



Arch Chemicals, Inc.

**MATERIAL  
SAFETY DATA**

FOR ANY EMERGENCY, CALL 24 HOURS/7 DAYS:	1-800-654-6911
FOR ALL TRANSPORTATION ACCIDENTS, CALL CHEMTREC@:	1-800-424-9300
FOR ALL MSDS QUESTIONS & REQUESTS, CALL MSDS CONTROL:	1-800-511-MSDS

**PRODUCT NAME: PULSAR® PLUS BRIQUETTES**

**SECTION 1 PRODUCT AND COMPANY IDENTIFICATION**

REVISION DATE: 03-19-2001 SUPERCEDES: None  
MSDS NO: 01534-0007 - 72302

MANUFACTURER: Arch Chemicals, Inc. 501 Merritt 7 PO Box 5204 Norwalk, CT 06856-5204

SYNONYMS: None  
CHEMICAL FAMILY: Hypochlorite  
FORMULA: Not Applicable/Mixture  
DESCRIPTION: Sanitizer and Oxidizer  
OSHA HAZARD CLASSIFICATION: Oxidizer, toxic by inhalation, corrosive, skin and eye hazard, lung toxin

SECTION 2 COMPONENT DATA

PRODUCT COMPOSITION

CAS or CHEMICAL NAME: Calcium hypochlorite  
CAS NUMBER: 7778-54-3  
PERCENTAGE RANGE: 60-80%  
HAZARDOUS PER 29 CFR 1910.1200: Yes  
EXPOSURE STANDARDS: 3 mg/cubic meter (ceiling) as Chlorine:  
Internal Exposure Standard

CAS or CHEMICAL NAME: Sodium chloride  
CAS NUMBER: 7647-14-5  
PERCENTAGE RANGE: 10-20%  
HAZARDOUS PER 29 CFR 1910.1200: No  
EXPOSURE STANDARDS: None Established

CAS or CHEMICAL NAME: Calcium chlorate  
CAS NUMBER: 10137-74-3  
PERCENTAGE RANGE: 0-5%  
HAZARDOUS PER 29 CFR 1910.1200: Yes  
EXPOSURE STANDARDS: None Established

CAS or CHEMICAL NAME: Calcium chloride  
CAS NUMBER: 10043-52-4  
PERCENTAGE RANGE: 0-5%  
HAZARDOUS PER 29 CFR 1910.1200: Yes  
EXPOSURE STANDARDS: None Established

CAS or CHEMICAL NAME: Calcium hydroxide  
CAS NUMBER: 1305-62-0

PERCENTAGE RANGE: 0-4%  
HAZARDOUS PER 29 CFR 1910.1200: Yes  
EXPOSURE STANDARDS:

	OSHA(PEL)		ACGIH(TLV)	
	ppm	mg/cubic-meter	ppm	mg/cubic-meter
TWA	None			5
CEIL	None		None	
ST	None		None	

CAS or CHEMICAL NAME: Calcium carbonate

CAS NUMBER: 471-34-1

PERCENTAGE RANGE: 0-4%

HAZARDOUS PER 29 CFR 1910.1200: Yes

EXPOSURE STANDARDS:

	OSHA(PEL)		ACGIH(TLV)	
	ppm	mg/cubic-meter	ppm	mg/cubic-meter
TWA:		15 (Total dust) 5 (Respirable fraction)		10
CEILING:	None		None	
STEL:	None		None	

CAS or CHEMICAL NAME: 2-Phosphono-1,2,4-tricarboxylic acid, sodium salt

CAS NUMBER: 40372-66-5

PERCENTAGE RANGE: 0.2-0.8%

HAZARDOUS PER 29 CFR 1910.1200: No

EXPOSURE STANDARDS: None Established

CAS or CHEMICAL NAME: Water

CAS NUMBER: 7732-18-5

PERCENTAGE RANGE: 4-10%

HAZARDOUS PER 29 CFR 1910.1200: No

EXPOSURE STANDARDS: None Established

### SECTION 3 PRECAUTIONS FOR SAFE HANDLING AND STORAGE

DO NOT TAKE INTERNALLY. AVOID INHALATION OF DUST AND FUMES. AVOID CONTACT WITH EYES, SKIN OR CLOTHING. UPON CONTACT WITH SKIN OR EYES, WASH OFF WITH WATER. REMOVE AND WASH CONTAMINATED CLOTHING BEFORE REUSE.

