

Praxair Material Safety Data Sheet

1. Chemical Product and Company Identification

Product Name: Boron trichloride (MSDS No. P-4566-D)			Trade Name: Boron Trichloride
Chemical Name: Boron Trichloride			Synonyms: Boron chloride, trichloroborane
Formula: BCl ₃			Chemical Family: Inorganic halide
Telephone:	Emergencies:	1-800-645-4633*	Company Name: Praxair, Inc. 39 Old Ridgebury Road Danbury, CT 06810-5113
	CHEMTREC:	1-800-424-9300*	
	Routine:	1-800-PRAXAIR	

* Call emergency numbers 24 hours a day only for spills, leaks, fire, exposure, or accidents involving this product. For routine information, contact your supplier, Praxair sales representative, or call 1-800-PRAXAIR (1-800-772-9247).

2. Composition/Information on Ingredients

See section 16 for important information about mixtures.

INGREDIENT	CAS NUMBER	CONCENTRATION	OSHA PEL	ACGIH TLV-TWA (2001)
Boron trichloride	10294-34-5	>99%*	None currently established**	None currently established**

*The symbol > means "greater than"; the symbol <, "less than."

** See section 3.

3. Hazards Identification

EMERGENCY OVERVIEW



**DANGER! Toxic, corrosive liquid and gas under pressure.
Harmful if inhaled.**



Causes eye, skin, and respiratory tract burns.

May cause liver, kidney, and respiratory system damage.

**Self-contained breathing apparatus and protective clothing must be worn by
rescue workers.**

Odor: Pungent, irritating

THRESHOLD LIMIT VALUE: None currently established (ACGIH-2001). Praxair recommends compliance with the OSHA and ACGIH (2000) limits of 5 ppm (ceiling) for hydrogen chloride, formed by the hydrolysis of boron trichloride. NOTE: Ceiling limits are *not* Time Weighted Average (TWA). TLVs should be used as a guide in the control of health hazards and not as fine lines between safe and dangerous concentrations.

EFFECTS OF A SINGLE (ACUTE) OVEREXPOSURE:

INHALATION—Overexposure to vapor concentrations moderately above 5 ppm irritates the upper respiratory tract. Intolerable concentrations range from 50-100 ppm. High concentrations (greater than 50 ppm) severely irritate the upper respiratory tract, causing the throat to burn and producing choking and coughing. Pulmonary edema, general lung injury, ulceration to the nose, throat, and larynx, and laryngeal spasm may also occur. Exposure to concentrations of 1500-2000 ppm for a few minutes is life-threatening. Liver and kidney injury has been reported after exposure to vapors. At higher concentrations, victim may suffocate from lack of oxygen.

SKIN CONTACT—Boron trichloride gas may cause severe skin irritation, chemical burns with ulceration, and scarring. Repeated exposure may produce dermatitis. With prolonged or widespread contact, the skin may absorb potentially harmful amounts of material.

SWALLOWING—An unlikely route of exposure. This product is a gas at normal temperature and pressure. May cause chemical burns of the mouth, throat, esophagus, and stomach, with severe abdominal and chest pain. Nausea, diarrhea, vomiting, weakness, collapse, and coma may occur.

EYE CONTACT—Exposure causes immediate pain and irritation with excess tearing and blinking. Severity of injury depends on concentration and duration of contact and may range from slight redness and irritation of the conjunctiva to total corneal opacification and blindness.

EFFECTS OF REPEATED (CHRONIC) OVEREXPOSURE: Prolonged or repeated exposure to vapor may discolor and erode the teeth, ulcerate the nasal mucosa, and cause the nose and gums to bleed.

OTHER EFFECTS OF OVEREXPOSURE: None known.

MEDICAL CONDITIONS AGGRAVATED BY OVEREXPOSURE: Inhalation may aggravate asthma and inflammatory or fibrotic pulmonary disease. Skin irritation may aggravate an existing dermatitis.

