

1

ATTACHMENT C-3

2

APPLICABLE MSDS INFORMATION FOR MUNITIONS



Material Safety Data Sheet

Distilled Mustard (HD)

Date: 22 September 1988
Revised: 29 September 1999



In the event of an emergency:
Telephone the SBCCOM Operations
Center's 24-hour emergency
Number: 410-436-2148

Section I - General Information

Manufacturer's Address:
U.S. Army Soldier and Biological Chemical Command (SBCCOM)
Edgewood Chemical Biological Center (ECBC)
ATTN: AMSSB-RCB-RS
Aberdeen Proving Ground, MD 21010-5424

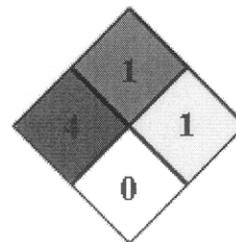
CAS Numbers 505-60-2, 39472-40-7, 68157-62-0

Chemical Name: Bis-(2-chloroethyl)sulfide

Trade name and synonyms:

H; HD; HS
Mustard Gas
Sulfur mustard; Sulphur mustard gas
Sulfide, bis (2-chloroethyl)
Bis(beta-chloroethyl)sulfide
1,1'-thiobis(2-chloroethane)
1-chloro-2(beta-chloroethylthio)ethane
Beta, beta'-dichlorodiethyl sulfide
2,2'dichlorodiethyl sulfide
Di-2-chloroethyl sulfide Beta, beta'-dichloroethyl sulfide Iprit S-Lost;
S-yperite; Schewefel-lost
Senfgas
Yellow Cross Liquid
Yperite; Y

EA 1033

Chemical Family: Chlorinated sulfur compound**Formula/Chemical Structure:**C₄ H₈ Cl₂ SCl CH₂ CH₂--S--CH₂ CH₂ Cl**NFPA 704 Signal:**

Health - 4

Flammability - 1

Reactivity - 1

Special - 0

Section II - Ingredients

Ingredients/Name: Sulfur Mustard**Percentage by Weight:** 100%**Threshold Limit Value (TLV):** 0.003mg/m³

Section III - Physical Data

Boiling Point °F (°C): Calculated 423.5 °F (217.5 °C) (decomposed)**Vapor Pressure (mm Hg):**

0.069 @ 20 °C

0.11 @ 25 °C

Vapor Density (Air = 1): 5.5**Solubility (g/100g solvent):** Negligible in water (0.92 @ 22 °C). Soluble in fats and oils, gasoline, kerosene, acetone, carbon tetrachloride, alcohol, tetrachloroethane, ethylbenzoate, and ether. Miscible with the organophosphorus nerve agents.**Specific Gravity (H₂O=1):** 1.27 @ 25 °C**Freezing/Melting Point (°C):** 14.45**Liquid Density (g/mL):**

1.274 g/mL @ 20 °C

1.268 g/mL @ 25 °C

Volatility (mg/m³):

600 @ 20 °C

910 @ 25 °C

Viscosity (Centipoise): 5.175 @ 20 °C

Molecular Weight (g/mol): 159.08

Appearance and Odor: Normally amber to black colored liquid with garlic or horseradish odor. Water clear if pure. The odor threshold for HD is 0.6 mg/m³ (0.0006 mg/L).

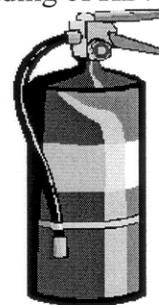
Section IV - Fire and Explosion Data

Flashpoint: 105 °C (Can be ignited by large explosive charges)

Flammability Limits (% by volume): Unknown

Extinguishing Media: Water, fog, foam, CO₂. Avoid use of extinguishing methods that will cause splashing or spreading of HD.

Special Fire Fighting Procedures: All persons not engaged in extinguishing the fire should be immediately evacuated from the area. Fires involving HD should be contained to prevent contamination to uncontrolled areas. When responding to a fire alarm in buildings or areas containing agents, firefighting personnel should wear full firefighter protective clothing (flame resistant) during chemical agent firefighting and fire rescue operations. Respiratory protection is required. Positive pressure, full facepiece, NIOSH-approved self-contained breathing apparatus (SCBA) will be worn where there is danger of oxygen deficiency and when directed by the fire chief or chemical accident/incident (CAI) operations officer. In cases where firefighters are responding to a chemical accident/incident for rescue/reconnaissance purposes, they will wear appropriate levels of protective clothing (See Section VIII). Do not breathe fumes. Skin contact with agent must be avoided at all times. Although the fire may destroy most of the agent, care must still be taken to ensure the agent or contaminated liquids do not further contaminate other areas or sewers. Contact with the agent, liquid or vapor, can be fatal.



Section V - Health Hazard Data

Airborne Exposure Limit (AEL): The AEL for HD is 0.003 mg/m^3 as found in "DA Pam 40-173, Occupational Health Guidelines for the Evaluation and Control of Occupational Exposure to Mustard Agents H, HD, and HT." To date, the Occupational Safety and Health Administration (OSHA) has not promulgated a permissible exposure concentration for HD.

Effects of Overexposure: HD is a vesicant (causing blisters) and alkylating agent producing cytotoxic action on the hematopoietic (blood-forming) tissues which are especially sensitive. The rate of detoxification of HD in the body is very slow and repeated exposures produce a cumulative effect. HD has been found to be a human carcinogen by the International Agency for Research on Cancer (IARC).

Median doses of HD in man are:

LD50 (skin) = 100 mg/kg

ICt50 (skin) = 2000 mg-min/m^3 at 70 - 80 °F (humid environment)
= 1000 mg-min/m^3 at 90 °F (dry environment)

ICt50 (eyes) = 200 mg-min/m^3

ICt50 (inhalation) = 1500 mg-min/m^3

LD50 (oral) = 0.7 mg/kg

Maximum safe Ct for skin and eyes are 5 and 2 mg-min/m^3 , respectively.

Acute Physiological Action of HD is Classified as Local and Systemic.

Local Actions: HD effects both the eyes and the skin. Skin damage occurs after percutaneous absorption. Being lipid soluble, HD can be absorbed into all organs. Skin penetration is rapid without skin irritation. Swelling (blisters) and reddening (erythema) of the skin occurs after a latency period of 4-24 hours following the exposure, depending on degree of exposure and individual sensitivity. The skin healing process is very slow. Tender skin, mucous membrane and perspiration-covered skin is more sensitive to the effects of HD. HD's effect on the skin, however, is less than on the eyes. Local action on the eyes produces severe necrotic damage and loss of eyesight. Exposure of eyes to HD vapor or aerosol produces lacrimation, photophobia, and inflammation of the conjunctiva and cornea.

Systemic Actions: Occurs primarily through inhalation and ingestion. The HD vapor or aerosol is less toxic to the skin or eyes than the liquid form. When inhaled, the upper respiratory tract (nose, throat,

trachea) is inflamed after a few hours latency period, accompanied by sneezing, coughing, and bronchitis, loss of appetite, diarrhea, fever, and apathy. Exposure to nearly lethal doses of HD can produce injury to bone marrow, lymph nodes, and spleen as shown by a drop in white blood cell count, thus resulting in increased susceptibility to local and systemic infections. Ingestion of HD will produce severe stomach pains, vomiting, and bloody stools after a 15-20 minute latency period.

Chronic Exposure: HD can cause sensitization, chronic lung impairment, (cough, shortness of breath, chest pain), cancer of the mouth, throat, respiratory tract and skin, and leukemia. It may also cause birth defects.

Emergency and First Aid Procedures:

Inhalation: Hold breath until respiratory protective mask is donned. Remove from the source **Immediately**. If breathing is difficult, administer oxygen. If breathing has stopped, give artificial respiration. Mouth-to-mouth resuscitation should be used when approved mask-bag or oxygen delivery systems are not available. Do not use mouth-to-mouth resuscitation when facial contamination is present. Seek medical attention **Immediately**.



Eye Contact: Speed in decontaminating the eyes is absolutely essential. Remove the person from the liquid source, flush the eyes **Immediately** with water for at least 15 minutes by tilting the head to the side, pulling the eyelids apart with the fingers and pouring water slowly into the eyes. Do not cover eyes with bandages but, if necessary, protect eyes by means of dark or opaque goggles. Transfer the patient to a medical facility **Immediately**.

Skin Contact: Don respiratory protective mask. Remove the victim from agent sources **Immediately**. Immediately wash skin and clothes with 5% solution of sodium hypochlorite or liquid household bleach within one minute. Cut and remove contaminated clothing, flush contaminated skin area again with 5% sodium hypochlorite solution, then wash contaminated skin area with soap and water. Seek medical attention **Immediately**.

Ingestion: Do not induce vomiting. Give victim milk to drink. Seek medical attention **Immediately**.

Section VI - Reactivity Data

Stability: Stable at ambient temperatures. Decomposition temperature is 100-351 °F (149-117 °C). Mustard is a



persistent agent depending on pH and moisture and has been known to remain active for up to three years in soil.



Incompatibility: Rapidly corrosive to brass @ 65 °C. Will corrode steel at a rate of 0.0001 in. of steel per month @ 65 °C.

Hazardous Decomposition: Mustard will hydrolyze to form HCl and thiodiglycol.

Hazardous Polymerization: Does not occur.

Section VII - Spill, Leak, and Disposal Procedures

Steps To Be Taken In Case Material Is Released Or Spilled: Only personnel in full protective clothing (See Section VIII) will be allowed in an area where HD is spilled. See Section V for emergency and first aid instructions.

Recommended Field Procedures: The HD should be contained using vermiculite, diatomaceous earth, clay, or fine sand and neutralized as soon as possible using copious amounts of 5.25% sodium hypochlorite solution. Scoop up all material and place in an approved DOT container. Cover the contents with decontaminating solution as above. The exterior of the container will be decontaminated and labeled according to EPA and DOT regulations. All leaking containers will be over packed with sorbent (e.g. vermiculite) placed between the interior and exterior containers. Decontaminate and label according to EPA and DOT regulations. Dispose of the material in accordance with waste disposal methods provided below. Conduct general area monitoring with an approved monitor to confirm that the atmospheric concentrations do not exceed the airborne exposure limits (See Sections II and VIII). If 5.25% sodium hypochlorite solution is not available then the following decontaminants may be used instead and are listed in the order of preference: Calcium Hypochlorite, Contamination Solution No. 2 (DS2), and Super Tropical Bleach Slurry (STB).

Warning: Pure, undiluted calcium hypochlorite (HTH) will burn on contact with liquid HD.

Recommended Laboratory Procedures:

Decontamination solution for each gram of HD. Allow 24 hours for decontamination to take place. Agitate solution at least one hour. Agitation is not necessary after the first hour. Testing for presence of active chlorine by use of



acidic potassium iodide solution to give free iodine color. Adjust the resulting solution pH to between 10 and 11.



Place three milliliters (ml) of decontaminated solution in a test tube. Add several crystals of potassium iodine and swirl to dissolve. Add 3 ml of 50 wt.% sulfuric acid:water and swirl. IMMEDIATE iodine color shows the presence of active chlorine. If negative, add additional decontaminant to the decontamination solution, wait two hours, and test again for active chlorine. This works for either 5.5% sodium hypochlorite or 10% calcium hypochlorite decontamination solution.

Scoop up all materials and clothing and place in an approved DOT container. The exterior of the container will be decontaminated and labeled according to EPA and DOT regulations. All leaking containers will be over packed with sorbent (e.g. vermiculite) placed between the interior and exterior containers. Decontaminate and label according to EPA and DOT regulations. Dispose of the material in accordance with waste disposal methods provided below. Conduct general area monitoring with an approved monitor to confirm that the atmospheric concentrations do not exceed the airborne exposure limits (See Section VIII).

