ground.

Methods for containment ELIMINATE all ignition sources (no smoking, flares, sparks or flames in immediate area). Stop the flow of material, if this is without risk. Prevent entry into waterways, sewer, basements or confined areas. Dike the spilled material, where this is possible.

Methods for cleaning up Use only non-sparking tools. All equipment used when handling the product must be grounded.

Large Spills: Use a non-combustible material like vermiculite, sand or earth to soak up the product and place into a container for later disposal. Dike far ahead of spill for later disposal.

Small Spills: Wipe up with absorbent material (e.g. cloth, fleece). Collect in a non-combustible container for prompt disposal.

Never return spills in original containers for re-use. Clean surface thoroughly to remove residual contamination. Clean up in accordance with all applicable regulations.

J. T. Baker SOLUSORB® solvent adsorbent is recommended for spills of this product.

7. Handling and Storage

Handling DO NOT handle, store or open near an open flame, sources of heat or sources of ignition. Protect material from direct sunlight. Take precautionary measures against static discharges. Wear appropriate personal protective equipment. Avoid breathing mist or vapor. Avoid contact with eyes, skin, and clothing. Do not taste or swallow. Use only with adequate ventilation. Wash thoroughly after handling. See Section 8 of the MSDS for Personal Protective Equipment.

Storage Keep away from food, drink and animal feedingsuffs. Keep out of the reach of children. Keep container tightly closed in a cool, well-ventilated place. Ground container and transfer equipment to eliminate static electric sparks. Comply with all national, state, and local codes pertaining to the storage, handling, dispensing, and disposal of flammable liquids.

8. Exposure Controls / Personal Protection

ACGIH

Material	Type	Value
METHANOL (67-56-1)	BEL	15.0000 mg/l
	STEL	250.0000 ppm
	TWA	200.0000 ppm

Occupational exposure limits

U.S. - OSHA

Material	Type	Value
METHANOL (67-56-1)	PEL	200.0000 ppm
		260.0000 mg/m3

Engineering controls Good general ventilation (typically 10 air changes per hour) should be used. Ventilation rates should be matched to conditions. If applicable, use process enclosures, local exhaust ventilation, or other engineering controls to maintain airborne levels below recommended exposure limits. If exposure limits have not been established, maintain airborne levels to an acceptable level. Explosion proof exhaust ventilation should be used.

Personal protective equipment

Eye / face protection Chemical goggles and face shield are recommended.

Skin protection Wear appropriate chemical resistant clothing. Wear appropriate chemical resistant gloves.

Respiratory protection Use a positive-pressure air-supplied respirator if there is any potential for an uncontrolled release, exposure levels are not known, or any other circumstances where air-purifying respirators may not provide adequate protection.

General hygiene considerations Provide eyewash station and safety shower. Always observe good personal hygiene measures, such as washing after handling the material and before eating, drinking, and/or smoking. Routinely wash work clothing and protective equipment to remove contaminants.

9. Physical & Chemical Properties

Appearance	Clear.
Color	Colorless.
Odor	Characteristic.
Odor threshold	Not available.
Physical state	Liquid.
Form	Liquid.
pH	Not available.
Melting point	-144.4 °F (-97.8 °C)
Freezing point	-144.4 °F (-97.8 °C)
Boiling point	149 °F (64.7 °C) 101.325 kPa
Flash point	53.6 °F (12 °C) Closed Cup
Evaporation rate	5.9 BuAc
Flammability limits in air, upper, % by volume	36
Flammability limits in air, lower, % by volume	7.3
Vapor pressure	16.9316 kPa at 25°C
Vapor density	1.1
Specific gravity	0.7866
Relative density	Not available.
Solubility (water)	Miscible
Partition coefficient (n-octanol/water)	-0.77
Auto-ignition temperature	464 °F (240 °C)
Percent volatile	100 %
Molecular weight	32.04 g/mol
Molecular formula	C-H4-O

10. Chemical Stability & Reactivity Information

Chemical stability	Stable under normal temperature conditions.
Conditions to avoid	Heat, flames and sparks. Sunlight.
Incompatible materials	Strong oxidizing agents. Contact with metals may evolve flammable hydrogen gas.
Hazardous decomposition products	Irritants. Toxic gas. Carbon oxides. Formaldehyde.
Possibility of hazardous reactions	Hazardous polymerization does not occur.