STORAGE CONDITIONS: Keep product tightly sealed in original containers. Store product in a cool, dry, well-ventilated area. Store away from combustible or flammable products. Keep product packaging clean and free of all contamination, including, e.g., other pool treatment products, acids, organic materials, nitrogen-containing compounds, dry powder fire extinguishers (containing mono-ammonium phosphate), oxidizers, all corrosive liquids, flammable or combustible materials, etc.

DO NOT STORE AT TEMPERATURES ABOVE: 52 Deg.C (125 Deg.F)

Storage above this temperature may result in rapid decomposition, evolution of chlorine gas and heat sufficient to ignite combustible products.

#### PRODUCT STABILITY AND COMPATIBILITY

SHELF LIFE LIMITATIONS: Shelf life (that is, the period of time before the product goes below stated label strength) is determined by storage time and temperatures. Do not store product at temperatures above 52 Deg.C (125 Deg.F). When stored under moderate temperature conditions, product will maintain stated label strength for approximately two years. Prolonged storage at 35 Deg.C (95 Deg.F) or above will significantly shorten the shelf life. Storage in a climate-controlled storage area or building is recommended in those areas where extremes of high temperature occur.

INCOMPATIBLE MATERIALS FOR PACKAGING: Product packaging must be clean

and free of contamination by other materials, including, e.g., other pool treatment products, acids, organic materials, nitrogen-containing compounds, dry powder fire extinguishers (containing mono-ammonium phosphate), oxidizers, all corrosive liquids, flammable or combustible materials, etc.

INCOMPATIBLE MATERIALS FOR STORAGE OR TRANSPORT: Do not allow product to come in contact with other materials, including, e.g., other pool treatment products, acids, organic materials, nitrogen-containing compounds, dry powder fire extinguishers (containing mono-ammonium phosphate), oxidizers, all corrosive liquids, flammable or combustible materials, etc.

#### SECTION 4 PHYSICAL DATA

APPEARANCE: White tablet-form product  
FREEZING POINT: Not Applicable  
BOILING POINT: Not Applicable  
DECOMPOSITION TEMPERATURE: onset - approx. 170-180 Deg.C (338-356 Deg.F)  
SPECIFIC GRAVITY: Not Applicable  
pH @ 25 DEG.C: 10.4-10.8 (1% soln.)  
SOLUBILITY IN WATER: Approximately 18% @ 25 Deg.C. (Product contains calcium hydroxide and calcium carbonate which will leave a residue.)  
BULK DENSITY: 0.8 g/cc, loose (granules), 1.9 g/cc (tablets)  
VAPOR PRESSURE @ 25 DEG.C: Not Applicable  
VOLATILES, PERCENT BY VOLUME: Not Applicable  
EVAPORATION RATE: Not Applicable  
VAPOR DENSITY: Not Applicable  
MOLECULAR WEIGHT: 143 (Active ingredient)  
ODOR: Chlorine-like  
COEFFICIENT OF OIL/WATER DISTRIBUTION: Not Applicable