Note: Surfaces contaminated with HD, then rinsed and decontaminated may evolve sufficient HD vapor to produce a physiological response. HD on laboratory glassware may be oxidized by its vigorous reaction with concentrated nitric acid.

Waste Disposal Method: Open pit burning or burying of HD or items containing or contaminated with HD in any quantity is prohibited. Decontamination of waste or excess material shall be accomplished according to the procedures outlined above and can be destroyed by incineration in EPA approved incinerators according to appropriate provisions of Federal, State, and local Resource Conservation Recovery Act (RCRA) regulations.

Note: Some decontaminant solutions are hazardous waste according to RCRA regulations and must be disposed of according to those regulations.

Section VIII - Special Protection Information

Respiratory Protection:

Concentration

$\leq 0.003 \text{ mg/m}^3$ as an 8-hr TWA

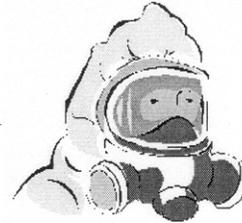
Respiratory Protective Equipment

Protective mask not required to be worn provided that:

(a) Monitoring will be conducted to confirm that engineering controls are properly maintaining concentrations $\leq 0.003 \text{ mg/m}^3$ as an 8-hr TWA.

(b) M40-series mask is available for emergency escape purposes.

(c) Exposure has been limited to the extent practicable by engineering controls (remote operations, ventilation, and process isolation) and work practices.



If these conditions are not met, then follow the guidance for $\geq 0.003 \text{ mg/m}^3$ as an 8-hr TWA.

Concentration

$\geq 0.003 \text{ mg/m}^3$ as an 8-hr TWA

Respiratory Protective Equipment

NIOSH/MSHA approved, pressure demand full face piece SCBA suitable for use in high agent concentrations with protective ensemble. (See DA Pam 386-61 for examples).

Ventilation

Local Exhaust: Mandatory. Must be filtered or scrubbed. Air emissions shall meet local, state, and federal regulations.

Special: Chemical laboratory hoods will have an average inward face velocity of 100 linear feet per minute (lfpm) $\pm 20\%$ with the velocity at any point not deviating from the average face velocity by more than 20%. Existing laboratory hoods will have an inward face velocity of 150 lfpm $\pm 20\%$. Laboratory hoods will be located such that cross drafts do not exceed 20% of the inward face velocity. A visual performance test using smoke producing devices will be performed in assessing the ability of the hood to contain agent HD.

Other: Recirculation of exhaust air from agent areas is prohibited. No connection between agent area and other areas through the ventilation system is permitted. Emergency backup power is necessary. Hoods should be tested semiannually or after modification or maintenance operations. Operations should be performed 20 centimeters inside

hoods.

Protective Gloves: Butyl Rubber gloves M3 and M4 Norton, Chemical Protective Glove Set

Eye Protection: As a minimum, chemical goggles will be worn. For splash hazards use goggles and face shield.

Other Protective Equipment: For laboratory operations, wear lab coats, gloves, and have mask readily accessible. In addition, daily clean smocks, foot covers, and head covers will be required when handling contaminated lab animals.

Monitoring: Available monitoring equipment for agent HD is the M8/M9 detector paper, blue band tube, M256/M256A1 kits, bubbler, Depot Area Air Monitoring System (DAAMS), Automated Continuous Air Monitoring System (ACAMS), CAM-M1, Hydrogen Flame Photometric Emission Detector (HYFED), the Miniature Chemical Agent Monitor (MINICAM), and Real Time Analytical Platform (RTAP). Real-time, low-level monitors (with alarm) are required for HD operations. In their absence, an Immediately Dangerous to Life and Health (IDLH) atmosphere must be presumed. Laboratory operations conducted in appropriately maintained and alarmed engineering controls require only periodic low-level monitoring.

Section IX - Special Precautions

Precautions To Be Taken In Handling and Storing: When handling agents, the buddy system will be incorporated. No smoking, eating, or drinking in areas containing agents is permitted. Containers should be periodically inspected for leaks, (either visually or using a detector kit). Stringent control over all personnel practices must be exercised. Decontaminating equipment will be conveniently located. Exits must be designed to permit rapid evacuation. Chemical showers, eyewash stations, and personal cleanliness facilities must be provided. Wash hands before meals and shower thoroughly with special attention given to hair, face, neck, and hands using plenty of soap and water before leaving at the end of the work day.

Other Precautions: HD should be stored in containers made of glass for Research, Development, Test and Evaluation (RDTE) quantities or one-ton steel containers for large quantities. Agent containers will be stored in a single containment system within a laboratory hood or in a double-containment system.

For additional information see "AR 385-61, The Army Toxic Chemical Agent Safety Program," "DA Pam 385-61, Toxic Chemical

Agent Safety Standards," and "DA Pam 40-173, Occupational Health Guidelines for the Evaluation and Control of Occupational Exposure to HD Agents H, HD, and HT."

Section X - Transportation Data

Note: Forbidden for transport other than via military (Technical Escort Unit) transport according to 49 CFR 172

Proper Shipping Name: Toxic liquids, n.o.s.

DOT Hazard Class: 6.1, Packing Group I, Hazard Zone B

DOT Label: Poison

DOT Marking: Toxic liquids, n.o.s. Bis-(2-chloroethyl) sulfide UN 2810, Inhalation Hazard

DOT Placard: Poison

Emergency Accident Precautions and Procedures: See Sections IV, VII, and VIII.

Precautions To Be Taken In Transportation: Motor vehicles will be placarded regardless of quantity. Drivers will be given full information regarding shipment and conditions in case of an emergency. AR 50-6 deals specifically with the shipment of chemical agents. Shipment of agents will be escorted in accordance with AR 740-32.

The Edgewood Chemical Biological Center (ECBC), Department of the Army, believes that the data contained herein are actual and are the results of the tests conducted by ECBC experts. The data are not to be taken as a warranty or representation for which the Department of the Army or ECBC assumes legal responsibility. They are offered solely for consideration. Any use of this data and information contained in this MSDS must be determined by the user to be in accordance with applicable Federal, State, and local laws and regulations.

Addendum A

Additional Information For Thickened HD

Trade Name and Synonyms: Thickened HD, THD

Trade Name and Synonyms for Thickener:
Acrylic acid butyl ester

Polymer with styrene
Butyl acrylate-styrene polymer
Butyl acrylate-styrene copolymer
N-Butyl acrylate-styrene polymer
Polymer with styrene acrylic acid butyl ester
2-Propenoic acid
Butyl ester
Polymer with ethenylbenzene Acronal 4D
Acronal 290D
Acronal 295D Mowilith DM60
Sokrate LX 75
OSH22097

Hazardous Ingredients: Styrene-butyl acrylate copolymer is used to thicken HD and is not known to be hazardous except in a finely-divided, powder form.

Physical Data: Essentially the same as HD.

Fire and Explosion Data: Same as HD and slight fire hazard when exposed to heat or flame.

Health Hazard Data: Same as HD except for skin contact. For skin contact, don respiratory protective mask and remove contaminated clothing IMMEDIATELY. IMMEDIATELY scrape the HD from the skin surface, then wash the contaminated surface with acetone. Seek medical attention IMMEDIATELY.

Spill, Leak, and Disposal Procedures: If spills or leaks of HD occur, follow the same procedures as those for HD, but dissolve THD in acetone before introducing any decontaminating solution. Containment of THD is generally not necessary. Spilled THD can be carefully scraped off the contaminated surface and placed in a fully removable head drum with a high density, polyethylene lining. THD can then be decontaminated, after it has been dissolved in acetone, using the same procedures used for HD. Contaminated surfaces should be treated with acetone, then decontaminated using the same procedures as those used for HD.

Note: Surfaces contaminated with THD and then rinse-decontaminated may evolve sufficient HD vapor to produce a physiological response.

Special Protection Information: Same as HD.

Special Precautions: Same as HD with the following addition. Handling the THD requires careful observation of the "stringers" (elastic, thread like attachments) formed when the agents are transferred or dispensed. These stringers must be broken cleanly

before moving the contaminating device or dispensing device to another location, or unwanted contamination of a working surface will result. Avoid contact with strong oxidizers, excessive heat, sparks, or open flame.

Transportation Data: Same as HD.

This page last updated on 21 September 2000

DOD Hazardous Materials Information System
DoD 6050.5-L
AS OF July 1998

FSC: 6810
NIIN: 00N022491
Manufacturer's CAGE: 0G9K0
Part No. Indicator: A
Part Number/Trade Name: TETRYL

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General Information
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Item Name:
Company's Name: OCCUPATIONAL HEALTH SERVICES INC
Company's Street: 11 WEST 42ND ST 12TH FLOOR
Company's P. O. Box:
Company's City: NEW YORK
Company's State: NY
Company's Country: US
Company's Zip Code: 10036
Company's Emerg Ph #: 615-366-2000
Company's Info Ph #: 800-445-6737 OR 212-789-3535
Distributor/Vendor # 1:
Distributor/Vendor # 1 Cage:
Distributor/Vendor # 2:
Distributor/Vendor # 2 Cage:
Distributor/Vendor # 3:
Distributor/Vendor # 3 Cage:
Distributor/Vendor # 4:
Distributor/Vendor # 4 Cage:
Safety Data Action Code:
Safety Focal Point: N
Record No. For Safety Entry: 001
Tot Safety Entries This Stk#: 001
Status: SMJ
Date MSDS Prepared: 11MAR91
Safety Data Review Date: 10DEC91
Supply Item Manager:
MSDS Preparer's Name:
Preparer's Company:
Preparer's St Or P. O. Box:
Preparer's City:
Preparer's State:
Preparer's Zip Code:
Other MSDS Number:
MSDS Serial Number: BLSLD
Specification Number:
Spec Type, Grade, Class:
Hazard Characteristic Code: N/
Unit Of Issue:
Unit Of Issue Container Qty:
Type Of Container:
Net Unit Weight:

Report for NIIN: 00N022491

NRC/State License Number:
Net Explosive Weight:
Net Propellant Weight-Ammo:
Coast Guard Ammunition Code:

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Ingredients/Identity Information
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Proprietary: NO
 Ingredient: TETRYL (TRINITROPHENYLMETHYLNITRAMINE)
 Ingredient Sequence Number: 01
 Percent: 100
 Ingredient Action Code:
 Ingredient Focal Point: N
 NIOSH (RTECS) Number: BY6300000
 CAS Number: 479-45-8
 OSHA PEL: S, 1.5 MG/M3
 ACGIH TLV: 1.5 MG/M3; 9293
 Other Recommended Limit: N/K

Proprietary: NO
 Ingredient: SUPP DATA:SYMPTOMATICALLY AND SUPPORTIVELY.
 Ingredient Sequence Number: 02
 Percent: N/K
 Ingredient Action Code:
 Ingredient Focal Point: N
 NIOSH (RTECS) Number: 9999999ZZ
 CAS Number:
 OSHA PEL: NOT APPLICABLE
 ACGIH TLV: NOT APPLICABLE
 Other Recommended Limit: N/K

Proprietary: NO
 Ingredient: EFTS OF OVEREXP:THROUGH SKIN, HOWEVER NO SYSTEMIC EFTS HAVE
 BEEN REPORTED FOR ACUTE EXPOS. CHRONIC:MAY CAUSE (SEE ING 4)
 Ingredient Sequence Number: 03
 Percent: N/K
 Ingredient Action Code:
 Ingredient Focal Point: N
 NIOSH (RTECS) Number: 9999999ZZ
 CAS Number:
 OSHA PEL: NOT APPLICABLE
 ACGIH TLV: NOT APPLICABLE
 Other Recommended Limit: N/K