11. Toxicological Information

Toxicological data

Product

METHANOL (67-56-1)

Test Results

Acute Dermal LD50 Rabbit: 15800 mg/kg
Acute Inhalation LC50 Rat: 87.5 mg/l 6.00 Hours
Acute Oral LD50 Rat: 5628 mg/kg

Sensitization Not a skin sensitizer.

US ACGIH Threshold Limit Values: Skin designation

METHANOL (CAS 67-56-1)

Can be absorbed through the skin.

Acute effects	May be fatal or cause blindness if swallowed. Cannot be made nonpoisonous. Harmful if inhaled or absorbed through skin.
Local effects	Causes eye irritation. Irritating to skin. High vapor concentrations may cause drowsiness and irritation of the eyes or respiratory tract.
Chronic effects	May cause central nervous system effects. In serious cases absorption of methanol in the body may lead to damage to the eyesight. Frequent or prolonged contact may defat and dry the skin, leading to discomfort and dermatitis.
Carcinogenicity	This product is not considered to be a carcinogen by IARC, ACGIH, NTP, or OSHA.
Skin corrosion/irritation	Causes skin irritation.
Epidemiology	No epidemiological data is available for this product.
Mutagenicity	No data available to indicate product or any components present at greater than 0.1% are mutagenic or genotoxic.
Neurological effects	High vapor/aerosol concentrations (attainable only at elevated temperatures) may cause central nervous system effects such as dizziness, drowsiness or headaches. Central and/or peripheral nervous system damage.
Reproductive effects	Suspected of damaging fertility or the unborn child.
Symptoms and target organs	Irritation. Drowsiness and dizziness. Blindness. Cough. Shortness of breath. Unconsciousness.
Further information	Danger of very serious irreversible effects. Symptoms may be delayed.

12. Ecological Information

Ecotoxicological data	
Product	Test Results
METHANOL (67-56-1)	EC50 Water flea (Daphnia magna): > 10000 mg/l 48.00 hours LC50 Fathead minnow (Pimephales promelas): > 100 mg/l 96.00 hours
Ecotoxicity	The product components are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.
Environmental effects	Ecological injuries are not known or expected under normal use.
Persistence and degradability	Expected to be readily biodegradable.
Partition coefficient (n-octanol/water)	-0.77

13. Disposal Considerations

Waste codes	
US RCRA Hazardous Waste U List: Reference	
METHANOL (CAS 67-56-1)	U154
Disposal instructions	Dispose of this material and its container to hazardous or special waste collection point. Incinerate the material under controlled conditions in an approved incinerator. All wastes must be handled in accordance with local, state and federal regulations.
Contaminated packaging	Since emptied containers retain product residue, follow label warnings even after container is emptied. Residual vapors may explode on ignition; do not cut, drill, grind, or weld on or near this container. Offer rinsed packaging material to local recycling facilities.

14. Transport Information

DOT	
Basic shipping requirements:	
UN number	UN1230
Proper shipping name	Methanol
Hazard class	3

Subsidiary hazard class 6.1
 Packing group II
 Additional information:
 Special provisions IB2, T7, TP2
 Basic shipping requirements:
 Labels required 3
 Additional information:
 Packaging exceptions 150
 Packaging non bulk 202
 Packaging bulk 242
 Reportable quantity 5000
 ERG number 131

IATA

Basic shipping requirements:
 UN number 1230
 Proper shipping name Methanol
 Hazard class 3
 Subsidiary hazard class 6.1
 Packing group II
 Additional information:
 ERG code 3P

IMDG

Basic shipping requirements:
 UN number 1230
 Proper shipping name METHANOL
 Hazard class 3
 Subsidiary hazard class 6.1
 Packing group II



DOT



IATA



IMDG

15. Regulatory Information

US federal regulations This product is a "Hazardous Chemical" as defined by the OSHA Hazard Communication Standard, 29 CFR 1910.1200.
 All components are on the U.S. EPA TSCA Inventory List.

US EPCRA (SARA Title III) Section 313 - Toxic Chemical: De minimis concentration

METHANOL (CAS 67-56-1) 1.0 %

US EPCRA (SARA Title III) Section 313 - Toxic Chemical: Listed substance

METHANOL (CAS 67-56-1) Listed.