#### SECTION 5 PERSONAL PROTECTIVE EQUIPMENT REQUIREMENTS

PERSONAL PROTECTION FOR ROUTINE USE OF PRODUCT:  
RESPIRATORY PROTECTION: Wear NIOSH approved respirator if dusts are created.  
VENTILATION: Use local exhaust ventilation to minimize dust and chlorine levels where industrial use occurs. Otherwise, ensure good general ventilation.  
SKIN AND EYE PROTECTIVE EQUIPMENT: Wear gloves, and safety glasses to avoid skin and eye contact. Where industrial use occurs, chemical goggles or full impermeable suit may be required.  
EQUIPMENT SPECIFICATIONS (WHEN APPLICABLE):  
RESPIRATOR TYPE: NIOSH approved full face-piece respirator with chlorine cartridges and dust/mist prefilter.  
PROTECTIVE CLOTHING TYPE: (This includes: gloves, boots, apron, protective suit): Neoprene

#### SECTION 6 FIRE AND EXPLOSION HAZARD INFORMATION

This product is chemically reactive with many substances. Any contamination of the product with other substances by spill or otherwise may result in a chemical reaction and fire. This product is a strong oxidizer which is capable of intensifying a fire once started.

##### FLAMMABILITY DATA:

FLAMMABLE: No  
COMBUSTIBLE: No  
PYROPHORIC: No  
FLASH POINT: Not Applicable  
AUTOIGNITION TEMPERATURE: Not Applicable  
FLAMMABLE LIMITS AT NORMAL ATMOSPHERIC TEMPERATURE AND PRESSURE (PERCENT

VOLUME IN AIR): UEL - Not Applicable

LEL - Not Applicable

NFPA RATINGS:

Health: 3  
Flammability: 0  
Reactivity: 1  
Special Hazard Warning: OX (OXIDIZER)

HMIS RATINGS:

Health: 3  
Flammability: 0  
Reactivity: 1

EXTINGUISHING MEDIA:

Water only

FIRE FIGHTING TECHNIQUES AND COMMENTS:

Use water to cool containers exposed to fire. Also see Section XI.

OTHER: Do not use dry extinguishers containing ammonium compounds

SECTION 7 REACTIVITY INFORMATION

CONDITIONS UNDER WHICH THIS PRODUCT MAY BE UNSTABLE:

TEMPERATURES ABOVE: 170 Deg.C (338 Deg.F)

MECHANICAL SHOCK OR IMPACT: No

ELECTRICAL (STATIC) DISCHARGE: No

HAZARDOUS POLYMERIZATION: Will not occur

INCOMPATIBLE MATERIALS: This product is chemically reactive with many substances, including, e.g., other pool treatment products, acids, organics, nitrogen-containing compounds, dry powder fire extinguishers (containing mono-ammonium phosphate), oxidizers, corrosive, flammable or combustible materials.

HAZARDOUS DECOMPOSITION PRODUCTS: Chlorine gas

OTHER CONDITIONS TO AVOID: Storage at temperatures >125 Deg.F (52 Deg.C)

Prevent ingress of humidity and moisture into container or package.

Always close the lid.

SUMMARY OF REACTIVITY: (See also Section VI)

OXIDIZER: Yes

PYROPHORIC: No

ORGANIC PEROXIDE: No

WATER REACTIVE: No

OTHER: Arch calcium hypochlorite products meet the specifications of ASTM method E-487-74 as set forth in 49 C. F. R. Sec. 173.21, Title 49-Code of Federal Regs.(DOT Regs.)

SECTION 8 FIRST AID

EYES: Immediately flush with large amounts of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Call a physician at once.

SKIN: Immediately flush with water for at least 15 minutes. Call a physician. If clothing comes in contact with the product, it should be removed immediately and laundered before reuse.

INGESTION: Immediately drink large quantities of water. DO NOT induce vomiting. Call a physician at once. DO NOT give anything by mouth if the person is unconscious or if having convulsions.

INHALATION: Remove victim to fresh air. Support respiration if needed. Call a physician.

## SECTION 9 TOXICOLOGY AND HEALTH INFORMATION

### ROUTES OF ABSORPTION

Inhalation, skin and eye contact, ingestion

### WARNING STATEMENT AND WARNING PROPERTIES

MAY BE FATAL IF SWALLOWED. AVOID BREATHING DUST OR FUMES. HARMFUL IF PRODUCT IS INHALED IN HIGH CONCENTRATIONS. CAUSES SKIN, EYE, DIGESTIVE TRACT AND RESPIRATORY TRACT BURNS.