SIGNIFICANT LABORATORY DATA WITH POSSIBLE RELEVANCE TO HUMAN HEALTH HAZARD EVALUATION: None known.

CARCINOGENICITY: Boron trichloride is not listed by NTP, OSHA, and IARC.

4. First Aid Measures

INHALATION: Immediately remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, qualified personnel may give oxygen. Keep patient warm. Call a physician.

SKIN CONTACT: Do not breathe vapor. Immediately flush skin with plenty of water while removing contaminated clothing and shoes. Discard clothing and shoes. Call a physician.

SWALLOWING: Rinse mouth with water; then give two glasses of water. Do not induce vomiting. Call a physician.

EYE CONTACT: Immediately flush eyes thoroughly with water for at least 15 minutes. Hold the eyelids open and away from the eyeballs to ensure that all surfaces are flushed thoroughly. See a physician, preferably an ophthalmologist, immediately.

NOTES TO PHYSICIAN: *Boron trichloride rapidly hydrolyzes to hydrochloric acid. Keep victims of exposure under medical observation for 24 to 48 hours. The hazards of this material are due mainly to its severe irritant and corrosive properties. Injury occurs mainly to the skin and to mucosal surfaces. There is no specific antidote; direct treatment to control of symptoms and clinical condition.*

5. Fire Fighting Measures

FLASH POINT (test method):	Not applicable	
AUTOIGNITION TEMPERATURE:	Not applicable	
FLAMMABLE LIMITS IN AIR , % by volume:	LOWER: Not applicable	UPPER: Not applicable
EXTINGUISHING MEDIA: Boron trichloride cannot catch fire. Use media appropriate for surrounding fire. Note incompatibilities in section 10.		

SPECIAL FIRE FIGHTING PROCEDURES: DANGER! Toxic, corrosive liquid and gas under pressure. Immediately evacuate all personnel from danger area. Do not approach area without self-contained breathing apparatus and protective clothing. Immediately cool cylinders with water spray from maximum distance; then move them away from fire if without risk. If cylinders are leaking, reduce toxic vapors with water spray or fog. Shut off leak if without risk. Reverse flow into cylinder may cause rupture. (See section 16.) On-site fire brigades must comply with OSHA 29 CFR 1910.156.

UNUSUAL FIRE AND EXPLOSION HAZARDS: Nonflammable, poisonous, corrosive gas. Heat of fire can build pressure in cylinder and cause it to rupture. Boron trichloride cylinders are equipped with a pressure relief device. (Exceptions may exist where authorized by DOT.) Vapors are extremely irritating and may burn skin and eyes on contact..

HAZARDOUS COMBUSTION PRODUCTS: See section 10.

6. Accidental Release Measures

STEPS TO BE TAKEN IF MATERIAL IS RELEASED OR SPILLED: DANGER! Toxic, corrosive liquid and gas under pressure. Immediately evacuate all personnel from danger area. Do not approach area without self-contained breathing apparatus and protective clothing. Reduce vapors with fog or fine water spray. Reverse flow into cylinder may cause rupture. Shut off flow if without risk. Ventilate area or move cylinder to a well-ventilated area. Prevent runoff from contaminating surrounding environment. Poisonous, corrosive vapors may spread from spill. Before entering area, especially a confined area, check atmosphere with an appropriate device.

WASTE DISPOSAL METHOD: Prevent waste from contaminating the surrounding environment. Keep personnel away. Discard any product, residue, disposable container, or liner in an environmentally acceptable manner, in full compliance with federal, state, and local regulations. If necessary, call your local supplier for assistance.

7. Handling and Storage

PRECAUTIONS TO BE TAKEN IN STORAGE: Store and use with adequate ventilation. Firmly secure cylinders upright to keep them from falling or being knocked over. Screw valve protection cap firmly in place by hand. Store only where temperature will not exceed 125°F (52°C). Store full and empty cylinders separately. Use a first-in, first-out inventory system to prevent storing full cylinders for long periods.