Proprietary: NO
 Ingredient: ING 3:DERM AS EARLY AS FIRST WEEK OF EXPOS WHICH FIRST APPEARS
 ON EXPOSED SKIN AREAS, BUT CAN SPREAD TO OTHER(SEE ING 5)
 Ingredient Sequence Number: 04
 Percent: N/K
 Ingredient Action Code:
 Ingredient Focal Point: N
 NIOSH (RTECS) Number: 9999999ZZ
 CAS Number:

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OSHA PEL: NOT APPLICABLE
 ACGIH TLV: NOT APPLICABLE
 Other Recommended Limit: N/K

Proprietary: NO
 Ingredient: ING 4:PARTS OF BODY IN FAIR-SKINNED INDIVIDUALS OR IN THOSE W/
 POOR HYGIENE. SYMPS INCL ITCHING OF & AROUND (SEE ING 6)
 Ingredient Sequence Number: 05
 Percent: N/K
 Ingredient Action Code:
 Ingredient Focal Point: N

NIOSH (RTECS) Number: 9999999ZZ
 CAS Number:
 OSHA PEL: NOT APPLICABLE
 ACGIH TLV: NOT APPLICABLE
 Other Recommended Limit: N/K

 Proprietary: NO
 Ingredient: ING 5:EYES, PROGRESSION TO ERYTHEMA & EDEMA, OCCURING MOST
 OFTEN ON NASAL FOLDS, CHEEKS & NECK, PAPULES & (SEE ING 7)
 Ingredient Sequence Number: 06
 Percent: N/K
 Ingredient Action Code:
 Ingredient Focal Point: N
 NIOSH (RTECS) Number: 9999999ZZ
 CAS Number:
 OSHA PEL: NOT APPLICABLE
 ACGIH TLV: NOT APPLICABLE
 Other Recommended Limit: N/K

 Proprietary: NO
 Ingredient: ING 6:VESICLES MAY ALSO DEVELOP. VERY SEVERE CASES SHOW
 MASSIVE GENERALIZED EDEMA W/PARTIAL OBSTRUCTION OF (SEE ING 8)
 Ingredient Sequence Number: 07
 Percent: N/K
 Ingredient Action Code:
 Ingredient Focal Point: N
 NIOSH (RTECS) Number: 9999999ZZ
 CAS Number:
 OSHA PEL: NOT APPLICABLE
 ACGIH TLV: NOT APPLICABLE
 Other Recommended Limit: N/K

 Proprietary: NO
 Ingredient: ING 7:TRACHEA DUE TO SWELLING OF TONGUE. EXFOLIATION USUALLY
 OCCURS AFTER EDEMA SUBSIDES. MOST OF THESE SYMPS(SEE ING 9)
 Ingredient Sequence Number: 08
 Percent: N/K
 Ingredient Action Code:
 Ingredient Focal Point: N
 NIOSH (RTECS) Number: 9999999ZZ
 CAS Number:
 OSHA PEL: NOT APPLICABLE

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ACGIH TLV: NOT APPLICABLE
 Other Recommended Limit: N/K

 Proprietary: NO
 Ingredient: ING 8:OCCUR BETWEEN 10TH & 20TH DAYS OF EXPOS. UPON REMOVAL OF
 EXPOS THERE IS RAPID ABATEMENT OF MILD SYMPS, (SEE ING 10)
 Ingredient Sequence Number: 09
 Percent: N/K
 Ingredient Action Code:
 Ingredient Focal Point: N
 NIOSH (RTECS) Number: 9999999ZZ
 CAS Number:
 OSHA PEL: NOT APPLICABLE
 ACGIH TLV: NOT APPLICABLE
 Other Recommended Limit: N/K

Proprietary: NO
 Ingredient: ING 9:& AFTER 3-10 DAYS PHYSICAL SIGNS DISAPPEAR. RPTD/PRLNGD
 CONT MAY LEAD TO SENSIT DERM. MAY BE ABSORBED (SEE ING 11)
 Ingredient Sequence Number: 10
 Percent: N/K
 Ingredient Action Code:
 Ingredient Focal Point: N
 NIOSH (RTECS) Number: 9999999ZZ
 CAS Number:
 OSHA PEL: NOT APPLICABLE
 ACGIH TLV: NOT APPLICABLE
 Other Recommended Limit: N/K

 Proprietary: NO
 Ingredient: ING 10:THRU SKIN & CAUSE IRRIT, EASY FATIGABILITY, MALISE,
 HDCH, LASSITUDE, INSOMNIA, NAUS, & VOMIT. HEAVY (SEE IN 12)
 Ingredient Sequence Number: 11
 Percent: N/K
 Ingredient Action Code:
 Ingredient Focal Point: N
 NIOSH (RTECS) Number: 9999999ZZ
 CAS Number:
 OSHA PEL: NOT APPLICABLE
 ACGIH TLV: NOT APPLICABLE
 Other Recommended Limit: N/K

 Proprietary: NO
 Ingredient: ING 11:EXPOSURE HAS RESULTED IN IRREVERSIBLE LIVER DAMAGE.
 EYE:ACUTE:MAY CAUSE IRRIT. CHRONIC:RPTD/PRLNGD (SEE ING 13)
 Ingredient Sequence Number: 12
 Percent: N/K
 Ingredient Action Code:
 Ingredient Focal Point: N
 NIOSH (RTECS) Number: 9999999ZZ
 CAS Number:
 OSHA PEL: NOT APPLICABLE
 ACGIH TLV: NOT APPLICABLE

Report for NIIN: 00N022491

Other Recommended Limit: N/K

 Proprietary: NO
 Ingredient: ING 12:CONTACT MAY CAUSE CONJUNCTIVITIS.KERATITIS &
 IRIDOCYCLITIS MAY OCCUR IN ASSOCIATION W/CONJUNCTIVITIS.(SEE ING 14)
 Ingredient Sequence Number: 13
 Percent: N/K
 Ingredient Action Code:
 Ingredient Focal Point: N
 NIOSH (RTECS) Number: 9999999ZZ
 CAS Number:
 OSHA PEL: NOT APPLICABLE
 ACGIH TLV: NOT APPLICABLE
 Other Recommended Limit: N/K

 Proprietary: NO
 Ingredient: ING 13:INGEST:ACUTE/CHRONIC:NO DATA AVAILABLE.
 Ingredient Sequence Number: 14
 Percent: N/K
 Ingredient Action Code:
 Ingredient Focal Point: N

NIOSH (RTECS) Number: 9999999ZZ
 CAS Number:
 OSHA PEL: NOT APPLICABLE
 ACGIH TLV: NOT APPLICABLE
 Other Recommended Limit: N/K

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Physical/Chemical Characteristics

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Appearance And Odor: YELLOW MONOCLINIC CRYSTALS
 Boiling Point: SEE ING 1
 Melting Point: 264F,129C
 Vapor Pressure (MM Hg/70 F): <1 @ 20C
 Vapor Density (Air=1): N/K
 Specific Gravity: 1.57 @ 19C
 Decomposition Temperature: N/K
 Evaporation Rate And Ref: N/K
 Solubility In Water: INSOLUBLE 0.02
 Percent Volatiles By Volume: N/K
 Viscosity:
 pH: N/K
 Radioactivity:
 Form (Radioactive Matl):
 Magnetism (Milligauss): N/P
 Corrosion Rate (IPY): N/K
 Autoignition Temperature:

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Fire and Explosion Hazard Data

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Flash Point: N/K
 Flash Point Method: N/P
 Lower Explosive Limit: N/K
 Upper Explosive Limit: N/K

Report for NIIN: 00N022491

Extinguishing Media: FLOOD WITH WATER, IF NO WATER AVAILABLE USE CARBON DIOXIDE, DRY CHEMICAL OR EARTH.
 Special Fire Fighting Proc: WEAR NIOSH/MSHA APPRVD SCBA & FULL PROT EQUIP (FP N). DO NOT MOVE CNTNRS IF EXPOS TO HEAT HAS OCCURRED. DO NOT FIGHT FIRE WHEN IT REACHES STORAGE/CARGO (SUPDAT)
 Unusual Fire And Expl Hazrds: SLIGHT FIRE/DANGEROUS EXPLOSION HAZARD WHEN EXPOSED TO HEAT OR FLAME OR BY REACTION WITH INCOMPATIBLE MATERIALS.

=====

Reactivity Data

=====

Stability: YES
 Cond To Avoid (Stability): MAY EXPLODE AT TEMPERATURES ABOVE 356F OR EXPOSURE TO EXTREME SHOCK.
 Materials To Avoid: TRIOXYGEN DIFLOURIDE:DETONATES SPONTANEOUSLY ON CONTACT. HYDRAZINE:IGNITES. OXIDIZING MATERIAL:INCOMPATIBLE.
 Hazardous Decomp Products: THERMAL DECOMPOSITION PRODUCTS MAY INCLUDE NO*X.
 Hazardous Poly Occur: NO
 Conditions To Avoid (Poly): NO DATA AVAILABLE.

=====

Health Hazard Data

=====

LD50-LC50 Mixture: NONE SPECIFIED BY MANUFACTURER.
 Route Of Entry - Inhalation: YES
 Route Of Entry - Skin: YES
 Route Of Entry - Ingestion: NO

Health Haz Acute And Chronic: ACUTE:INHAL:MAY CAUSE IRRITATION OF RESPIRATORY TRACT WITH EFTS LOCALIZED FROM NOSTRILS TO BRONCHI. SYMPTOMS INCLUDE BURNING, ITCHING, SNEEZING, CORYZA, EPISTAXIS, & COUGH. CHRONIC:MAY CAUSE IRRIT, EASY FATIGABILITY, MALAISE, HEADACHE, LASSITUDE, INSOMNIA, NAUSEA, & VOMIT. ANEMIA, EITHER OF THE (EFTS OF OVEREXP)

Carcinogenicity - NTP: NO
 Carcinogenicity - IARC: NO
 Carcinogenicity - OSHA: NO

Explanation Carcinogenicity: NOT RELEVANT.

Signs/Symptoms Of Overexp: HLTH HAZ:MARROW DEPRESS OR DEFICIENCY TYPE HAS BEEN OBSERVED AMONG TETRYL WORKERS. MAY CAUSE IRREVERSIBLE LIVER DMG AFTER HEAVY EXPOS. ACUTE:SKIN:ACUTE:IRRIT & MAY CAUSE BRIGHT YELLOW/ORANGE STAIN ON PALMS, FACE, NECK & HAIR. SENSIT REACTIONS MAY OCCUR IN PREVIOUSLY EXPOSED INDIVIDUALS. CAN BE ABSORBED (SEE ING 3)

Med Cond Aggravated By Exp: NONE SPECIFIED BY MANUFACTURER.

Emergency/First Aid Proc: INHAL:REMOVE TO FRESH AIR IMMED. IF BRTHG HAS STOPPED, GIVE ARTF RESP. KEEP WARM & AT REST. TREAT SYMPTOMATICALLY & SUPPORTIVELY. GET MD IMMED. SKIN:REMOVE CONTAM CHTHG/SHOES IMMED. WASH W/ SOAP OR MILD DETERGENT & LGE AMTS OF WATER UNTIL NO EVIDENCE OF CHEM REMAINS (APPROX 15-20 MINS). GET MD IMMEDIATELY. EYE:WASH IMMED W/LGE AMTS OF WATER OR NORMAL SALINE, OCCASIONALLY LIFTING LIDS (SUPP DATA)

=====
 Precautions for Safe Handling and Use
 =====

Steps If Matl Released/Spill: OCCUPATIONAL SPILL:SHUT OFF IGNITION SOURCES. DO NOT TOUCH SPILLED MATERIAL. NO SMOKING, FLAMES OR FLARES IN HAZARD AREA. EVACUATE AREA FOR 2500 FEET IN ALL DIRECTIONS. KEEP

Report for NIIN: 00N022491

UNNECESSARY PEOPLE AWAY.