### HUMAN RESPONSE DATA

ODOR THRESHOLD: Approximately 1.4 mg/cubic-meter, based on odor threshold of chlorine.

IRRITATION THRESHOLD: Approximately 13-22 mg/cubic meter, based on the irritation threshold of chlorine.

IMMEDIATELY DANGEROUS TO LIFE OR HEALTH: Approximately 45 mg/cubic-meter, based on IDLH concentration of chlorine.

### SIGNS, SYMPTOMS, AND EFFECTS OF EXPOSURE

#### INHALATION

##### ACUTE:

Inhalation of dust or vapor from this product can be irritating to the nose, mouth, throat and lungs. In confined areas, mechanical agitation can result in high levels of dust, and reaction with incompatible materials (as listed in Section VII) can result in high concentrations of chlorine vapor, either of which may result in burns to the respiratory tract, producing lung edema, shortness of breath, wheezing, choking, chest pains, impairment of lung function and possible permanent lung damage.

##### CHRONIC:

Chronic (repeated) inhalation exposure may cause impairment of lung function and permanent lung damage.

#### EYE

Severe irritation and/or burns can occur following eye exposure. Contact may cause impairment of vision and corneal damage.

#### SKIN

##### ACUTE:

Dermal exposure can cause severe irritation and/or burns characterized by redness, swelling and scab formation. Prolonged skin exposure may cause permanent damage.

##### CHRONIC:

Effects from chronic skin exposure would be similar to those from single exposure except for effects secondary to tissue destruction.

#### INGESTION

##### ACUTE:

Irritation and/or burns can occur to the entire gastrointestinal tract, including the stomach and intestines, characterized by nausea, vomiting, diarrhea, abdominal pain, bleeding and/or tissue ulceration. Due to the corrosive nature of this product, ingestion may be fatal.

##### CHRONIC:

There are no known or reported effects from chronic exposure except for effects similar to those experienced from single exposure.

### MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE

Asthma, respiratory and cardiovascular disease

### INTERACTIONS WITH OTHER CHEMICALS WHICH ENHANCE TOXICITY

None known or reported

ANIMAL TOXICOLOGY

ACUTE TOXICITY:

Inhalation LC 50: Approximately 1300 mg/cubic-meter (1 hr., rat) -  
based on acute inhalation toxicity for chlorine  
Oral LD 50: 850 mg/kg. (rat)  
Dermal LD 50: > 2 g/kg. (rabbit)  
Causes burns to eyes and skin

ACUTE TARGET ORGAN TOXICITY:

This product may be severely irritating and/or corrosive to all tissues contacted and upon inhalation, may cause irritation to the mucous membranes and upper respiratory tract.

CHRONIC TARGET ORGAN TOXICITY:

There are no known or reported effects from repeated exposure.

REPRODUCTIVE TOXICITY:

Calcium hypochlorite has been tested for teratogenicity in laboratory animals. Results of this study have shown that calcium hypochlorite is not a teratogen.

CARCINOGENICITY:

This product is not known or reported to be carcinogenic by any reference source, including: IARC, OSHA, NTP or EPA.

One hundred mice were exposed dermally 3 times a week for 18 months to a solution of calcium hypochlorite. Histopathological examination failed to show an increased incidence of tumors.

IARC (International Agency for Research on Cancer) reviewed studies conducted with several hypochlorite salts. IARC has classified hypochlorite salts as having inadequate evidence for carcinogenicity to humans and animals. IARC therefore considers hypochlorite salts to be not classifiable as to their carcinogenicity to humans.

MUTAGENICITY:

Calcium hypochlorite has been tested in the Dominant lethal assay in male mice, and it did not induce a dominant lethal response.