PRECAUTIONS TO BE TAKEN IN HANDLING: Protect cylinders from damage. Use a suitable hand truck to move cylinders; do not drag, roll, slide, or drop. Never attempt to lift a cylinder by its cap; the cap is intended solely to protect the valve. Never insert an object (e.g., wrench, screwdriver, pry bar) into cap openings; doing so may damage the valve and cause a leak. Use an adjustable strap wrench to remove over-tight or rusted caps. Open valve slowly. If valve is hard to open, discontinue use and contact your supplier. For other precautions in using this mixture, see section 16.

For additional information on storage and handling, refer to Compressed Gas Association (CGA) pamphlet P-1, "*Safe Handling of Compressed Gases in Containers*," available from the CGA. Refer to section 16 for the address and phone number along with a list of other available publications.

8. Exposure Controls/Personal Protection

VENTILATION/ENGINEERING CONTROLS:

LOCAL EXHAUST—Use a corrosion-resistant local exhaust ventilation system with sufficient air flow velocity to maintain concentration below the TLV in the worker's breathing zone.

MECHANICAL (general)—Not recommended as a primary ventilation system to control worker's exposure.

SPECIAL—A corrosion-resistant, canopy-type, forced-draft fume hood may be more desirable for certain applications.

OTHER—See SPECIAL.

RESPIRATORY PROTECTION: Select per OSHA 29 CFR 1910.134 and ANSI Z88.2. Use air-supplied respirators for concentrations up to 10 ppm. For higher concentrations, a full-face, self-contained breathing apparatus operated in the pressure demand mode is recommended.

PROTECTIVE GLOVES: Neoprene.

EYE PROTECTION: Wear safety glasses when handling cylinders. Select per OSHA 29 CFR 1910.133.

OTHER PROTECTIVE EQUIPMENT: Metatarsal shoes for cylinder handling and protective clothing where needed. Select per OSHA 29 CFR 1910.132 and 1910.133. Regardless of protective equipment, never touch live electrical parts.

9. Physical and Chemical Properties

MOLECULAR WEIGHT:	117.7
SPECIFIC GRAVITY ($H_2O = 1$) at 53.6°/39.2°F (12°/4°C):	1.35
SPECIFIC GRAVITY (Air = 1) at 70°F (21.1°C) and 1 atm:	4.04
VAPOR PRESSURE at 70°F (21.1°C):	19.1 psia (131.7 kPa, abs)
SOLUBILITY IN WATER:	Reacts
PERCENT VOLATILES BY VOLUME:	100
EVAPORATION RATE (Butyl Acetate = 1):	High
BOILING POINT at 1 atm:	54.32°F (12.4°C)
MELTING POINT at 1 atm:	-161.1°F (-107.3°C)
APPEARANCE, ODOR, AND STATE: Colorless gas at normal temperature and pressure	

10. Stability and Reactivity**STABILITY:**☐ Unstable☒ Stable

INCOMPATIBILITY (materials to avoid): Reacts with most common substances, including water, organics, hydrogen, ammonia, grease, oxygen, alcohols, nitrogen peroxide.

HAZARDOUS DECOMPOSITION PRODUCTS: Thermal decomposition will produce toxic fumes of chlorides. BCl_3 is hydrolyzed by water or moisture to form hydrochloric and boric acids (HCl and H_3BO_3).

HAZARDOUS POLYMERIZATION:☐ May Occur☒ Will Not Occur

CONDITIONS TO AVOID: None known.

11. Toxicological Information

LC_{50} = 2541 ppm, 1 hour, rat

12. Ecological Information

No adverse ecological effects expected. Boron trichloride does not contain any Class I or Class II ozone-depleting chemicals. Boron trichloride is not listed as a marine pollutant by DOT.

13. Disposal Considerations

WASTE DISPOSAL METHOD: Do not attempt to dispose of residual or unused quantities. Return cylinder to supplier.

