20 MULE TEAM

Material Safety Data Sheet

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Borax Decahydrate

1 Chemical product and company identification

Product name: *Borax*
Grades: Technical, NF, SQ
Product use: Industrial manufacturing
Chemical Formula: $Na_2B_4O_7 \cdot 10H_2O$
Chemical name/synonyms: Sodium tetraborate decahydrate, disodium tetraborate decahydrate, borax decahydrate, Borax 10 Mol
Chemical family: Inorganic borates
CAS registry number: 1303-96-4
(Refer to Section 15 for TSCA/DSL Chemical inventory listing)

Manufactured by:
U.S. Borax Inc.
14486 Borax Road
Boron, CA 93516-2000, USA
+1 (760) 762 7000

EMERGENCY PHONE NUMBER:
U.S. & Canada ……..…….. (866) 786 3439
Outside the U.S. & Canada……. (661) 284 5200

2 Composition/information on ingredients

This product contains greater than 99 percent (%) Sodium tetraborate decahydrate, $Na_2B_4O_7 \cdot 10H_2O$, which is hazardous under the OSHA Hazard Communication Standard and under the Canadian Controlled Products Regulations of the Hazardous Products Act (WHMIS), based on animal chronic toxicity studies. (Refer to Sections 3 and 11 for details on hazards).

3 Hazard identification

Emergency overview
Borax is a white, odorless, powder substance that is not flammable, combustible, or explosive and has low acute oral and dermal toxicity.
Potential ecological effects
Large amounts of *Borax* can be harmful to plants and other species. Therefore, releases to the environment should be minimized.

Potential health effects
Routes of exposure: Inhalation is the most significant route of exposure in occupational and other settings. Dermal exposure is not usually a concern because *Borax* is poorly absorbed through intact skin.
Inhalation: Occasional mild irritation effects to the nose and throat may occur from inhalation of *Borax* dust at levels greater than 10 mg/m3.
Eye contact: Causes serious eye irritation.
Skin contact: *Borax* does not cause irritation to intact skin.
Ingestion: May be harmful if swallowed. Products containing *Borax* are not intended for ingestion. *Borax* has a low acute toxicity. Small amounts (e.g., a teaspoon) swallowed accidentally are not likely to cause effects; swallowing amounts larger than that may cause gastrointestinal symptoms.
Cancer: *Borax* is not a known carcinogen.
Reproductive/developmental: Suspected of damaging fertility or the unborn child. Animal ingestion studies in several species, at high doses, indicate that borates cause reproductive and developmental effects. A human study of occupational exposure to borate dust showed no adverse effect on reproduction.
Target organs: No target organ has been identified in humans. High dose, animal ingestion studies indicate the testes are the target organs in male animals.
Signs and symptoms of exposure: Symptoms of accidental over-exposure to *Borax* might include nausea, vomiting and diarrhea, with delayed effects of skin redness and peeling. These symptoms have been associated with the accidental overexposure to the chemically related substance boric acid. (Refer to Section 11 for details on Toxicological data).

4 First aid measures

Inhalation: If symptoms such as nose or throat irritation are observed, remove person to fresh air.
Eye contact: Use eye wash fountain or fresh water to cleanse the eye. If irritation persists for more than 30 minutes, seek medical attention.
Skin contact: No treatment necessary because non-irritating.
Ingestion: Swallowing small quantities (one teaspoon) will cause no harm to healthy adults. If larger amounts are swallowed, give two glasses of water to drink and seek medical attention.
Note to physicians: Observation only is required for adult ingestion in the range of 4-8 grams of *Borax*. For ingestion of larger amounts, maintain adequate kidney function and force fluids. Gastric lavage is recommended for symptomatic patients only. Hemodialysis should be reserved for massive acute ingestion or patients with renal failure. Boron analyses of urine or blood are only useful for documenting exposure and should not be used to evaluate severity of poisoning or to guide treatment[1].
(Refer to Section 11 for details).

5 Fire-fighting measures

General hazard: None, because *Borax* is not flammable, combustible or explosive. The product is itself a flame retardant.
Extinguishing media: Any fire extinguishing media may be used on nearby fires.

Flammability classification (29 CFR 1910.1200): Nonflammable solid.

6 Accidental release measures

General: *Borax* is a water-soluble white powder that may, at high concentrations, cause damage to trees or vegetation by root absorption.
(Refer to Section 12 for specific information on Ecological).
Land spill: Vacuum, shovel or sweep up *Borax* and place in containers for disposal in accordance with applicable local regulations. Avoid contamination of water bodies during cleanup and disposal. Personal protective equipment is not needed to cleanup land spills.