Calcium hypochlorite has been reported to produce mutagenic activity in two in vitro assays. It has, however, been shown to lack the capability to produce mutations in animals based on results from the micronucleus assay. In vitro assays frequently are inappropriate to judge the mutagenic potential of bactericidal chemicals due to a high degree of cellular toxicity. The concentration which produces mutations in these in vitro assays is significantly greater than the concentrations used for disinfection. Based on high cellular toxicity in in vitro assays and the lack of mutagenicity in animals, the risk of genetic damage to humans is judged not significant.

AQUATIC TOXICITY:

Bluegill, 96 hr. LC50: 0.088 mg/l (nominal, static)  
Rainbow trout, 96 hr. LC50: 0.16 mg/l (nominal, static)  
Daphnia magna, 48 hr. LC50: 0.11 mg/l (nominal, static)

TOXICITY TO WILDLIFE:

Bobwhite quail, dietary LC50: > 5,000 ppm  
Mallard ducklings, dietary LC50: > 5,000 ppm  
Bobwhite quail, oral LD50: 3474 mg/kg.

SECTION 10 TRANSPORTATION INFORMATION

THIS MATERIAL IS REGULATED AS A DOT HAZARDOUS MATERIAL.

DOT DESCRIPTION FROM THE HAZARDOUS MATERIALS TABLE 49 CFR 172.101:  
LAND (U.S. DOT): CALCIUM HYPOCHLORITE MIXTURES DRY, 5.1, UN 1748,  
PG2

WATER (IMO): SAME AS ABOVE

AIR (IATA/ICAO): SAME AS ABOVE

HAZARD LABEL/PLACARD: OXIDIZER  
REPORTABLE QUANTITY: 10 lbs. (Per 49 CFR 172.101, Appendix)  
EMERGENCY GUIDE NO: 45

#### SECTION 11 SPILL AND LEAKAGE PROCEDURES

FOR ALL TRANSPORTATION ACCIDENTS, CALL CHEMTREC AT 800-424-9300.  
REPORTABLE QUANTITY: 10 lbs. (as Calcium hypochlorite) Per 40 CFR 302.4

#### SPILL MITIGATION PROCEDURES:

Hazardous concentrations in air may be found in local spill area and immediately downwind. Remove all sources of ignition. Stop source of spill as soon as possible and notify appropriate personnel.

AIR RELEASE: Vapors may be suppressed by the use of a water fog. All water utilized to assist in fume suppression, decontamination or fire suppression may be contaminated and must be contained before disposal and/or treatment.

WATER RELEASE: This material is heavier than water. This material is soluble in water. Monitor all exit water for available chlorine and pH. Advise local authorities of any contaminated water release.

LAND SPILL: Contact at 1-800-6546-911 immediately.  
DANGER: All spills of this product should be treated as contaminated. Contaminated product may initiate a chemical reaction which may spontaneously ignite any combustible material present, resulting in a fire of great intensity. In case of a spill, separate all spilled product from packaging, debris and other material. Using a clean broom or shovel, place all spilled product into plastic bags, and place those bags into a clean, dry disposal container, properly marked and labelled. Disposal containers made of plastic or metal are recommended. Do not seal disposal containers tightly. Immediately remove all product in disposal containers to an isolated area outdoors. Place all damaged packaging material in a disposal container of water to assure decontamination (i.e. removal of all product) before disposal. Place all undamaged packaging in a clean, dry container properly marked and labelled. Call for disposal procedures.

#### SPILL RESIDUES:

Dispose of per guidelines under Section 12, WASTE DISPOSAL.  
This material may be neutralized for disposal; you are requested to contact at 800-6546-911 before beginning any such operation.

#### PERSONAL PROTECTION FOR EMERGENCY SPILL AND FIRE-FIGHTING SITUATIONS:

Response to this material requires the use of a full encapsulated suit and a NIOSH approved positive pressure supplied air respirator.