CERCLA (Superfund) reportable quantity

METHANOL: 5000.0000

Superfund Amendments and Reauthorization Act of 1986 (SARA)

Hazard categories
 Immediate Hazard - Yes
 Delayed Hazard - Yes
 Fire Hazard - Yes
 Pressure Hazard - No
 Reactivity Hazard - No

Section 311 hazardous chemical
 Yes

Clean Air Act (CAA)
 HAPS list

Inventory status

Country(s) or region	Inventory name	On inventory (yes/no)*
Australia	Australian Inventory of Chemical Substances (AICS)	Yes
Canada	Domestic Substances List (DSL)	Yes
Canada	Non-Domestic Substances List (NDSL)	No
China	Inventory of Existing Chemical Substances in China (IECSC)	Yes
Europe	European Inventory of Existing Commercial Chemical Substances (EINECS)	Yes
Europe	European List of Notified Chemical Substances (ELINCS)	No
Japan	Inventory of Existing and New Chemical Substances (ENCS)	Yes
Korea	Existing Chemicals List (ECL)	Yes
New Zealand	New Zealand Inventory	Yes
Philippines	Philippine Inventory of Chemicals and Chemical Substances (PICCS)	Yes
United States & Puerto Rico	Toxic Substances Control Act (TSCA) Inventory	Yes

*A "Yes" indicates that all components of this product comply with the inventory requirements administered by the governing country(s)

State regulations
 This product does not contain a chemical known to the State of California to cause cancer, birth defects or other reproductive harm.

US - New Jersey Community RTK (EHS Survey): Reportable threshold

METHANOL (CAS 67-56-1) 500 LBS

US - Pennsylvania RTK - Hazardous Substances: Listed substance

METHANOL (CAS 67-56-1) Listed.

Saf-T-Data
 Health: 3 - Severe (Poison)
 Flammability: 3 - Severe (Flammable)
 Reactivity: 1 - Slight
 Contact: 3 - Severe (Life)
 Lab Protective Equip: DB - GOGGLES & SHIELD; LAB COAT & APRON; VENT HOOD; PROPER GLOVES; CLASS B EXTINGUISHER
 Storage Color Code: R - Red (Flammable)

16. Labeling Info

Label Hazard Warning
 DANGER -- POISON
 FLAMMABLE LIQUID AND VAPOR. May be fatal or cause blindness if swallowed. Cannot be made nonpoisonous. Harmful if inhaled or absorbed through skin. Causes skin and eye irritation. High vapor concentrations may cause drowsiness and irritation of the eyes or respiratory tract. May cause harm to the unborn child. Prolonged exposure may cause chronic effects.

Label Precautions
 Keep away from heat, sparks and flame. Take precautionary measures against static discharge. Avoid breathing dust/fume/gas/mist/vapors/spray. Avoid contact with eyes, skin, and clothing. Do not taste or swallow. Use only with adequate ventilation. Keep container closed. Wash thoroughly after handling.

Label First Aid

Immediately flush eyes with plenty of water for at least 15 minutes. Immediately flush skin with plenty of water. If gas/fume/vapor/dust/mist from the material is inhaled, remove the affected person immediately to fresh air. Get medical attention immediately. IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician. Do not induce vomiting. If vomiting occurs, the head should be kept low so that stomach vomit doesn't enter the lungs. Do not use mouth-to-mouth method if victim ingested the substance.

17. Other Information

NFPA ratings

Health: 2
Flammability: 3
Instability: 0

Disclaimer

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MSDS Material Safety Data Sheet

From: Avantor Performance Materials, Inc.
Saucon Valley Plaza
3477 Corporate Parkway
Suite #200
Center Valley, PA 18034



24 Hour Emergency Telephone: 908-859-2151
CHEMTREC: 1-800-424-9300

National Response in Canada
CANUTEC: 613-996-6666

Outside U.S. and Canada
Chemtrec: 703-527-3887

NOTE: CHEMTREC, CANUTEC and National Response Center emergency numbers to be used only in the event of chemical emergencies involving a spill, leak, fire, exposure or accident involving chemicals.