14. Transport Information

DOT/IMO SHIPPING NAME: Boron trichloride

HAZARD

CLASS: 2.3

IDENTIFICATION

NUMBER: UN 1741

PRODUCT

RQ: None

SHIPPING LABEL(s): POISON GAS, CORROSIVE*

PLACARD (when required): POISON GAS, CORROSIVE*

**The words in the POISON GAS diamond are INHALATION HAZARD.*

SPECIAL SHIPPING INFORMATION: Cylinders should be transported in a secure position, in a well-ventilated vehicle. Cylinders transported in an enclosed, nonventilated compartment of a vehicle can present serious safety hazards.

Additional Marking Requirement: INHALATION HAZARD

Shipment of compressed gas cylinders that have been filled without the owner's consent is a violation of federal law [49 CFR 173.301(b)].

15. Regulatory Information

The following selected regulatory requirements may apply to this product. Not all such requirements are identified. Users of this product are solely responsible for compliance with all applicable federal, state, and local regulations.

U.S. FEDERAL REGULATIONS:

EPA (ENVIRONMENTAL PROTECTION AGENCY)

CERCLA: COMPREHENSIVE ENVIRONMENTAL RESPONSE, COMPENSATION, AND LIABILITY ACT OF 1980 (40 CFR Parts 117 and 302):

Reportable Quantity (RQ): None

SARA: SUPERFUND AMENDMENT AND REAUTHORIZATION ACT:

SECTIONS 302/304: Require emergency planning based on Threshold Planning Quantity (TPQ) and release reporting based on Reportable Quantities (RQ) of Extremely Hazardous Substances (EHS) (40 CFR Part 355):

Threshold Planning Quantity (TPQ): 500 lb (226.8 kg)

EHS RQ: 500 lb (226.8 kg)

SECTIONS 311/312: Require submission of MSDSs and reporting of chemical inventories with identification of EPA hazard categories. The hazard categories for this product are as follows:

IMMEDIATE: Yes

PRESSURE: No

DELAYED: Yes

REACTIVITY: Yes

FIRE: No

SECTION 313: Requires submission of annual reports of release of toxic chemicals that appear in 40 CFR Part 372.

Boron trichloride is subject to the reporting requirements of Section 313.

40 CFR 68: RISK MANAGEMENT PROGRAM FOR CHEMICAL ACCIDENTAL RELEASE PREVENTION: Requires development and implementation of risk management programs at facilities that manufacture, use, store, or otherwise handle regulated substances in quantities that exceed specified thresholds.

Boron trichloride is listed as a regulated substance in quantities of 5,000 lb (2268 kg) or greater.

TSCA: TOXIC SUBSTANCES CONTROL ACT: Boron trichloride is listed on the TSCA inventory.

OSHA: OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION:

29 CFR 1910.119: PROCESS SAFETY MANAGEMENT OF HIGHLY HAZARDOUS CHEMICALS: Requires facilities to develop a process safety management program based on Threshold Quantities (TQ) of highly hazardous chemicals.

Boron trichloride is listed in Appendix A as a highly hazardous chemical in quantities of 2500 lb (1134 kg) or greater.

STATE REGULATIONS:

CALIFORNIA: Boron trichloride is not listed by California under the SAFE DRINKING WATER AND TOXIC ENFORCEMENT ACT OF 1986 (Proposition 65).

PENNSYLVANIA: Boron trichloride is subject to the PENNSYLVANIA WORKER AND COMMUNITY RIGHT-TO-KNOW ACT (35 P.S. Sections 7301-7320).

16. Other Information

Be sure to read and understand all labels and instructions supplied with all containers of this product.