## SECTION 12 WASTE DISPOSAL

If this product becomes a waste, it meets the criteria of a hazardous waste as defined under 40 CFR 261 and would have the following EPA hazardous waste number: D001.

If this product becomes a hazardous waste, it will be a hazardous waste which is subject to the Land Disposal Restrictions under 40 CFR 268 and must be managed accordingly.

As a hazardous solid waste, it must be disposed of in accordance with local, state, and federal regulations in a permitted hazardous waste treatment, storage and disposal facility by treatment.

CARE MUST BE TAKEN TO PREVENT ENVIRONMENTAL CONTAMINATION FROM THE USE OF THIS MATERIAL. THE USER OF THIS MATERIAL HAS THE RESPONSIBILITY TO DISPOSE OF UNUSED MATERIAL, RESIDUES AND CONTAINERS IN COMPLIANCE WITH ALL RELEVANT LOCAL, STATE AND FEDERAL LAWS AND REGULATIONS REGARDING TREATMENT, STORAGE AND DISPOSAL FOR HAZARDOUS AND NONHAZARDOUS WASTES.

## SECTION 13 ADDITIONAL REGULATORY STATUS INFORMATION

### TOXIC SUBSTANCES CONTROL ACT:

This substance is listed on the Toxic Substances Control Act inventory.

NSF LIMITS: NSF Maximum Drinking Water Use Concentration - 46 mg/l  
as calcium hypochlorite

### SUPERFUND AMENDMENTS AND REAUTHORIZATION ACT TITLE 3: HAZARD CATEGORIES, PER 40 CFR 370.2:

#### HEALTH:

Immediate (Acute)

#### PHYSICAL:

Fire and Reactivity

### EMERGENCY PLANNING AND COMMUNITY RIGHT TO KNOW, PER 40 CFR 355, APP.A: EXTREME HAZARDOUS SUBSTANCE - THRESHOLD PLANNING QUANTITY:

None Established

### SUPPLIER NOTIFICATION REQUIREMENTS, PER 40 CFR 372.45:

None Established

## SECTION 14 ADDITIONAL INFORMATION

REGULATED UNDER FIFRA, USDA & FDA

MSDS REVISION STATUS: Changes have been made to Sections 5, 9 and 11.

## SECTION 15 MAJOR REFERENCES

1. Ishidate, M. et al. (1984). Primary mutagenicity screening of food additives currently used in Japan. *Fd. Chem. Toxicol.* 22:623-636.
2. Hayashi, M. et al. (1988). Micronucleus tests in mice on 39 food additives and eight miscellaneous chemicals. *Fd. Chem. Toxicol.* 26:487-500.
3. Report on the Acute Inhalation in Rats, Acute Oral LD50 in Rats, Eye Irritation in Rabbits, Dermal Irritation in Rabbits, and Acute Dermal Toxicity in Rabbits of HTH. Biometric Testing Laboratories, Inc., Whippany, NJ. Experiment Reference #A-1490 (RC-30406), February 9, 1975.
4. Report on the Teratogenic Study with Calcium Hypochlorite in Albino Rats. Industrial Bio-Test Laboratories, Inc., Northbrook, IL. IBT