All non-emergency questions should be directed to Customer Service, 1-855-AVANTOR (855-282-6867) for assistance.

SODIUM BISULFATE

1. Product Identification

Synonyms: Sodium hydrogen sulfate; sodium acid sulfate; sulfuric acid, monosodium salt, monohydrate

CAS No.: 7681-38-1 (Anhydrous)

Molecular Weight: 138.08

Chemical Formula: NaHSO4 . H2O

Product Codes:

J.T. Baker: 3534

Macron: 7432

2. Composition/Information on Ingredients

Ingredient	CAS No	Percent	Hazardous
Sodium Bisulfate	7681-38-1	90 - 100%	Yes

3. Hazards Identification

Emergency Overview

DANGER! CORROSIVE. CAUSES BURNS TO ANY AREA OF CONTACT. MAY BE HARMFUL OR FATAL IF SWALLOWED.

SAF-T-DATA^(tm) Ratings (Provided here for your convenience)

Health Rating: 3 - Severe (Life)

Flammability Rating: 0 - None

Reactivity Rating: 1 - Slight

Contact Rating: 3 - Severe (Corrosive)

Lab Protective Equip: GOGGLES & SHIELD; LAB COAT & APRON; VENT HOOD; PROPER GLOVES

Storage Color Code: White (Corrosive)

Potential Health Effects

Inhalation:

Inhalation produces damaging effects on the mucous membranes and upper respiratory tract. Symptoms may include irritation of the nose and throat, and labored breathing. May cause lung edema, a medical emergency.

Ingestion:

Corrosive. Swallowing can cause severe burns of the mouth, throat, and stomach, leading to death. Can cause sore throat, vomiting, diarrhea.

Skin Contact:

Corrosive. Symptoms of redness, pain, and severe burn can occur.

Eye Contact:

Acidic irritant. Pain, tearing and redness can occur. Crystalline dust may also be abrasive. Solutions are acidic and splashes may cause eye damage.

Chronic Exposure:

Lung irritation, tracheal bronchitis, persistent coughing, and corrosion of teeth are possible effects from long term exposure to dust, mist or fumes from wet or moist sodium bisulfate.

Aggravation of Pre-existing Conditions:

No information found.

4. First Aid Measures

Inhalation:

Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

Ingestion:

If swallowed, DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious person. Get medical attention immediately.

Skin Contact:

Immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Get medical attention immediately. Wash clothing before reuse. Thoroughly clean shoes before reuse.

Eye Contact:

Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

5. Fire Fighting Measures

Fire:

Not considered to be a fire hazard.

Explosion:

Not considered to be an explosion hazard.

Fire Extinguishing Media:

Use any means suitable for extinguishing surrounding fire. Water may be used to cool containers and to knock down vapors in a fire situation. Do not use water on material itself or allow water to get inside container.

Special Information:

In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode.

6. Accidental Release Measures

Ventilate area of leak or spill. Keep unnecessary and unprotected people away from area of spill. Wear appropriate personal protective equipment as specified in Section 8. Spills: Pick up and place in a suitable container for reclamation or disposal, using a method that does not generate dust.

7. Handling and Storage

Keep in a tightly closed container, stored in a cool, dry, ventilated area. Protect against physical damage. Isolate from incompatible substances. Containers of this material may be hazardous when empty since they retain product residues (dust, solids); observe all warnings and precautions listed for the product.

8. Exposure Controls/Personal Protection

Airborne Exposure Limits:

None established.

Ventilation System:

A system of local and/or general exhaust is recommended to keep employee exposures as low as possible. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, *Industrial Ventilation, A Manual of Recommended Practices*, most recent edition, for details.

Personal Respirators (NIOSH Approved):

If the exposure limit is exceeded and engineering controls are not feasible, a half-face respirator with an acid gas cartridge and particulate (NIOSH type N95 or better) filter may be worn for up to ten times the exposure limit or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. A full-face piece respirator with an acid gas cartridge and particulate (NIOSH type N100) filter may be worn up to 50 times the exposure limit, or the maximum use concentration specified by the appropriate regulatory agency, or respirator supplier, whichever is lowest. If oil particles (e.g. lubricants, cutting fluids, glycerine, etc.) are present, use a NIOSH type R or P filter. For emergencies or instances where the exposure levels are not known, use a full-facepiece positive-pressure, air-supplied respirator. **WARNING:** Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.