Neutralizing Agent: NONE SPECIFIED BY MANUFACTURER.

Waste Disposal Method: MUST BE IN ACCORDANCE WITH STANDARDS APPLICABLE TO GENERATORS OF HAZ WASTE, 40 CFR 262. EPA HAZARDOUS WASTE NUMBERS, D001 & D003. 100 POUND CERCLA SECTION 103 REPORTABLE QUANTITY. OBSERVE ALL FEDERAL, STATE, AND LOCAL REGULATIONS.

Precautions-Handling/Storing: STORE I/A/W 27 CFR SUBPART K & 29 CFR SUBPART 1910.109. CONSULT NFPA PUB 495, EXPLOSIVES, STORAGE & USE FOR PROPER STORAGE AND HANDLING REQUIREMENTS.

Other Precautions: DO NOT ALLOW FIRE TO REACH CARGO AREA.

=====
 Control Measures
 =====

Respiratory Protection: USE NIOSH/MSHA APPROVED RESPIRATOR BASED ON CONTAMINATION LEVELS FOUND IN WORKPLACE. FOR MORE SPECIAL INFORMATION, REFER TO ORIGINAL MSDS FOR RESPIRATORY PROTECTION RECOMMENDATIONS.

Ventilation: PROVIDE GENERAL DILUTION VENTILATION TO MEET PUBLISHED EXPOSURE LIMITS.

Protective Gloves: IMPERVIOUS GLOVES (FP N).

Eye Protection: CHEMICAL WORKERS GOGGLES (FP N).

Other Protective Equipment: EMERGENCY EYE WASH FOUNTAIN. IMPERVIOUS CLOTHING & EQUIPMENT TO PREVENT REPEATED OR PROLONGED SKIN CONTACT.

Work Hygienic Practices: NONE SPECIFIED BY MANUFACTURER.

Suppl. Safety & Health Data: FIRE FIGHT PROC:AREA. WITHDRAW FROM AREA & LET BURN. IF POSS EXISTS THAT CLASS A EXPLOS ARE INVOLVED, EVACUATE TO DISTANCE OF 3/4 MILE FOR TRACTOR/TRAILER LOAD; 1 MILE FOR RAILCAR LOAD. FIRST AID PROC:UNTIL NO EVIDENCE OF CHEM REMAINS (APPROX 15-20 MINS). GET MD IMMED. INGEST:NO SPECIFIC ANTIDOTE. TREAT (SEE ING 2)

=====
 Transportation Data
 =====

Transportation Action Code:
 Transportation Focal Point: N
 Trans Data Review Date: 92030
 DOT PSN Code: PGH
 DOT Symbol:
 DOT Proper Shipping Name: TRINITROPHENYLMETHYLNITRAMINE OR TETRYL
 DOT Class: 1.1D
 DOT ID Number: UN0208
 DOT Pack Group: II
 DOT Label: EXPLOSIVE 1.1D
 DOT/DoD Exemption Number:
 IMO PSN Code: PBN
 IMO Proper Shipping Name: TRINITROPHENYLMETHYLNITRAMINE
 IMO Regulations Page Number: 1112
 IMO UN Number: 0208
 IMO UN Class: 1.1 D
 IMO Subsidiary Risk Label: -
 IATA PSN Code: ZZY
 IATA UN ID Number: N/R
 IATA Proper Shipping Name: FORBIDDEN BY THIS MODE OF TRANSPORTATION
 IATA UN Class: N/R
 IATA Subsidiary Risk Class: N/R

Report for NIIN: 00N022491

IATA Label: N/R
 AFI PSN Code: YXR
 AFI Symbols:
 AFI Prop. Shipping Name: TRINITROPHENYLMETHYLNITRAMINE OR TETRYL
 AFI Class: 1.1D
 AFI ID Number: UN0208
 AFI Pack Group: II
 AFI Label:
 AFI Special Prov:
 AFI Basic Pac Ref: 5-116
 MMAC Code:
 N.O.S. Shipping Name:
 Additional Trans Data:

=====

Disposal Data

=====

Disposal Data Action Code:
 Disposal Data Focal Point:
 Disposal Data Review Date:
 Rec # For This Disp Entry:
 Tot Disp Entries Per NSN:
 Landfill Ban Item:
 Disposal Supplemental Data:
 1st EPA Haz Wst Code New:
 1st EPA Haz Wst Name New:
 1st EPA Haz Wst Char New:
 1st EPA Acute Hazard New:
 2nd EPA Haz Wst Code New:
 2nd EPA Haz Wst Name New:
 2nd EPA Haz Wst Char New:
 2nd EPA Acute Hazard New:
 3rd EPA Haz Wst Code New:
 3rd EPA Haz Wst Name New:
 3rd EPA Haz Wst Char New:
 3rd EPA Acute Hazard New:

=====

Label Data

```

=====
Label Required: YES
Technical Review Date: 09DEC91
Label Date: 09DEC91
MFR Label Number:
Label Status: G
Common Name: TETRYL
Chronic Hazard: YES
Signal Word: DANGER!
Acute Health Hazard-None:
Acute Health Hazard-Slight:
Acute Health Hazard-Moderate: X
Acute Health Hazard-Severe:
Contact Hazard-None:
Contact Hazard-Slight:
Contact Hazard-Moderate: X

```

Report for NIIN: 00N022491

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Contact Hazard-Severe:
Fire Hazard-None:
Fire Hazard-Slight: X
Fire Hazard-Moderate:
Fire Hazard-Severe:
Reactivity Hazard-None:
Reactivity Hazard-Slight:
Reactivity Hazard-Moderate:
Reactivity Hazard-Severe: X
Special Hazard Precautions: CLASS A EXPLOSIVE. ACUTE:MAY IRRITATE
RESPIRATORY TRACT, SKIN, EYES. CAN CAUSE BURNING, ITCHING, SNEEZING,
CORYZA, EPISTAXIS, COUGH, YELLOW/ORANGE STAIN ON SKIN/PALMS/FACE/NECK/HAIR.
SENSITIZATION REACTIONS CAN OCCUR IN PREVIOUSLY EXPOSED INDIVIDUALS.
CHRONIC:MAY CAUSE IRRITABILITY, MALAISE, HEADACHE, LASSITUDE, INSOMNIA,
NAUSEA, VOMITING, BONE MARROW DEFICIENCY, ANEMIA, LIVER DAMAGE,
CONJUNCTIVITIS, KERATITIS, DERMATITIS, EDEMA, SWELLING OF TONGUE. MAY CAUSE
IRREVERSIBLE LIVER DAMAGE AFTER HEAVY EXPOSURE.
Protect Eye: Y
Protect Skin: Y
Protect Respiratory: Y
Label Name: OCCUPATIONAL HEALTH SERVICES INC
Label Street: 11 WEST 42ND ST 12TH FLOOR
Label P.O. Box:
Label City: NEW YORK
Label State: NY
Label Zip Code: 10036
Label Country: US
Label Emergency Number: 615-366-2000
Year Procured:

```

DOD Hazardous Materials Information System
DoD 6050.5-L
AS OF July 1998

FSC: 1376
NIIN: 00N018210
Manufacturer's CAGE: 2D881
Part No. Indicator: A
Part Number/Trade Name: TRINITROTOLUENE (TNT) TYPE 1 FLAKE FORM

=====
General Information
=====

Item Name:
Company's Name: HERCULES INCORPORATED
Company's Street: RADFORD ARMY AMMUNITION PLANT
Company's P. O. Box:
Company's City: RADFORD
Company's State: VA
Company's Country: US
Company's Zip Code: 24141
Company's Emerg Ph #: 703-639-7294
Company's Info Ph #: 703-639-7294
Distributor/Vendor # 1:
Distributor/Vendor # 1 Cage:
Distributor/Vendor # 2:
Distributor/Vendor # 2 Cage:
Distributor/Vendor # 3:
Distributor/Vendor # 3 Cage:
Distributor/Vendor # 4:
Distributor/Vendor # 4 Cage:
Safety Data Action Code:
Safety Focal Point: N
Record No. For Safety Entry: 001
Tot Safety Entries This Stk#: 001
Status: SMJ
Date MSDS Prepared: 02JUL91
Safety Data Review Date: 10SEP91
Supply Item Manager:
MSDS Preparer's Name:
Preparer's Company:
Preparer's St Or P. O. Box:
Preparer's City:
Preparer's State:
Preparer's Zip Code:
Other MSDS Number:
MSDS Serial Number: BKZPP
Specification Number:
Spec Type, Grade, Class:
Hazard Characteristic Code: E1
Unit Of Issue:
Unit Of Issue Container Qty:
Type Of Container:
Net Unit Weight:

Report for NIIN: 00N018210

NRC/State License Number:
Net Explosive Weight:
Net Propellant Weight-Ammo:
Coast Guard Ammunition Code:

=====
Ingredients/Identity Information
=====

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=====
Proprietary: NO
Ingredient: 2,4,6-TRINITROTOLUENE (TNT)
Ingredient Sequence Number: 01
Percent: 99
Ingredient Action Code:
Ingredient Focal Point: N
NIOSH (RTECS) Number: XU0175000
CAS Number: 118-96-7
OSHA PEL: S, 1.5 MG/M3
ACGIH TLV: S, 0.5 MG/M3; 9293
Other Recommended Limit: N/K
=====

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Physical/Chemical Characteristics

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=====
Appearance And Odor: FLAKES, PALE YELLOW IN COLOR.
Boiling Point: 464F,240C
Melting Point: N/K
Vapor Pressure (MM Hg/70 F): N/K
Vapor Density (Air=1): N/A
Specific Gravity: 1.5-1.6
Decomposition Temperature: N/K
Evaporation Rate And Ref: NOT APPLICABLE
Solubility In Water: 0.01% @ 25C
Percent Volatiles By Volume: <0.1
Viscosity:
pH: N/K
Radioactivity:
Form (Radioactive Matl):
Magnetism (Milligauss): N/P
Corrosion Rate (IPY): N/K
Autoignition Temperature:
=====

```

Fire and Explosion Hazard Data

```

=====
Flash Point: EXPLODES
Flash Point Method: N/P
Lower Explosive Limit: N/A
Upper Explosive Limit: N/A
Extinguishing Media: DELUGE WITH WATER-USE LARGE QUANTITIES.
Special Fire Fighting Proc: WEAR NIOSH/MSHA APPROVED SCBA AND FULL
PROTECTIVE EQUIPMENT (FP N). EVACUATE THE AREA.
Unusual Fire And Expl Hazrds: HIGHLY DANGEROUS-SHOCK WILL EXPLODE IT. WILL
DETONATE IF CONFINED AND EXPOSED TO EXTRME HEAT.
=====

```

Report for NIIN: 00N018210

Reactivity Data

```

=====
Stability: YES
Cond To Avoid (Stability): AVOID CONTACT WITH ALKALINE MATERIALS. WILL
DETONATE IF CONFINED AND EXPOSED TO EXTREME HEAT.
Materials To Avoid: SODIUM HYDROXIDE, POTASSIUM HYDROXIDE AND OTHER HIGHLY
ALKALINE MATERIALS.
Hazardous Decomp Products: NOX.
Hazardous Poly Occur: NO
Conditions To Avoid (Poly): NOT RELEVANT.
=====

```

Health Hazard Data

LD50-LC50 Mixture: NONE SPECIFIED BY MANUFACTURER.
 Route Of Entry - Inhalation: YES
 Route Of Entry - Skin: NO
 Route Of Entry - Ingestion: NO
 Health Haz Acute And Chronic: ALLERGENIC, CAN CAUSE DERMATITIS. DISCOLOR
 SKIN AND HAIR PALE YELLOW. CAUSES NAUSEA, VOMITING AND ANOREXIA ALSO LIVER
 AND BLOOD DAMAGE, AND APLASTIC ANEMIA.
 Carcinogenicity - NTP: NO
 Carcinogenicity - IARC: NO
 Carcinogenicity - OSHA: NO
 Explanation Carcinogenicity: NOT RELEVANT.
 Signs/Symptoms Of Overexp: SEE HEALTH HAZARDS.
 Med Cond Aggravated By Exp: NONE SPECIFIED BY MANUFACTURER.
 Emergency/First Aid Proc: EYE:IMMEDIATELY FLUSH THOROUGHLY WITH LARGE
 AMOUNTS OF LOW PRESSURE WATER FOR AT LEAST 25 MINUTES. REMOVE CONTACT
 LENSES TO ASSURE THOROUGH FLUSHING. CALL MD. SKIN:WASH WITH TNT INDICATOR
 SOAP AND RUNNING WATER. INHAL:REMOVE TO FRESH AIR. TREAT ANY IRRITATION
 SYMPTOMATICALLY. CALL MD. INGEST:CALL MD IMMEDIATELY (FP N).

