



MATERIAL SAFETY DATA SHEET

PRODUCT NAME: DIBORANE

1. Chemical Product and Company Identification

**BOC Gases,
Division of
The BOC Group, Inc.
575 Mountain Avenue
Murray Hill, NJ 07974**

**BOC Gases
Division of
BOC Canada Limited
5975 Falbourne Street, Unit 2
Mississauga, Ontario L5R 3W6**

TELEPHONE NUMBER: (908) 464-8100
24-HOUR EMERGENCY TELEPHONE NUMBER:
CHEMTREC (800) 424-9300

TELEPHONE NUMBER: (905) 501-1700
24-HOUR EMERGENCY TELEPHONE NUMBER:
(905) 501-0802
EMERGENCY RESPONSE PLAN NO: 20101

PRODUCT NAME: DIBORANE
CHEMICAL NAME: Diborane
COMMON NAMES/SYNONYMS: Boroethane; Boron Hydride
TDG (Canada) CLASSIFICATION: 2.3 (2.1)
WHMIS CLASSIFICATION: A, B6, D1A

PREPARED BY: Loss Control (908)464-8100/(905)501-1700
PREPARATION DATE: 6/1/95
REVIEW DATES: 6/11/96

2. Composition, Information on Ingredients

INGREDIENT	% VOLUME	PEL-OSHA ¹	TLV-ACGIH ²	LD ₅₀ or LC ₅₀ Route/Species
Diborane FORMULA: B ₂ H ₆ CAS: 19287-45-7 RTECS #: HQ9275000	100.0	0.1 ppm TWA	0.1 ppm TWA	LC ₅₀ 40 ppm/4H (rat)

¹ As stated in 29 CFR 1910, Subpart Z (revised July 1, 1993)

² As stated in the ACGIH 1994-95 Threshold Limit Values for Chemical Substances and Physical Agents

3. Hazards Identification

EMERGENCY OVERVIEW

Irritant to the respiratory system resulting in pulmonary edema. Symptoms may include headache, fatigue, drowsiness, shortness of breath and coughing, eventually leading to convulsions and death. Prolonged exposure to very low concentrations may result in dizziness, vertigo, chills, fatigue or muscular weakness. Spontaneously combustible in moist air.

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ROUTE OF ENTRY:

Skin Contact Yes	Skin Absorption No	Eye Contact Yes	Inhalation Yes	Ingestion No
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HEALTH EFFECTS:

Exposure Limits Yes	Irritant Yes	Sensitization No
Teratogen No	Reproductive Hazard No	Mutagen No
Synergistic Effects None Reported		

Carcinogenicity: -- NTP: No IARC: No OSHA: No

EYE EFFECTS:

Contact may cause irritation or burns.

SKIN EFFECTS:

Contact may cause thermal burns and irritation.

INGESTION EFFECTS:

Since product is a gas at room temperature, ingestion is unlikely.

INHALATION EFFECTS:

Irritant to the respiratory system. Inhalation exposure may result in pulmonary edema, pneumonitis, and injuries to the central nervous system, liver and kidneys. Symptoms of exposure may include headache, fatigue, drowsiness, shortness of breath, coughing and eventual convulsions and death.

Prolonged exposure to very low concentrations may result in dizziness, vertigo, chills, fatigue or muscular weakness.

NFPA HAZARD CODES

Health: 4
Flammability: 4
Reactivity: 3
WATER REACTIVE

HMIS HAZARD CODES

Health: 4
Flammability: 4
Reactivity: 3

RATINGS SYSTEM

0 = No Hazard
1 = Slight Hazard
2 = Moderate Hazard
3 = Serious Hazard
4 = Severe Hazard

4. First Aid Measures

EYES:

In case of eye contact, immediately flush with low pressure, cool water for at least 15 minutes, opening eyelids to ensure flushing. Get immediate medical attention.

SKIN:

Treat thermal burns. Flush affected areas immediately large quantities of water. Then wash thoroughly with soap and water. Consult a physician if irritation develops.

INGESTION:

Consult poison control center.

INHALATION:

MSDS: G-189

Revised: 6/11/96

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PROMPT MEDICAL ATTENTION IS MANDATORY IN ALL CASES OF OVEREXPOSURE. RESCUE PERSONNEL SHOULD BE EQUIPPED WITH SELF-CONTAINED BREATHING APPARATUS. Quick removal from the contaminated area is most important. Conscious persons should be assisted to an uncontaminated area and inhale fresh air. Unconscious persons should be moved to an uncontaminated area, and given artificial resuscitation and supplemental oxygen if they are not breathing. Further treatment should be symptomatic and supportive.