Skin Protection:

Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact.

Eye Protection:

Use chemical safety goggles and/or full face shield where dusting or splashing of solutions is possible. Maintain eye wash fountain and quick-drench facilities in work area.

9. Physical and Chemical Properties

Appearance:

Colorless crystals.

Odor:

Odorless.

Solubility:

67g/100g water.

Density:

2.10

pH:

1.4

% Volatiles by volume @ 21C (70F):

0

Boiling Point:

Not applicable.

Melting Point:

58C (136F)

Vapor Density (Air=1):

No information found.

Vapor Pressure (mm Hg):

No information found.

Evaporation Rate (BuAc=1):

No information found.

10. Stability and Reactivity

Stability:

Stable under ordinary conditions of use and storage. Hygroscopic.

Hazardous Decomposition Products:

Oxides of sulfur and the contained metal.

Hazardous Polymerization:

Will not occur.

Incompatibilities:

Strong bases, calcium hypochlorite and sodium carbonate.

Conditions to Avoid:

Moisture, dusting and incompatibles.

11. Toxicological Information

Oral LD50 Rat: 2490 mg/kg.

-----\Cancer Lists\-----

Ingredient	---NTP Carcinogen---		IARC Category
	Known	Anticipated	
Sodium Bisulfate (7681-38-1)	No	No	None

12. Ecological Information

Environmental Fate:

No information found.

Environmental Toxicity:

Water Flea Data: 48 Hr EC50 Daphnia magna: 190 mg/L

13. Disposal Considerations

Whatever cannot be saved for recovery or recycling should be managed in an appropriate and approved waste facility. Although not a listed RCRA hazardous waste, this material may exhibit one or more characteristics of a hazardous waste and require appropriate analysis to determine specific disposal requirements. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

14. Transport Information

Domestic (Land, D.O.T.)

Proper Shipping Name: CORROSIVE SOLID, ACIDIC, INORGANIC, N.O.S. (SODIUM BISULFATE)

Hazard Class: 8

UN/NA: UN3260

Packing Group: III

Information reported for product/size: 12KG

International (Water, I.M.O.)

Proper Shipping Name: CORROSIVE SOLID, ACIDIC, INORGANIC, N.O.S. (SODIUM BISULFATE)

Hazard Class: 8

UN/NA: UN3260

Packing Group: III

Information reported for product/size: 12KG

15. Regulatory Information

-----\Chemical Inventory Status - Part 1\-----
Ingredient TSCA EC Japan Australia

Sodium Bisulfate (7681-38-1) Yes Yes Yes Yes

-----\Chemical Inventory Status - Part 2\-----
Ingredient Korea DSL NDSL Phil.

Sodium Bisulfate (7681-38-1) Yes Yes No Yes

-----\Federal, State & International Regulations - Part 1\-----
Ingredient -SARA 302- -SARA 313-
RQ TPQ List Chemical Catg.

Sodium Bisulfate (7681-38-1) No No No No

-----\Federal, State & International Regulations - Part 2\-----
Ingredient CERCLA -RCRA- -TSCA-
261.33 8(d)

Sodium Bisulfate (7681-38-1) No No No

Chemical Weapons Convention: No TSCA 12(b): No CDTA: No
SARA 311/312: Acute: Yes Chronic: Yes Fire: No Pressure: No
Reactivity: No (Mixture / Solid)

Australian Hazchem Code: 2X

Poison Schedule: S5

WHMIS:

This MSDS has been prepared according to the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

16. Other Information

NFPA Ratings: Health: 3 Flammability: 0 Reactivity: 0

Label Hazard Warning:

DANGER! CORROSIVE. CAUSES BURNS TO ANY AREA OF CONTACT. MAY BE HARMFUL OR FATAL IF SWALLOWED.

Label Precautions:

Do not get in eyes, on skin, or on clothing.
Do not breathe dust.
Keep container closed.
Use only with adequate ventilation.
Wash thoroughly after handling.

Label First Aid:

In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. If swallowed, DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious person. In all cases get medical attention immediately.

Product Use:

Laboratory Reagent.

Revision Information:

No Changes.

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Prepared by: Environmental Health & Safety