- #B758b, April 18, 1972.
5. Report on the Mutagenic Study with Monosodium Cyanurate and Calcium Hypochlorite (HTH) in Albino Mice. Industrial Bio-Test Laboratories, Inc., Northbrook, IL. IBT #E756. April 18, 1972.
  6. Chemical Hazard Summary No. 20: Calcium Hypochlorite. Canadian Centre for Occupational Health and Safety, Hamilton, Ontario, Canada L8N 1H6. December 1986.
  7. Report on 18-Month Dermal Carcinogenicity Study with Monosodium Cyanuric Acid and HTH in Swiss White Mice. Industrial Bio-Test Laboratories, Inc., Northbrook, IL, IBT #651-00751, April 9, 1974.
  8. Report to PPG Industries, Inc. on the Acute Toxicity Studies with PITTCHLOR (Granular Calcium Hypochlorite). Industrial Bio-Test Laboratories, Inc., Northbrook, IL, IBT #601-06659, May 7, 1975.
  9. Report on the Acute Toxicity of HTH to Bluegill, Rainbow Trout and the Water Flea. E G & G, Bionomics Aquatic Toxicology Laboratory, Wareham, MA, July 1977.
  10. Report on the 8-Day Dietary LD50 Study with HTH in Mallard Ducklings. Industrial Bio-Test Laboratories, Inc., Northbrook, IL, IBT #651-06184, May 15, 1975.
  11. Report on the 8-Day Dietary LC50 with HTH in Bobwhite Quail. Industrial Bio-Test Laboratories, Inc., Northbrook, IL, IBT #651-06183.
  12. Final Report on the Acute Oral LD50 of Calcium Hypochlorite in Bobwhite Quail. Wildlife International, LTD., Easton, MD, Project #133-107, July 15, 1977.
  13. IARC Monographs on the Evaluation of Carcinogenic Risks to Humans. Vol.52: Chlorinated Drinking Water; Chlorination By-Products; Some Other Halogenated Compounds; Cobalt and Cobalt Compounds. World Health Organization, International Agency for Research on Cancer (IARC), Lyon, France, 1991.
  14. Sittig, Marshall, Handbook of Toxic and Hazardous Chemicals and Carcinogens, 2nd Ed., Noyes Publications, Park Ridge, NJ, 1985.
  15. Chemical Hazard Response Information System (CHRIS), Vol. II, U.S. Coast Guard, Washington, D.C., 1984.
  16. Chlorine and Your Health. The Chlorine Institute, Inc., Washington, D.C., August 1988.
  17. ACGIH Documentation of the Threshold Limit Values and Biological Exposure Indices, Sixth Edition, 1991. American Conference of Governmental Industrial Hygienists, Inc., Cincinnati, OH.
  18. Amooore, John E. and Earl Hautala, Odor as an Aid to Chemical Safety: Odor Thresholds Compared with Threshold Limit Values and Volatiles for 214 Industrial Chemicals in Air and Water Dilution. Journal of Applied Toxicology, Vol. 3, No. 6, pp. 272-290, 1983.
  19. Forsberg, K., and S.Z. Mansdorf, Quick Selection Guide to Chemical Protective Clothing, Second Edition, Van Nostrand Reinhold, N.Y., 1993.

Additional references are available upon request.

THIS MATERIAL SAFETY DATA SHEET (MSDS) HAS BEEN PREPARED IN COMPLIANCE WITH THE FEDERAL OSHA HAZARD COMMUNICATION STANDARD, 29 CFR 1910.1200. THE INFORMATION IN THIS MSDS SHOULD BE PROVIDED TO ALL WHO WILL USE, HANDLE, STORE, TRANSPORT, OR OTHERWISE BE EXPOSED TO THIS PRODUCT. THIS INFORMATION HAS BEEN PREPARED FOR THE GUIDANCE OF PLANT ENGINEERING, OPERATIONS AND MANAGEMENT AND FOR PERSONS WORKING WITH OR HANDLING THIS PRODUCT. ARCH CHEMICALS BELIEVES THIS INFORMATION TO BE RELIABLE AND UP TO DATE AS OF THE DATE OF PUBLICATION BUT, MAKES NO WARRANTY THAT IT IS. ADDITIONALLY, IF THIS MSDS IS MORE THAN THREE YEARS OLD, YOU SHOULD CONTACT ARCH CHEMICALS MSDS CONTROL AT THE PHONE NUMBER ON THE FRONT PAGE TO MAKE CERTAIN THAT THIS DOCUMENT IS CURRENT.

**Arch Chemicals, Inc.**  
MSDS Control  
501 Merritt 7  
PO Box 5204  
Norwalk, CT 06856-5204