5. Fire Fighting Measures

Conditions of Flammability: Spontaneously combustible at room temperature in moist air		
Flash point: Not Available	Method: Not Applicable	Autoignition Temperature: 100 °F (36 °C)
LEL(%): 0.9	UEL(%): 98	
Hazardous combustion products: Borane compounds		
Sensitivity to mechanical shock: Not Available		
Sensitivity to static discharge: Not Available		

FIRE AND EXPLOSION HAZARDS:

Ignites spontaneously in moist air at room temperature. The heat of combustion from a diborane fire is greater than that from a similar hydrocarbon, such as ethane.

EXTINGUISHING MEDIA:

Only acceptable extinguishing media are protein based foams with a nitrogen carrier.

FIRE FIGHTING INSTRUCTIONS:

Reacts with most extinguishing media such as water, carbon dioxide, chemical powders and halogenated compounds. Attempt to stop the flow of gas and allow fire to burn itself out. Fire fighters should use self-contained breathing apparatus. Wear full turnout gear. Use water spray to cool fire fighters.

Be cautious of a Boiling Liquid Evaporating Vapor Explosion, BLEVE, if flame is impinging on surrounding containers. Direct 500 GPM water stream onto containers above liquid level with remote monitors. Limit the number of personnel in proximity to the fire. Evacuate surrounding areas to at least 3000 feet in all directions.

6. Accidental Release Measures

Evacuate all personnel from affected area. Use appropriate protective equipment. If leak is in user's equipment, be certain to purge piping with inert gas prior to attempting repairs. If leak is in container or container valve, contact the appropriate emergency telephone number listed in Section 1 or call your closest BOC location.

7. Handling and Storage

Earth-ground and bond all lines and equipment associated with the system. All electrical equipment should be non-sparking or explosion proof.

Diborane is noncorrosive and may be used with all materials of construction except aluminum. It is also compatible with ordinary glass, Pyrex and quartz. Kel-F and Teflon are also the preferred gasketing material.

Use only in well-ventilated areas. Stationary customer site vessels should be operated in accordance with the manufacturer's and BOC instructions. Do not attempt to repair, adjust or in any other way modify the operation

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of these vessels. If there is a malfunction or other type of operations problem with the vessel, contact the closest BOC location immediately for assistance.

Protect cylinders from physical damage. Store in cool, dry, well-ventilated area away from heavily trafficked areas and emergency exits. DO NOT allow the temperature where cylinders are stored to exceed 125°F (52°C). Cylinders should be stored upright and firmly secured to prevent falling or being knocked over. Full and empty cylinders should be segregated. Use a "first in-first out" inventory system to prevent full cylinders from being stored for excessive periods of time.

Valve protection caps must remain in place unless container is secured with valve outlet piping to use point. Close valve after each use and when the container is empty. Do not drag, slide or roll cylinders on their sides. Use a suitable hand truck for container movement. Use a pressure reducing regulator when connecting container to piping or systems. Do not use gas directly from container. Do not heat container by any means to increase the discharge rate of product from the container.

For additional information, consult the Compressed Gas Association (CGA) Pamphlet P-1.

8. Exposure Controls, Personal Protection

EXPOSURE LIMITS¹:

INGREDIENT	% VOLUME	PEL-OSHA ²	TLV-ACGIH ³	LD ₅₀ or LC ₅₀ Route/Species
Diborane FORMULA: B ₂ H ₆ CAS: 19287-45-7 RTECS #: HQ9275000	100.0	0.1 ppm TWA	0.1 ppm TWA	LC ₅₀ 40 ppm/4H (rat)

¹ Refer to individual state or provincial regulations, as applicable, for limits which may be more stringent than those listed here.

² As stated in 29 CFR 1910, Subpart Z (revised July 1, 1993)

³ As stated in the ACGIH 1994-1995 Threshold Limit Values for Chemical Substances and Physical Agents.

ENGINEERING CONTROLS:

Use local exhaust ventilation to reduce concentrations to within current exposure limits. A laboratory type hood is suitable for handling small or limited quantities.

EYE/FACE PROTECTION:

Gas-tight goggles or full-face piece respirator.

SKIN PROTECTION:

Protective gloves made of any suitable material. Use insulated gloves if contact with liquid product may occur.