Spillage into water: Where possible, remove any intact containers from the water. Advise local water authority that none of the affected water should be used for irrigation or for the abstraction of potable water until natural dilution returns the boron value to its normal environmental background level.
(Refer to Sections 12, 13 and 15 for additional information).
Borax is a non-hazardous waste when spilled or disposed of, as defined in the Resource Conservation and Recovery Act (RCRA) regulations (40 CFR 261).
(Refer to Section 15 for additional references).

7 Handling and storage

General: No special handling precautions are required, but dry, indoor storage is recommended. To maintain package integrity and to minimize caking of the product, bags should be handled on a first-in, first-out basis. Good housekeeping procedures should be followed to minimize dust generation and accumulation.

Storage temperature: Ambient

Storage pressure: Atmospheric

Special sensitivity: Moisture (caking)

8 Exposure controls/personal protection

Engineering controls: Use local exhaust ventilation to keep airborne concentrations of *Borax* dust below permissible exposure levels.
Personal protection: Where airborne concentrations are expected to exceed exposure limits, NIOSH/MSHA certified respirators should be used. Eye goggles and gloves are not required for normal industrial exposures, but may be warranted if environment is excessively dusty.

Occupational exposure limits: *Borax* is treated by OSHA as "Particulate Not Otherwise Classified" (PNOR). CAL OSHA has established a Permissible Exposure Limit (PEL) for borates (tetra, sodium salts). ACGIH, which is not a regulatory agency, has established a Threshold Limit Value (TLV) for borates.

OSHA/PEL (total dust): 15 mg/m^3
OSHA/PEL (respirable dust): 5 mg/m^3
Cal OSHA/PEL: 5 mg/m^3
ACGIH/TLV: 2 mg/m^3

9 Physical and chemical properties

Appearance:	White, odourless crystalline solid	**Melting point:**	62°C (144°F) (heated in closed space)
Specific Gravity:	1.71	**Molecular weight:**	381.37
Vapour pressure:	Negligible at 20°C	**pH @ 20°C:**	9.3 (0.1% solution); 9.2 (1.0% solution); 9.3 (4.7% solution)
Solubility (water):	4.71% @ 20°C; 65.64% @ 100°C		

10 Stability and reactivity

General: *Borax* is a stable product, but when heated it loses water, eventually forming anhydrous borax ($Na_2B_4O_7$).
Incompatible materials and conditions to avoid: Reaction with strong reducing agents, such as metal hydrides or alkali metals, will generate hydrogen gas, which could create an explosive hazard.

Hazardous decomposition: None.

11 Toxicological Information

Acute toxicity
Ingestion: Low acute oral toxicity; LD_{50} in rats is 4,500 to 6,000 mg/kg of body weight.
Skin/dermal: Low acute dermal toxicity; LD_{50} in rabbits is greater than 2,000 mg/kg of body weight. *Borax* is poorly absorbed through intact skin.
Inhalation: Low acute inhalation toxicity; LC_{50} in rats is greater than 2.0 mg/L (or g/m3).
Skin irritation: Non-irritant.
Eye irritation: Draize test in rabbits produced eye irritation effects. Therefore, *Borax* may be considered to be an eye irritant.
Sensitization: *Borax* is not a skin sensitizer.

Other
Reproductive/developmental toxicity: Animal feeding studies in rat, mouse and dog, at high doses, have demonstrated effects on fertility and testes[2]. Studies with the chemically related boric acid in the rat, mouse and rabbit, at high doses, demonstrate developmental effects on the fetus, including fetal weight loss and minor skeletal variations[3,4]. The doses administered were many times in excess of those to which humans would normally be exposed[5].
Carcinogenicity/mutagenicity: No evidence of carcinogenicity in mice[6]. No mutagenic activity was observed for boric acid in a battery of short-term mutagenicity assays.
Human data: Human epidemiological studies show no increase in pulmonary disease in occupational populations with chronic exposures to boric acid dust and sodium borate dust. A recent epidemiology study under the conditions of normal occupational exposure to borate dusts indicated no effect on fertility[7].

12 Ecological information

Ecotoxicity data
General: Boron (B) is the element in sodium tetraborate decahydrate (*Borax)* which is used by convention to report borate ecological effects. To convert *Borax* into the equivalent boron (B) content, multiply by 0.1134. Boron occurs naturally in sea water, freshwater and soils. Sea water concentrations are about 5 mg B/L. Most freshwater concentrations are below 1 mg B/L. Soil concentrations range from 10 to 300 mg B/kg dry soil, but not all boron is bioavailable in soil. Soil concentrations reflect the local types of rock; sedimentary rocks have higher concentrations of boron than igneous rocks. Boron is an essential micronutrient for healthy growth of plants and is often applied to agricultural crops at rates up to 2.3 mg B/kg soil. It has been shown to be essential to fish & frogs. But, it can be harmful, especially to boron-sensitive plants at high concentrations. Care should be used to minimize release of *Borax* to the environment.
Ecotoxicity to Aquatic Organisms
Based on data from algae, invertebrates, and fish, this product is not classified as hazardous to the environment.
Algal toxicity:[8]
Green algae, *Selenastrum capricornutum*
72 hr EC_{50} (biomass) = 40 mg B/L (lowest value)
72 hr NOEC (based on growth) = 17.5 mg B/L (lowest value)