=====
 Precautions for Safe Handling and Use
 =====

Steps If Matl Released/Spill: CLEAN UP SPILL IMMEDIATELY USING A SOFT
 BRISTLE BRUSH AND A CONDUCTIVE RUBBER OR PLASTIC SHOVEL.
 Neutralizing Agent: NONE SPECIFIED BY MANUFACTURER.
 Waste Disposal Method: BURN ON OPEN BURNING GROUND IN ACCORDANCE WITH
 STATE AND LOCAL REGULATIONS. MAY ALSO BE BURNED IN AN INCINERATOR APPROVED
 FOR EXPLOSIVES. DISPOSE OF IN ACCORDANCE WITH FEDERAL, STATE AND LOCAL
 REGULATIONS (FP N).
 Precautions-Handling/Storing: NONE SPECIFIED BY MANUFACTURER.
 Other Precautions: NONE SPECIFIED BY MANUFACTURER.

=====
 Control Measures
 =====

Respiratory Protection: NIOSH/MSHA APPROVED RESPIRATOR FOR DUSTS.
 Ventilation: MECHANICAL (GENERAL) VENTILATION.
 Protective Gloves: COTTON OR LEATHER GLOVES.
 Eye Protection: CHEMICAL WORKERS GOGGLES (FP N).
 Other Protective Equipment: FLAME-PROOF COVERALLS AND CONDUCTIVE SHOES.
 Work Hygienic Practices: NONE SPECIFIED BY MANUFACTURER.

Report for NIIN: 00N018210

Suppl. Safety & Health Data: NONE SPECIFIED BY MANUFACTURER.

=====
 Transportation Data
 =====

Transportation Action Code:
 Transportation Focal Point: N
 Trans Data Review Date: 91294
 DOT PSN Code: EEL
 DOT Symbol:
 DOT Proper Shipping Name: CYCLOTETRAMETHYLENETETRANITRAMINE, WETTED OR
 HMX, WETTED OR OCTOGEN, WETTED
 DOT Class: 1.1D
 DOT ID Number: UN0226
 DOT Pack Group: II
 DOT Label: EXPLOSIVE 1.1D
 DOT/DoD Exemption Number:
 IMO PSN Code: PBV
 IMO Proper Shipping Name: TRINITROTOLUENE
 IMO Regulations Page Number: 1144

IMO UN Number: 0209
 IMO UN Class: 1.1 D
 IMO Subsidiary Risk Label: -
 IATA PSN Code: YYG
 IATA UN ID Number: 0209
 IATA Proper Shipping Name:
 IATA UN Class: 1.1D
 IATA Subsidiary Risk Class:
 IATA Label:
 AFI PSN Code: XSI
 AFI Symbols:
 AFI Prop. Shipping Name: TETRAHYDROFURAN
 AFI Class: 3
 AFI ID Number: UN2056
 AFI Pack Group: II
 AFI Label:
 AFI Special Prov:
 AFI Basic Pac Ref: 7-7
 MMAC Code:
 N.O.S. Shipping Name:
 Additional Trans Data:

=====

Disposal Data

=====

Disposal Data Action Code:
 Disposal Data Focal Point:
 Disposal Data Review Date:
 Rec # For This Disp Entry:
 Tot Disp Entries Per NSN:
 Landfill Ban Item:
 Disposal Supplemental Data:
 1st EPA Haz Wst Code New:
 1st EPA Haz Wst Name New:
 1st EPA Haz Wst Char New:

Report for NIIN: 00N018210

1st EPA Acute Hazard New:
 2nd EPA Haz Wst Code New:
 2nd EPA Haz Wst Name New:
 2nd EPA Haz Wst Char New:
 2nd EPA Acute Hazard New:
 3rd EPA Haz Wst Code New:
 3rd EPA Haz Wst Name New:
 3rd EPA Haz Wst Char New:
 3rd EPA Acute Hazard New:

=====

Label Data

=====

Label Required: YES
 Technical Review Date: 10SEP91
 Label Date: 10SEP91
 MFR Label Number:
 Label Status: G
 Common Name: TRINITROTOLUENE (TNT) TYPE 1 FLAKE FORM
 Chronic Hazard: YES
 Signal Word: DANGER!
 Acute Health Hazard-None:
 Acute Health Hazard-Slight: X
 Acute Health Hazard-Moderate:
 Acute Health Hazard-Severe:

Contact Hazard-None:
Contact Hazard-Slight: X
Contact Hazard-Moderate:
Contact Hazard-Severe:
Fire Hazard-None:
Fire Hazard-Slight:
Fire Hazard-Moderate:
Fire Hazard-Severe: X
Reactivity Hazard-None:
Reactivity Hazard-Slight:
Reactivity Hazard-Moderate:
Reactivity Hazard-Severe: X
Special Hazard Precautions: ACUTE:CAUSES NAUSEA, VOMITING, AND ANOREXIA.
DO NOT BREATHE VAPORS OR SWALLOW MATERIAL. USE WITH ADEQUATE VENTILATION.
CAN CAUSE SKIN IRRITATION. AVOID CONTACT WITH EYES, SKIN, AND CLOTHING.
WASH THOROUGHLY AFTER HANDLING. KEEP AWAY FROM HEAT AND FLAME. CHRONIC:
TARGET ORGANS:CAN CAUSE DERMATITIS, LIVER AND BLOOD DAMAGE. AN ALLERGEN.
Protect Eye: Y
Protect Skin: Y
Protect Respiratory: Y
Label Name: HERCULES INCORPORATED
Label Street: RADFORD ARMY AMMUNITION PLANT
Label P.O. Box:
Label City: RADFORD
Label State: VA
Label Zip Code: 24141
Label Country: US
Label Emergency Number: 703-639-7294
Year Procured:

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DOD Hazardous Materials Information System
DoD 6050.5-L
AS OF July 1998

FSC: 1376
NIIN: 010539362
Manufacturer's CAGE: 2D881
Part No. Indicator: A
Part Number/Trade Name: PROPELLANT M6 STANDARD

=====

General Information

=====

Item Name:
Company's Name:
Company's Street:
Company's P. O. Box:
Company's City:
Company's State:
Company's Country:
Company's Zip Code:
Company's Emerg Ph #:
Company's Info Ph #:
Distributor/Vendor # 1:
Distributor/Vendor # 1 Cage:
Distributor/Vendor # 2:
Distributor/Vendor # 2 Cage:
Distributor/Vendor # 3:
Distributor/Vendor # 3 Cage:
Distributor/Vendor # 4:
Distributor/Vendor # 4 Cage:
Safety Data Action Code:
Safety Focal Point:
Record No. For Safety Entry:
Tot Safety Entries This Stk#:
Status:
Date MSDS Prepared:
Safety Data Review Date:
Supply Item Manager:
MSDS Preparer's Name:
Preparer's Company:
Preparer's St Or P. O. Box:
Preparer's City:
Preparer's State:
Preparer's Zip Code:
Other MSDS Number:
MSDS Serial Number:
Specification Number:
Spec Type, Grade, Class:
Hazard Characteristic Code:
Unit Of Issue: LB
Unit Of Issue Container Qty:
Type Of Container:
Net Unit Weight:

Report for NIIN: 010539362

NRC/State License Number:
Net Explosive Weight: 150.0
Net Propellant Weight-Ammo:
Coast Guard Ammunition Code:

=====

Ingredients/Identity Information

```

=====
Proprietary:
Ingredient:
Ingredient Sequence Number:
Percent:
Ingredient Action Code:
Ingredient Focal Point:
NIOSH (RTECS) Number:
CAS Number:
OSHA PEL:
ACGIH TLV:
Other Recommended Limit:
=====

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Physical/Chemical Characteristics

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=====
Appearance And Odor:
Boiling Point:
Melting Point:
Vapor Pressure (MM Hg/70 F):
Vapor Density (Air=1):
Specific Gravity:
Decomposition Temperature:
Evaporation Rate And Ref:
Solubility In Water:
Percent Volatiles By Volume:
Viscosity:
pH:
Radioactivity:
Form (Radioactive Matl):
Magnetism (Milligauss): N/P
Corrosion Rate (IPY):
Autoignition Temperature: 383F
=====

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Fire and Explosion Hazard Data

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=====
Flash Point: N/A
Flash Point Method:
Lower Explosive Limit:
Upper Explosive Limit:
Extinguishing Media:
Special Fire Fighting Proc:
Unusual Fire And Expl Hazrds:
=====

```

Reactivity Data

```

=====
Stability:
Cond To Avoid (Stability):

```

Report for NIIN: 010539362

```

Materials To Avoid:
Hazardous Decomp Products:
Hazardous Poly Occur:
Conditions To Avoid (Poly):
=====

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Health Hazard Data