RESPIRATORY PROTECTION:

An airline respirator with full face piece equipped with an escape bottle or a self-contained breathing apparatus should be available for emergency use.

OTHER/GENERAL PROTECTION:

Safety shoes, safety shower, eyewash "fountain", face shield.

9. Physical and Chemical Properties

PARAMETER	VALUE	UNITS
Physical state (gas, liquid, solid)	: Gas	
Vapor pressure	: Not Available	
Vapor density at STP(Air = 1)	: 0.95	
Evaporation point	: Not Available	
Boiling point	: -134.5	°F
	: -92.5	°C
Freezing point	: -264.7	°F
	: -164.9	°C
pH	: Not Available	
Specific gravity	: Not Available	
Oil/water partition coefficient	: Not Available	
Solubility (H2O)	: Hydrolyzes	
Odor threshold	: Not Available	
Odor and appearance	: A colorless gas with a sickly-sweet odor.	

10. Stability and Reactivity

STABILITY:

Unstable at elevated temperatures. Diborane mixture storage time should be minimized.

INCOMPATIBLE MATERIALS:

Reacts violently with moist air at room temperature, oxidizing agents, ammonia, alcohols, fresh metallic aluminum, lithium, halogens, halogenated compounds and metal oxides.

HAZARDOUS DECOMPOSITION PRODUCTS:

Hydrogen, higher boranes at room temperature. Decomposition rate increases with temperature to form non-volatile boranes (eg., pentaborane). Diborane disassociates to boron and hydrogen above 570 °F (300 °C). Reacts with water to form hydrogen and boric acid.

CONDITIONS TO AVOID (POLYMERIZATION):

Higher borane decomposition products (typically tetra-borane) may be more shock sensitive than diborane.

HAZARDOUS POLYMERIZATION:

Will not occur.

11. Toxicological Information

LC₅₀ Human, Inhalation 159 molar PPM for 15 minutes*.

Also lethal dose, Human, Inhalation 30 to 90 mg/m³ for 4 hours*.

* Note these values were not listed in the Registry of Toxic Effects of Chemical Substances (RTECS) or Sax, Dangerous Properties of Industrial Materials, 7th ed.

Its toxicity seems to be similar to that for phosgene, chlorine, fluorine, and arsine. Damage to the lungs resulting in pulmonary edema will most probably occur as well as kidney and liver damage. The signs of the intoxication may be delayed for up to 24 hours or occur immediately after the exposure.

MSDS: G-189

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12. Ecological Information

This product does NOT contain any ingredients which are regulated on the U.S. EPA List of Toxic Chemicals (40 CFR 372), and is therefore not subject to release reporting under Section 313 of EPCRA/SARA Title III.

13. Disposal Considerations

Do not attempt to dispose of residual waste or unused quantities. Return in the shipping container PROPERLY LABELED, WITH ANY VALVE OUTLET PLUGS OR CAPS SECURED AND VALVE PROTECTION CAP IN PLACE to BOC Gases or authorized distributor for proper disposal.

14. Transport Information

PARAMETER	United States DOT	Canada TDG
PROPER SHIPPING NAME:	Diborane	Diborane
HAZARD CLASS:	2.3	2.3 (2.1)
IDENTIFICATION NUMBER:	UN 1911	UN 1911
SHIPPING LABEL:	POISON GAS, FLAMMABLE GAS	POISON GAS, FLAMMABLE GAS

Additional Marking Requirement: "Inhalation Hazard"

Additional Shipping Paper Description Requirement: "Poison-Inhalation Hazard, Zone A"

15. Regulatory Information

SARA TITLE III NOTIFICATIONS AND INFORMATION

SARA TITLE III - HAZARD CLASSES:

Acute Health Hazard

Chronic Health Hazard

Fire Hazard

Sudden Release of Pressure Hazard

Reactivity Hazard

16. Other Information

Compressed gas cylinders shall not be refilled without the express written permission of the owner. Shipment of a compressed gas cylinder which has not been filled by the owner or with his/her (written) consent is a violation of transportation regulations.

DISCLAIMER OF EXPRESSED AND IMPLIED WARRANTIES:

Although reasonable care has been taken in the preparation of this document, we extend no warranties and make no representations as to the accuracy or completeness of the information contained herein, and assume no responsibility regarding the suitability of this information for the user's intended purposes or for the consequences of its use. Each individual should make a determination as to the suitability of the information for their particular purpose(s).