Aquatic Invertebrate toxicity:[9]
Daphnid, *Daphnia magna* (Straus)
48-hour EC_{50} = 133 mg B/L (lowest value)
21-day NOEC = 6 mg B/L (lowest chronic value)
21-day NOEC = 10.5 mg B/L (geometric mean, 6 tests)
Larval midge, *Chironomus riparius*
28-day NOEC = 180 mg B/L (spiked sediment)
Inhibition Respiration of Activated Sludge[10]
LC_{50} = 175 mg B/L (3 hr Standard Test)

Fish toxicity:[9-11]
Sea-water:
Dab, *Limanda limanda*
96-hr LC_{50} = 74 mg B/L
Fresh water:
Flannelmouth sucker, *Catostomas latipinnis*
96 hr LC_{50} = 125 mg B/L
Zebrafish, *Brachydanio rerio*
34-day NOEC = 5.6 mg B/L (lowest value)

Ecotoxicity to Terrestrial Organisms
Plant toxicity: Short term tests of shoot length report 7-10 day IC_{50} values of 452 to 1603 mg B/kg soil (dry wt) for 12 plant species.[12] The most sensitive end-point for long term plant studies reported a NOEC of 1.6 mg B/kg-soil for the bean *Phaseolus vulgaris*.[13] Studies also indicate that soil concentrations of less than 2 mg B/kg soil could be deficient in boron as a plant micronutrient, affecting almost half of those species tested.

Terrestrial Invertebrate toxicity:[14-15]
Earthworm, *Eisenia andrei*
56-63 day NOEC = 54 mg B/kg dry soil (geometric mean, 4 tests)
Collembolan, *Folsomia candida & Onychirius folsomi*
35 day NOEC = 31-37 mg B/kg dry soil

Environmental fate data
Persistence/degradation: *Borax* is an inorganic substance and does not biodegrade. Under environmental conditions, borates decompose to undissociated boric acid. *Bioaccumulation:* Based on laboratory and field data, borates do not bioaccumulate or biomagnify through the food chain. *Mobility:* Borates are water soluble and do not strongly adsorb to soil or sediment. Log P_{ow} = -0.757 at 25° C. Borates should be considered leachable through normal soil.

13 Disposal considerations

Disposal guidance: Small quantities of *Borax* can usually be disposed of at landfill sites. No special disposal treatment is required, but local authorities should be consulted about any specific local requirements. Tonnage quantities of product should, if possible, be used for an appropriate application.

RCRA (40 CFR 261): *Borax* is not listed under any sections of the Federal Resource Conservation and Recovery Act (RCRA).
NPRI (Canada): *Borax* is not listed on the Canadian National Pollutant Release Inventory.
(Refer to Section 15 for additional regulatory information.)

14 Transport information

International transportation: Does not have a UN Number, and is not regulated under international rail, road, water or air transport regulations.

TDG Canadian transportation: *Borax* is not regulated under the Transportation of Dangerous Goods (TDG).