```

=====
LD50-LC50 Mixture:
Route Of Entry - Inhalation:
Route Of Entry - Skin:
Route Of Entry - Ingestion:

```

Health Haz Acute And Chronic:
Carcinogenicity - NTP:
Carcinogenicity - IARC:
Carcinogenicity - OSHA:
Explanation Carcinogenicity:
Signs/Symptoms Of Overexp:
Med Cond Aggravated By Exp:
Emergency/First Aid Proc:

=====
Precautions for Safe Handling and Use
=====

Steps If Matl Released/Spill:
Neutralizing Agent:
Waste Disposal Method:
Precautions-Handling/Storing:
Other Precautions:

=====
Control Measures
=====

Respiratory Protection:
Ventilation:
Protective Gloves:
Eye Protection:
Other Protective Equipment:
Work Hygienic Practices:
Suppl. Safety & Health Data:

=====
Transportation Data
=====

Transportation Action Code:
Transportation Focal Point: A
Trans Data Review Date: 93111
DOT PSN Code: MCI
DOT Symbol:
DOT Proper Shipping Name: POWDER, SMOKELESS
DOT Class: 1.3C
DOT ID Number: UN0161
DOT Pack Group: II
DOT Label: EXPLOSIVE 1.3C
DOT/DoD Exemption Number:
IMO PSN Code: MHH
IMO Proper Shipping Name: POWDER, SMOKELESS

Report for NIIN: 010539362

IMO Regulations Page Number: 1133
IMO UN Number: 0161
IMO UN Class: 1.3 C
IMO Subsidiary Risk Label: -
IATA PSN Code: UUY
IATA UN ID Number: 0161
IATA Proper Shipping Name:
IATA UN Class: 1.3C
IATA Subsidiary Risk Class:
IATA Label:
AFI PSN Code: UUY
AFI Symbols: 0
AFI Prop. Shipping Name: POWDER, SMOKELESS
AFI Class: 1.3C
AFI ID Number: UN0161
AFI Pack Group: II

AFI Label:
AFI Special Prov:
AFI Basic Pac Ref: 5-94
MMAC Code:
N.O.S. Shipping Name:
Additional Trans Data: EX-8809141K; KEEP AWAY FROM HEAT, SPARKS AND OPEN
FLAME.

=====
Disposal Data
=====

Disposal Data Action Code:
Disposal Data Focal Point:
Disposal Data Review Date:
Rec # For This Disp Entry:
Tot Disp Entries Per NSN:
Landfill Ban Item:
Disposal Supplemental Data:
1st EPA Haz Wst Code New:
1st EPA Haz Wst Name New:
1st EPA Haz Wst Char New:
1st EPA Acute Hazard New:
2nd EPA Haz Wst Code New:
2nd EPA Haz Wst Name New:
2nd EPA Haz Wst Char New:
2nd EPA Acute Hazard New:
3rd EPA Haz Wst Code New:
3rd EPA Haz Wst Name New:
3rd EPA Haz Wst Char New:
3rd EPA Acute Hazard New:

=====
Label Data
=====

Label Required:
Technical Review Date:
Label Date:
MFR Label Number:
Label Status:

Report for NIIN: 010539362

Common Name:
Chronic Hazard:
Signal Word:
Acute Health Hazard-None:
Acute Health Hazard-Slight:
Acute Health Hazard-Moderate:
Acute Health Hazard-Severe:
Contact Hazard-None:
Contact Hazard-Slight:
Contact Hazard-Moderate:
Contact Hazard-Severe:
Fire Hazard-None:
Fire Hazard-Slight:
Fire Hazard-Moderate:
Fire Hazard-Severe:
Reactivity Hazard-None:
Reactivity Hazard-Slight:
Reactivity Hazard-Moderate:
Reactivity Hazard-Severe:
Special Hazard Precautions:
Protect Eye:

Protect Skin:
Protect Respiratory:
Label Name:
Label Street:
Label P.O. Box:
Label City:
Label State:
Label Zip Code:
Label Country:
Label Emergency Number:
Year Procured:

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DOD Hazardous Materials Information System
DoD 6050.5-L
AS OF July 1998

FSC: 1315
NIIN: 008251384
Manufacturer's CAGE: 70657
Part No. Indicator: A
Part Number/Trade Name: CHARGE, PROPELLING, M67 ASSEMBLY

=====
General Information
=====

Item Name:
Company's Name: ICI AMERICAS INC FILMS DIV
Company's Street: NEW MURPHY RD AND CONCORD PIKE
Company's P. O. Box:
Company's City: WILMINGTON
Company's State: DE
Company's Country: US
Company's Zip Code: 19897
Company's Emerg Ph #: 800-327-8633 (MEDICAL)
Company's Info Ph #: 302-886-3000 (TECHNICAL)
Distributor/Vendor # 1:
Distributor/Vendor # 1 Cage:
Distributor/Vendor # 2:
Distributor/Vendor # 2 Cage:
Distributor/Vendor # 3:
Distributor/Vendor # 3 Cage:
Distributor/Vendor # 4:
Distributor/Vendor # 4 Cage:
Safety Data Action Code:
Safety Focal Point: A
Record No. For Safety Entry: 001
Tot Safety Entries This Stk#: 001
Status: SE
Date MSDS Prepared: 21AUG91
Safety Data Review Date: 14MAY92
Supply Item Manager:
MSDS Preparer's Name:
Preparer's Company:
Preparer's St Or P. O. Box:
Preparer's City:
Preparer's State:
Preparer's Zip Code:
Other MSDS Number:
MSDS Serial Number: BPRKK
Specification Number:
Spec Type, Grade, Class:
Hazard Characteristic Code: NK
Unit Of Issue:
Unit Of Issue Container Qty:
Type Of Container:
Net Unit Weight:

Report for NIIN: 008251384

NRC/State License Number: N/R
Net Explosive Weight:
Net Propellant Weight-Ammo: N/R
Coast Guard Ammunition Code:

=====
Ingredients/Identity Information
=====

Proprietary: NO
Ingredient: DINITROTOLUENE (SARA III)
Ingredient Sequence Number: 01
Percent: 10
Ingredient Action Code:
Ingredient Focal Point: A
NIOSH (RTECS) Number: XT1575000
CAS Number: 121-14-2
OSHA PEL: 1.5 MG/M3 SKIN
ACGIH TLV: NOT KNOWN
Other Recommended Limit: NOT KNOWN

Proprietary: NO
Ingredient: DIBUTYL PHTHALATE (SARA III)
Ingredient Sequence Number: 02
Percent: 5
Ingredient Action Code:
Ingredient Focal Point: A
NIOSH (RTECS) Number: TI0875000
CAS Number: 84-74-2
OSHA PEL: 5 MG/M3
ACGIH TLV: 5 MG/M3
Other Recommended Limit: NOT KNOWN

Proprietary: NO
Ingredient: DIPHENYLAMINE
Ingredient Sequence Number: 03
Percent: 1
Ingredient Action Code:
Ingredient Focal Point: A
NIOSH (RTECS) Number: JJ7800000
CAS Number: 122-39-4
OSHA PEL: 10 MG/M3
ACGIH TLV: 10 MG/M3
Other Recommended Limit: NOT KNOWN

Proprietary: NO
Ingredient: LEAD CARBONATE.ACGIH TLV IS FOR INORGANIC LEAD DUSTS AND FUMES.
Ingredient Sequence Number: 04
Percent: 1
Ingredient Action Code:
Ingredient Focal Point: A
NIOSH (RTECS) Number: OF9275000
CAS Number: 598-63-0
OSHA PEL: NOT KNOWN

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ACGIH TLV: 0.15 MG(PB)/M3
Other Recommended Limit: NOT KNOWN

Proprietary: NO
Ingredient: NITROCELLULOSE
Ingredient Sequence Number: 05
Percent: 85
Ingredient Action Code:
Ingredient Focal Point: A
NIOSH (RTECS) Number: QW0970000
CAS Number: 9004-70-0

OSHA PEL: NOT KNOWN
ACGIH TLV: NOT KNOWN
Other Recommended Limit: NOT KNOWN

Proprietary: NO
Ingredient: POTASSIUM SULFATE
Ingredient Sequence Number: 06
Percent: 1
Ingredient Action Code:
Ingredient Focal Point: A
NIOSH (RTECS) Number: TT5900000
CAS Number: 7778-80-5
OSHA PEL: NOT KNOWN
ACGIH TLV: NOT KNOWN
Other Recommended Limit: NOT KNOWN

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Physical/Chemical Characteristics

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Appearance And Odor: SEWN CLOTH BAGS CONTAINING PROPELLENT.
Boiling Point: N/A
Melting Point: NOT KNOWN
Vapor Pressure (MM Hg/70 F): NOT KNOWN
Vapor Density (Air=1): NOT KNOWN
Specific Gravity: SEE SUPP DATA
Decomposition Temperature: NOT KNOWN
Evaporation Rate And Ref: NOT KNOWN
Solubility In Water: NEGLIGIBLE
Percent Volatiles By Volume: NEGLIG
Viscosity:
pH: N/K
Radioactivity:
Form (Radioactive Matl):
Magnetism (Milligauss):
Corrosion Rate (IPY): N/K
Autoignition Temperature:

=====

Fire and Explosion Hazard Data

=====

Flash Point: N/A
Flash Point Method: N/P
Lower Explosive Limit: N/A
Upper Explosive Limit: N/A

Report for NIIN: 008251384

Extinguishing Media: DELUGE WITH WATER.ALL MATERIAL WILL PROBABLY BE
CONSUMED BEFORE FIRE EXTINGUISHED UNLESS USE LOTS OF WATER VERY QUICKLY.
Special Fire Fighting Proc: EVACUATE THE AREA.
Unusual Fire And Expl Hazrds: EASILY IGNITED,HIGHLY COMBUSTIBLE EXPLOSIVE.

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Reactivity Data

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Stability: YES
Cond To Avoid (Stability): STABLE UNDER NORMAL CONDITIONS.
Materials To Avoid: ACIDS AND BASES.
Hazardous Decomp Products: COMBUSTION:CO*2,CO,NITROGEN OXIDES,AMMONIA.
POSS LEAD FUMES/OXIDES,METHANE,ALDEHYDES,CARBOXYLIC ACIDS & HYDROGEN
CYANIDE.
Hazardous Poly Occur: NO
Conditions To Avoid (Poly): WILL NOT OCCUR.

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Health Hazard Data

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LD50-LC50 Mixture: LD50 RAT ORAL >5 G/KG PROPELLANT (EST) .
Route Of Entry - Inhalation: YES
Route Of Entry - Skin: NO
Route Of Entry - Ingestion: YES
Health Haz Acute And Chronic: SEE SIGNS AND SYMPTOMS OF OVEREXPOSURE.
Carcinogenicity - NTP: NO
Carcinogenicity - IARC: NO
Carcinogenicity - OSHA: NO
Explanation Carcinogenicity: NONE
Signs/Symptoms Of Overexp: TOXICITY INFO NOT AVAIL.PROPELLANT IN CLOTH BAG
HANDLED IAW GOOD INDUS HYG MAY NOT PRESENT HEALTH HAZARD.SKIN:RPTD/ PRLNGD
CONTACT W/ PROPELLANT MAY IRRITATE.ABSORPTION/INGEST/INHAL OF
DINITROTOLUENE MAY CAUSE FORMATION OF METHEMOGLOBINEMIA W/ CYANOSIS,NAUS,
CONFUSION.SINGLE DOSE INGESTED IS PRACTICALLY NONTOXIC.
Med Cond Aggravated By Exp: NOT KNOWN
Emergency/First Aid Proc: OPEN BAG W/ SIGNIFICANT EXPOS:EYES:FLUSH W/
H*20.REMOVE CONTACT LENSES.CONTINUE FLUSHING FOR AT LEAST 15 MIN.IF
SYMPTOMS DEVELOP,GET MED HELP. SKIN:WASH SKIN/HAIR/NAILS W/ LOTS OF SOAP &
H*20.GET MED ATTN. INGEST:DRINK 1-2 GLASSES OF H*20.SEE MED PERS.GIVE
NOTHING BY MOUTH IF UNCON. INHAL:MOVE TO FRESH AIR.IF NOT BRTHG,GIVE ARTF
RESP,PREF MOUTH-TO-MOUTH.IF BRTHG LABORED:GIVE O*2.CONSULT MED PERS.
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Precautions for Safe Handling and Use

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Steps If Matl Released/Spill: OPEN BAG:ELIMINATE IGNITION SOURCES.
VENTILATE AREA.WEAR SKIN & RESP PROTECTION.CLEAN UP IMMEDIATELY USING SOFT
BRISTLED BRUSH & CONDUCTIVE RUBBER OR PLASTIC SHOVEL.USE EXTREME CAUTION;
MATL IS SENSITIVE TO FRICTION,IMPACT & ELECTROSTATIC DISCHARGE.
Neutralizing Agent: NOT KNOWN
Waste Disposal Method: DISP MUST BE IAW FED,STATE,& LOC REGS.COORDINATE W/
SUPPORTING INSTALLATION/MACOM ENVIRON OFFICE PRIOR TO DISP (FP A).EMPTY
CONTR RETAINS RESIDUES.OBSERVE ALL HAZARD PRECAUTIONS.USE EMPTY CONTAINER
ONLY FOR STORAGE AND SHIPMENT OF ORIGINAL PRODUCT.
Precautions-Handling/Storing: FOLLOW ARMY REGS FOR HNDLG & STORAGE.
SENSITIVE TO FRICTION,IMPACT,ELECTROSTATIC DISCHARGE.CONTROL OF EXPOSURE TO
=====

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<PEL OF INGREDIENTS MAY NOT BE SUFF.

Other Precautions: PREVENT SKIN CONTACT W/ BAG CONTENTS.AVOID BREATHING
DUST.OPEN VAPOR BAGS IN WELL VENT AREA,ALLOW VAPORS TO ESCAPE BEFORE
FURTHER HANDLING.MINIMIZE EXPOS W/ GOOD HYGIENE PRACTICES.

Control Measures

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Respiratory Protection: MSHA-NIOSH APPROVED POSITIVE PRESSURE AIR-SUPPLIED
RESPIRATOR PROVIDES THE BEST PROTECTION.
Ventilation: USE LOCAL EXHAUST TO KEEP EXPOSURES TO A MINIMUM.
Protective Gloves: IMPERVIOUS
Eye Protection: CHEMICAL SAFETY GOGGLES (FP A) .
Other Protective Equipment: COVERALLS AND APRON.EYEWASH FACILITIES AS
NEEDED.
Work Hygienic Practices: WASH CONTAMINATED CLOTHING DAILY & DECONTAMINATE