OTHER HAZARDOUS CONDITIONS OF HANDLING, STORAGE, AND USE: *Toxic, corrosive liquid and gas under pressure.* Do not breathe gas. Use only with adequate ventilation or respiratory protection. (See section 8.) Do not get liquid or vapor in eyes, on skin, or on clothing. (See section 3.) Have safety showers and eyewash fountains immediately available. Use piping and equipment adequately designed to withstand pressures to be encountered. **Prevent reverse flow.** Reverse flow into cylinder may cause rupture. Use a check valve or other protective device in any line or piping from the cylinder. **Gas reacts with trace amounts of water to form highly corrosive acid.** Use only in a closed system constructed of corrosion-resistant materials and kept scrupulously dry. Purge system with a dry, inert gas before and after use. Close cylinder valve after each use; keep closed even when empty. **Never work on a pressurized system.** If there is a leak, close the cylinder valve. Blow the system down in a safe and environmentally sound manner in compliance with all federal, state, and local laws; then repair the leak. **When returning cylinder to supplier,** be sure valve is closed; then install valve outlet plug tightly. **Never place a compressed gas cylinder where it may become part of an electrical circuit.**

NOTE: Prior to using any plastics, confirm their compatibility with boron trichloride.

MIXTURES: When you mix two or more gases or liquefied gases, you can create additional, unexpected hazards. Obtain and evaluate the safety information for each component before you produce the mixture. Consult an industrial hygienist or other trained person when you evaluate the end product. Remember, gases and liquids have properties that can cause serious injury or death.

HAZARD RATING SYSTEMS:

NFPA RATINGS:

HEALTH	= 3
FLAMMABILITY	= 0
REACTIVITY	= 1
SPECIAL	= None

HMIS RATINGS:

HEALTH	= 1
FLAMMABILITY	= 0
REACTIVITY	= 1

STANDARD VALVE CONNECTIONS FOR U.S. AND CANADA:

THREADED:

CGA-660 Connection is standard.

PIN-INDEXED YOKE:

Not applicable

ULTRA-HIGH-INTEGRITY CONNECTION:

CGA-634

Use the proper CGA connections. **DO NOT USE ADAPTERS.** Additional limited-standard connections may apply. See CGA pamphlets V-1 listed below.

Ask your supplier about free Praxair safety literature as referred to in this MSDS and on the label for this product. Further information about this product can be found in the following pamphlets published by the Compressed Gas Association, Inc. (CGA), 4221 Walney Road, 5th Floor, Chantilly, VA 20151-2923, Telephone (703) 788-2700.

P-1	<i>Safe Handling of Compressed Gases in Containers</i>
V-1	<i>Compressed Gas Cylinder Valve Inlet and Outlet Connections</i>
—	<i>Handbook of Compressed Gases, Fourth Edition</i>

Praxair asks users of this product to study this MSDS and become aware of product hazards and safety information. To promote safe use of this product, a user should (1) notify employees, agents, and contractors of the information in this MSDS and of any other known product hazards and safety information, (2) furnish this information to each purchaser of the product, and (3) ask each purchaser to notify its employees and customers of the product hazards and safety information.

The opinions expressed herein are those of qualified experts within Praxair, Inc. We believe that the information contained herein is current as of the date of this Material Safety Data Sheet. Since the use of this information and the conditions of use of the product are not within the control of Praxair, Inc., it is the user's obligation to determine the conditions of safe use of the product.

Praxair MSDSs are furnished on sale or delivery by Praxair or the independent distributors and suppliers who package and sell our products. To obtain current Praxair MSDSs for these products, contact your Praxair sales representative or local distributor or supplier. If you have questions regarding Praxair MSDSs, would like the form number and date of the latest MSDS, or would like the names of the Praxair suppliers in your area, phone or write the Praxair Call Center (**Phone:** 1-800-PRAXAIR; **Address:** Praxair Call Center, Praxair, Inc., PO Box 44, Tonawanda, NY 14151-0044).

Praxair and the *Flowing Airstream* design are trademarks or registered trademarks of Praxair Technology, Inc. in the United States and other countries.



Praxair, Inc.
39 Old Ridgebury Road
Danbury, CT 06810-5113