15 Regulatory information

OSHA/Cal OSHA: This MSDS document meets the requirements of both OSHA (29 CFR 1910.1200) and Cal OSHA (Title 8 CCR 5194 (g)) hazard communication standards. Refer to Section 8 for regulatory exposure limits.
WHMIS classification: Sodium tetraborate decahydrate (*Borax*) is classified as Class D - Division 2A under Canadian WHMIS guidelines.
Chemical inventory listing: Sodium tetraborate decahydrate (*Borax*), CAS# 1303-96-4, appears on several chemical inventory lists (including the EPA TSCA inventory 1303-96-4), Canadian DSL (1303-96-4), European EINECS (215-540-4), Japanese MITI (1-69), Australian and Korean lists (9212-848) under the CAS No. representing this inorganic salt.
RCRA: Sodium tetraborate decahydrate is not listed as a hazardous waste under any sections of the Resource Conservation and Recovery Act (RCRA) or regulations (40 CFR 261 *et seq*).
Superfund: CERCLA/SARA. Sodium tetraborate decahydrate is not listed under CERCLA or its 1986 amendments, SARA, including substances listed under Section 313 of SARA, Toxic Chemicals, 42 USC 11023, 40 CFR 372.65, Section 302 of SARA, Extremely Hazardous Substances, 42 USC 11002, 40 CFR 355, or the CERCLA Hazardous Substances list, 42 USC 9604, 40 CFR 302.
Safe Drinking Water Act (SDWA): Sodium tetraborate decahydrate is not regulated under the SDWA, 42 USC 300g-1, 40 CFR 141 *et seq*. Consult state and local regulations for possible water quality advisories regarding boron compounds.
Clean Air Act (Montreal Protocol): *Borax* was not manufactured with and does not contain any Class I or Class II ozone depleting substances.
Clean Water Act (CWA) (Federal Water Pollution Control Act): 33 USC 1251 *et seq*.
a) Sodium tetraborate decahydrate (*Borax*) is not itself a discharge covered by any water quality criteria of Section 304 of the CWA, 33 USC 1314.
b) It is not on the Section 307 List of Priority Pollutants, 33 USC 1317, 40 CFR 129.
c) It is not on the Section 311 List of Hazardous Substances, 33 USC 1321, 40 CFR 116.
Canadian drinking water guideline: An "Interim Maximum Acceptable Concentration" (IMAC) for boron is currently set at 5 mg B/L.
IARC: The International Agency for Research on Cancer (IARC) (a unit of the World Health Organization) does not list or categorize Sodium tetraborate decahydrate as a carcinogen.
NTP Biennial Report on Carcinogens: Sodium tetraborate decahydrate is not listed.
OSHA carcinogen: Sodium tetraborate decahydrate is not listed.
California Proposition 65: Sodium tetraborate decahydrate (*Borax*) is not listed on the Proposition 65 list of carcinogens or reproductive toxicants.
Federal Food, Drug and Cosmetic Act: Pursuant to 21 CFR 175.105, 176.180 and 181.30, *Borax* is approved by the FDA for use in adhesive components of packaging materials, as a component of paper coatings on such materials, or for use in the manufacture thereof, which materials are expected to come in contact with dry food products.

16 Other information

References
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2. Weir R J & Fisher R S 1972. Toxicol. Appl. Pharmacol. **23**: 351-364.
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5. Murray F J, Dec 1995. Regulatory Toxicol. Pharmacol.
6. National Toxicology Program (NTP), 1987. Toxicology and carcinogenesis studies of boric acid in B6C3F1 mice, Tech. Report Ser. No. 324, U.S. Dept. of Health and Human Services. NIH Publ. No. 88-2580.
7. Whorton *et al*., 1994. Occup. Environ. Med. **51**: 761-767.
8. Hanstveit, AO, & H Oldersma, 2000. TNO Nutrition and Food Research Institute, The Netherlands. TNO report V99.157. Unpublished report to Borax Europe, Ltd
9. HERA, 2005. Risk assessment of boric acid. www.heraproject.com.
10. Hanstvelt AO and JA Schoonmade, 2000. TNO Nutrition and Food Science Research Institute, The Netherlands. TNO report V99.156 Unpublished report to Borax Europe, Ltd.
11. Hooftman et al. 2000. TNO Nutrition and Food Research Institute, The Netherlands. TNO report V99-168 Unpublished

Product label text hazard information*:
- Do not ingest.
- Eye Irritant
- Ingestion may cause reproductive harm or birth defects based on animal data.
- Avoid contamination of food or feed.
- Not for use in food, drugs or pesticides+.
- Refer to MSDS.
- KEEP OUT OF REACH OF CHILDREN.

*The WHMIS panel format is used for Canadian product.
+Except for NF (pharmaceutical grade) products.
National Fire Protection Assoc. (NFPA) Classification:
Health 1
Flammability 0
Reactivity 0
Hazardous Materials Information Systems (HMIS):
Red: (Flammability) 0
Yellow: (Reactivity) 0
Blue: (Acute Health) 1*
*Chronic Effects
For further information contact:
U.S. Borax Inc.
Product Stewardship & Sustainability Department
+1 (303) 713 5000

report to Borax Europe, Ltd.
12. Aquaterra Environmental, 1998. Guelph, Canada. Unpublished report to Environment Canada.
13. Gupta UC and JA Cutcliffe, 1984. Can J Soi Sci. 64: 571-576.
14. STANTEC/AEC 2003, 2004. Guelph, Canada. Unpublished report to Environment Canada.
15. EPFL, 2003. Lausanne, Switzerland Unpublished report to Environment Canada.

For general information on the toxicology of inorganic borates, see Patty's Industrial Hygiene and Toxicology, 5th Ed. Vol. III, (2001), Chap. 45, Boron; ECETOC Tech. Report No. 63 (1995).