FOOTWEAR BEFORE REUSE.SHOWER THOROUGHLY AT END OF WORK SHIFT.(SEE SUP)
Suppl. Safety & Health Data: PART NUMBER:9205472.SPECIFIC GRAVITY:1.5
(WATER=1) FOR PROPELLANT M1.HYGIENE PRACT:THOROUGHLY WASH HANDS & FACE WITH
SOAP & WATER BEFORE EATING,DRINKING OR SMOKING.EATING,DRINKING OR SMOKING
SHOULD NOT BE ALLOWED IN HANDLING AREAS.
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Transportation Data

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Transportation Action Code:
Transportation Focal Point:
Trans Data Review Date:
DOT PSN Code:
DOT Symbol:
DOT Proper Shipping Name:
DOT Class:
DOT ID Number:
DOT Pack Group:
DOT Label:
DOT/DoD Exemption Number:
IMO PSN Code:
IMO Proper Shipping Name:
IMO Regulations Page Number:
IMO UN Number:
IMO UN Class:
IMO Subsidiary Risk Label:
IATA PSN Code:
IATA UN ID Number:
IATA Proper Shipping Name:
IATA UN Class:
IATA Subsidiary Risk Class:
IATA Label:
AFI PSN Code:
AFI Symbols:
AFI Prop. Shipping Name:
AFI Class:
AFI ID Number:
AFI Pack Group:
AFI Label:

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Report for NIIN: 008251384

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AFI Special Prov:
AFI Basic Pac Ref:
MMAC Code:
N.O.S. Shipping Name:
Additional Trans Data:

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Disposal Data
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Disposal Data Action Code:
Disposal Data Focal Point:
Disposal Data Review Date:
Rec # For This Disp Entry:
Tot Disp Entries Per NSN:
Landfill Ban Item:
Disposal Supplemental Data:
1st EPA Haz Wst Code New:
1st EPA Haz Wst Name New:
1st EPA Haz Wst Char New:
1st EPA Acute Hazard New:
2nd EPA Haz Wst Code New:
2nd EPA Haz Wst Name New:
2nd EPA Haz Wst Char New:
2nd EPA Acute Hazard New:
3rd EPA Haz Wst Code New:
3rd EPA Haz Wst Name New:
3rd EPA Haz Wst Char New:

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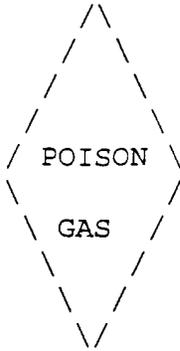
3rd EPA Acute Hazard New:

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Label Data
=====

Label Required: YES
Technical Review Date: 14MAY92
Label Date: 14MAY92
MFR Label Number: NOT KNOWN
Label Status: F
Common Name: CHARGE, PROPELLING, M67 ASSEMBLY
Chronic Hazard: N/P
Signal Word: DANGER!
Acute Health Hazard-None: X
Acute Health Hazard-Slight:
Acute Health Hazard-Moderate:
Acute Health Hazard-Severe:
Contact Hazard-None: X
Contact Hazard-Slight:
Contact Hazard-Moderate:
Contact Hazard-Severe:
Fire Hazard-None:
Fire Hazard-Slight:
Fire Hazard-Moderate:
Fire Hazard-Severe: X
Reactivity Hazard-None:
Reactivity Hazard-Slight:
Reactivity Hazard-Moderate:

Report for NIIN: 008251384

Reactivity Hazard-Severe: X
Special Hazard Precautions: EXPLOSIVE, UNSTABLE, FLAMMABLE SOLID. EASILY
IGNITED, HIGHLY COMBUSTIBLE. SENSITIVE TO FRICTION, IMPACT AND ELECTROSTATIC
DISCHARGE. KEEP AWAY FROM HEAT, SPARKS AND FLAME. ACUTE: NO TOXICITY
INFORMATION IS AVAILABLE ON THIS SPECIFIC PREPARATION. IF HANDLED IN
ACCORDANCE WITH GOOD INDUSTRIAL HYGIENE PRACTICE, THIS PROPELLANT IN CLOTH
BAGS MAY NOT PRESENT ANY ACTUAL HEALTH HAZARD. CHRONIC: REPEATED/PROLONGED
CONTACT WITH THE PROPELLANT MAY INDUCE SKIN IRRITATION.
Protect Eye: Y
Protect Skin: Y
Protect Respiratory: Y
Label Name: ICI AMERICAS INC FILMS DIV
Label Street: NEW MURPHY RD AND CONCORD PIKE
Label P.O. Box:
Label City: WILMINGTON
Label State: DE
Label Zip Code: 19897
Label Country: US
Label Emergency Number: 800-327-8633 (MEDICAL)
Year Procured: N/K



REVISED: 30 June 95
DATE: 26 September 1993

U.S. ARMY EDGEWOOD
RESEARCH, DEVELOPMENT
AND ENGINEERING CENTER

Emergency Telephone #s:
ERDEC Safety Office
410-671-4411 0700-1700
EST After normal duty
hours: 410-671-2148
Ask for ERDEC Staff
Duty Officer

HT MATERIAL SAFETY DATA SHEET

SECTION I - GENERAL INFORMATION

MANUFACTURER'S NAME: Department of the Army

MANUFACTURER'S ADDRESS: U.S. ARMY CHEMICAL AND BIOLOGICAL DEFENSE COMMAND
EDGEWOOD RESEARCH, DEVELOPMENT AND ENGINEERING
CENTER
ATTN: SCBRD-ODR-S
ABERDEEN PROVING GROUND, MD 21010-5423

CAS REGISTRY NUMBER: Not Available

CHEMICAL NAME:

HD : Bis-(2-chloroethyl) sulfide
T : Bis-[2-(2-chloroethylthio)-ethyl] ether

Alternate chemical names:

See components (HD, T)

TRADE NAME AND SYNONYMS:

HT
Sulfur - Mustard (Vesicant)

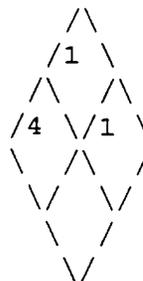
CHEMICAL FAMILY: Chlorinated sulfur compound

FORMULA/CHEMICAL STRUCTURE: Mixture of 60% Sulfur Mustard (HD) and 40%
Sulfur Mustard (T) by weight

HD: C4 H8 Cl2 S
T: C8 H16 Cl2 O S2

HT-1

NFPA 704 SIGNAL: Health - 4
Flammability - 1
Reactivity - 1



SECTION II - COMPOSITION

INGREDIENTS NAME	FORMULA	PERCENTAGE BY WEIGHT	AIRBORNE EXPOSURE LIMIT (AEL)
HT	*	100	0.003 mg/m3

* See Section I

SECTION III - PHYSICAL DATA

BOILING POINT: No constant boiling point. Above 228 DEG C

VAPOR PRESSURE (torr): 0.104 @ 25 DEG C

VAPOR DENSITY (AIR=1): 6.92

SOLUBILITY IN WATER: Practically insoluble.

SPECIFIC GRAVITY (H2O=1): 1.265 at 20 DEG C

FREEZING (MELTING) POINT: 0.0 to 1.3 DEG C

AUTOIGNITION TEMPERATURE DEG F (DEG C): Data not available

VISCOSITY (CENTISTOKES): 6.05 @ 20 DEG C

PERCENTAGE VOLATILE BY VOLUME (mg/m3): 831 @ 25 DEG C

EVAPORATION RATE: Data not available

APPEARANCE & ODOR: Odor: Garlic-like

Appearance: Highly viscous clear to pale yellow liquid

SECTION IV - FIRE AND EXPLOSION DATA

FLASHPOINT: (METHOD USED): approximately 100 DEG C (method unknown)

FLAMMABILITY LIMITS (% by volume): Data not available

EXTINGUISHING MEDIA: Water, fog, foam, CO₂. Avoid use of extinguishing methods that will splash or spread mustard.

UNUSUAL FIRE & EXPLOSION HAZARDS: May produce hydrogen chloride and sulfur oxides in a fire. Unburned agent vapors may be present and can cause toxic and vesicant effects.

SPECIAL FIRE FIGHTING PROCEDURES: All persons not engaged in extinguishing the fire should be immediately evacuated from the area. Fires involving HT should be contained to prevent contamination to uncontrolled areas. When responding to a fire alarm in buildings or areas containing agents, fire-fighting personnel should wear full firefighter protective clothing (without TAP clothing) during chemical agent firefighting and fire rescue operations. Respiratory protection is required. Positive pressure, full facepiece, NIOSH-approved self-contained breathing apparatus (SCBA) will be worn where there is danger of oxygen deficiency and when directed by the fire chief or chemical accident/incident (CAI) operations officer. In cases where fire-fighters are responding to a chemical accident/incident for rescue/reconnaissance purposes vice firefighting, they will wear appropriate levels of protective clothing (see Section 8).

SECTION V - HEALTH HAZARD DATA

AIRBORNE EXPOSURE LIMIT (AEL): The AEL for HT is 0.003 mg/m³ as found in DA Pam 40-173, "Occupational Health Guidelines for the Evaluation and Control of Occupational Exposure to Mustard Agents H, HD, and HT". No individual should be intentionally exposed to any direct skin or eye contact. The date, however, the Occupational Safety and Health Administration (OSHA) has not promulgated a permissible exposure concentration for HT.

HD, a component of HT, is recognized as a human carcinogen by the International Agency for Research on Cancer (IARC).

EFFECTS OF OVEREXPOSURE: HT is a vesicant (causing blisters). Since HT contains HD, HT is an alkylating agent producing cytotoxic action on the hematopoietic (blood-forming) tissues which are especially sensitive. The rate of detoxification of HT in the body is very slow and repeated exposure

produce a cumulative effect. Median lethal and incapacitating doses of HT in man have not been established. However, the inhalation LCt50s in certain animal species have been established as follows:

Dog:	100 - 200 mg-min/m ³
Guinea Pig:	3000 - 6000 mg-min/m ³
Rabbit:	3000 - 6000 mg-min/m ³
Mouse:	820 mg-min/m ³

Maximum safe Ct for HD for skin and eyes are 5 and 2 mg-min/m³, respectively.

ACUTE PHYSIOLOGICAL ACTION OF HT IS CLASSIFIED AS LOCAL AND SYSTEMIC.

LOCALLY, HT affects both the eyes and the skin. SKIN damage occurs after percutaneous resorption. Being lipid soluble, HT can be resorbed into all organs. Skin penetration is rapid without skin irritation. Swelling (blisters) and reddening (erythema) of the skin occurs after a latency period of 4-24 hours following the exposure, depending on the degree of exposure and individual sensitivity. The skin healing process is very slow. Tender skin, mucous membranes, and perspiration covered skin are more sensitive to the effects of HT. HT's effect on the skin, however, is less than on the eyes. Local action on the eyes produces severe necrotic damage and loss of eyesight. Exposure of eyes to HT vapor or aerosol produces lacrimation, photophobia, and inflammation of the conjunctiva and cornea.

SYSTEMIC ACTIONS occur primarily through inhalation and ingestion. The HT vapor or aerosol is less toxic to the skin or eyes than the liquid form. When inhaled, the upper respiratory tract (nose, throat, trachea) is inflamed after a few hours latency period, accompanied by sneezing, coughing and bronchitis, loss of appetite, diarrhea, fever, and apathy. Exposure to nearly lethal doses of HT can produce injury to bone marrow, lymph nodes, and spleen as indicated by a drop in WBC count and, therefore, results in an increased susceptibility to local and systemic infections. Ingestion of HT will produce severe stomach pains, vomiting, and bloody stools after a 15-20 minute latency period.

CHRONIC EXPOSURE to HT can cause sensitization, chronic lung impairment, (cough, shortness of breath, chest pain) and cancer of the mouth, throat, respiratory tract, and skin, and leukemia. It may also cause birth defects.

EMERGENCY AND FIRST AID PROCEDURES:

INHALATION: Remove from the source IMMEDIATELY. If breathing has stopped, give artificial respiration. If breathing is difficult, administer oxygen. Seek medical attention IMMEDIATELY.

EYE CONTACT: Speed in decontaminating the eyes is absolutely essential. Remove person from the liquid source, flush the eyes immediately with water

by tilting the head to the side, pulling the eyelids apart with the fingers and pouring water slowly into the eyes. Do not cover eyes with bandages but, if necessary, protect eyes by means of dark or opaque goggles. Transfer the victim to the medical facility IMMEDIATELY.

SKIN CONTACT: Don respiratory protection mask and gloves; remove victim from agent source immediately. Flush skin and clothes with 5 percent sodium hypochlorite solution or liquid household bleach, then wash contaminated skin area with soap and water. If shower facilities are available, wash thoroughly and transfer to medical facility IMMEDIATELY.

INGESTION: Do not induce vomiting. Give victim milk to drink. Seek medical attention IMMEDIATELY.

SECTION VI - REACTIVITY DATA

STABILITY: Stable at ambient temperatures. Decomposition temperature is 165 DEG C to 185 DEG C. HT is a persistent agent depending on pH and moisture, and has been known to remain active for up to three years in soil.

INCOMPATIBILITY: Conditions to avoid. Rapidly corrosive to brass @ 65 DEG C. Will corrode steel at a rate of .0001 in. of steel per month @ 65 DEG C.

HAZARDOUS DECOMPOSITION: HT will hydrolyze to form HCl, thiodiglycol, and bis-(2-(2-hydroxyethylthio) ethyl ether.

HAZARDOUS POLYMERIZATION: Will not occur.

SECTION VII - SPILL, LEAK, AND DISPOSAL PROCEDURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED: Only personnel in full protective clothing will be allowed in an area where HT is spilled (See section 8). In case of personnel contamination see section V "Emergency and First Aid Instructions."

RECOMMENDED FIELD PROCEDURES: Spills of HT must be contained by using vermiculite, diatomaceous earth, clay or fine sand and neutralized as possible using copious amounts of 5.25 percent Sodium Hypochlorite solution. Scoop up all material and place in approved DOT containers. Cover the contents of the drum with decontaminating solution as above. The exterior of the drum shall be decontaminated and then labeled IAW EPA and DOT regulations. All leaking containers shall be overpacked with vermiculite placed between the interior and exterior containers. Decontaminate and label IAW EPA and DOT regulations. Dispose of the material used to decontaminate exterior of

drum IAW Federal, state and local regulations. Conduct general area monitoring with an approved monitor (see Section 8) to confirm that the atmospheric concentrations do not exceed the airborne exposure limit (see Sections 2 and 8).

If 5.25 percent Sodium Hypochlorite solution is not available then the following decontaminants may be used instead and are listed in the order of preference: Calcium Hypochlorite, Decontamination Solution No. 2 (DS2) and Super Tropical Bleach Slurry (STB). WARNING: Pure, undiluted Calcium Hypochlorite (HTH) will burn on contact with liquid blister agent.

RECOMMENDED LABORATORY PROCEDURES: A minimum of 65 grams of decon solution is allowed to agitate for a minimum of one hour. Agitation is not necessary following the first hour if a single phase is obtained. At the end of 24 hours, the resulting solution shall be adjusted to a pH between 10 and 11. Test for presence of active chlorine by use of acidic potassium iodide solution to give free iodine color. Place 3 ml of the decontaminate in a test tube. Add several crystals of Potassium Iodine and swirl to dissolve. Add 3 ml of 50 wt percent Sulfuric Acid:water and swirl. IMMEDIATE Iodine color indicates the presence of active chlorine. If negative, add additional 5.25 percent Sodium Hypochlorite solution to the decontamination solution, wait two hours, then test again for active chlorine. Continue procedure until positive chlorine is given by solution.

A 10 wt percent HTH (calcium hypochlorite) mixture may be substituted for Sodium Hypochlorite. Use 65 grams of decon per gram of HT and continue the test as described for Sodium Hypochlorite.

Scoop up all material and place in approved DOT containers. Cover the contents of the drum with decontaminating solution as above. The exterior of the drum shall be decontaminated and then labeled IAW EPA and DOT regulations. All leaking containers shall be overpacked with vermiculite placed between the interior and exterior containers. Decontaminate and label IAW EPA and DOT regulations. Dispose of the material IAW waste disposal methods provided below. Dispose of the material used to decontaminate exterior of drum IAW Federal, state and local regulations. Conduct general area monitoring with an approved monitor to confirm that the atmospheric concentrations do not exceed the airborne exposure limits (see Section 8).

NOTE: Surfaces contaminated with HT and then rinse-decontaminated may evolve sufficient HT vapor to produce a physiological response.

WASTE DISPOSAL METHOD: All neutralized material should be collected, contained and thermally decomposed in an EPA permitted incinerator for decontaminated HT (see note), which will filter or scrub toxic by-products from effluent air before discharge to the atmosphere. Any contaminated protective clothing should be decontaminated using HTH or bleach and analyzed to assure

it is free of detectable contamination (3X) level. The clothing should then be sealed in plastic bags inside properly labeled drums and held for shipment back to the DA issue point. Decontamination of waste or excess material shall be accomplished in accordance with the following procedure outlined above with the following exception:

--- HT on laboratory glassware may be oxidized by its vigorous reaction with concentrated nitric acid.

Open pit burning or burying of HT or items containing or contaminated with HT in any quantity is prohibited.

Note: Some states consider certain decontaminated surety agents as RCRA hazardous waste. Local regulations must be considered before disposal action is taken.

SECTION VIII - SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION:

Concentration (mg/m3) Respiratory Protection/Ensemble Required

Less than or equal to 0.003 as an 8-hr TWA	Protective mask not required provided that: (a) Continuous real-time monitoring (with alarm capability) is conducted in the work area at the 0.003 mg/m3 level of detection. (b) M9, M17 or M40 mask is available and donned if excursion concentrations exceed 0.003 mg/m3. (c) Exposure has been limited to the extent practicable by engineering controls (remote operations, ventilation, and process isolation) or work practices.
--	--

If these conditions are not met then the following applies:

Full facepiece, chemical canister, air-purifying respirators. (The M9, M17, or M40 series or other certified equivalent masks acceptable for this purpose in conjunction with the M3 toxicological agent protective (TAP) suit for dermal protection.)

Greater than
0.003 as an
8-hr TWA

NIOSH/MSHA approved pressure demand full
facepiece SCBA suitable for use in high agent
concentrations with protective ensemble.
(See DA Pam 385-61 for examples).

VENTILATION:

Local Exhaust. Mandatory. Must be filtered or scrubbed. Air emissions shall meet local, state and federal regulations.

Special. Chemical laboratory hoods shall have an average inward face velocity of 100 linear feet per minute (lfpm) plus or minus 10% with the velocity at any point not deviating from the average face velocity by more than 20%. Existing laboratory hoods shall have an inward face velocity by 150 lfpm plus or minus 20%. Laboratory hoods shall be located such that cross drafts do not exceed 20% of inward face velocity. A visual performance test utilizing smoke producing devices shall be performed in assessing the ability of the hood to contain agent HT.

Other. Recirculation of exhaust air from agent areas is prohibited. No connection between agent area and other areas through the ventilation system is permitted. Emergency backup power is necessary. Hoods should be tested semi-annually or after modification or maintenance operations. Operations should be performed 20 cm inside hoods.

PROTECTIVE GLOVES: MANDATORY. Butyl Toxicological Agent Protective gloves (M3, M4, gloveset).

EYE PROTECTION: As a minimum, chemical goggles will be worn. For splash hazard use goggles and face-shield.

OTHER PROTECTIVE EQUIPMENT: For general lab work, gloves and lab coat shall be worn with M9, M40 or M17 mask readily available.

In addition, when handling contaminated lab animals, a daily clean smock, foot covers, and head covers are required.

MONITORING: Available monitoring equipment for agent HT is the M8/M9 detector paper, blue band tube, M256/M256A1 kits, bubbler, Depot Area Air Monitoring System (DAMMS), Automated Continuous Air Monitoring System (ACAMS), CAM-M1, Hydrogen Flame Photometric Emission Detector (HYFED), Miniature Chemical Agent Monitor (MINICAM), and the Real Time Analytical Platform (RTAP).

Real-time, low-level monitors (with alarm) are required for HT operations. In their absence, an IDLH atmosphere must be presumed. Laboratory operations conducted in appropriately maintained and alarmed engineering controls re-

quire only periodic low-level monitoring.

SECTION IX - SPECIAL PRECAUTIONS

PRECAUTIONS TO BE TAKEN IN HANDLING AND STORING:

During handling, the "buddy" (two-man) system will be used. Containers should be periodically inspected for leaks, either visually or using a detector kit, and prior to transferring the containers from storage to work areas. Stringent control over all personnel handling HT must be exercised. Chemical showers, eyewash stations, and personal cleanliness facilities must be provided. Wash hands before meals and each worker will shower thoroughly with special attention given to hair, face, neck, and hands, using plenty of soap before leaving at the end of the workday. No smoking, eating, or drinking is permitted at the work site. Decontamination equipment shall be conveniently located. Exits must be designed to permit rapid evacuation. HT should be stored in containers made of glass for Research Development Test and Evaluation (RDTE) quantities or one-ton steel containers for large quantities. Agent shall be double-contained in liquid-tight containers when in storage.

OTHER PRECAUTIONS: For additional information see AR 385-61, "The Army Toxic Chemical Agent Safety Program", DA Pam 385-61, "Toxic Chemical Agent Safety Standards", and DA Pam 40-173, "Occupational Health Guidelines for the Evaluation and Control of Occupational Exposure to Mustard Agents H, HD, and HT".

SECTION X - TRANSPORTATION DATA

FORBIDDEN FOR TRANSPORT OTHER THAN VIA MILITARY (TECHNICAL ESCORT UNIT)
TRANSPORT AS PER 49 CFR 172

PROPER SHIPPING NAME: Poisonous liquids, n.o.s.

DOT HAZARD CLASSIFICATION: 6.1, Packing Group I, Hazard Zone B

DOT LABEL: Poison

DOT MARKING: Poisonous liquids, n.o.s. (Bis-(2-chloroethyl) sulfide, and
Bis-[2-(2-chloroethylthio)-ethyl] ether) UN 2810, Inhalation
Hazard

DOT PLACARD: POISON

PRECAUTIONS TO BE TAKEN IN TRANSPORTATION: Motor vehicles will be placarded regardless of quantity. Driver shall be given full and complete information regarding shipment and conditions in case of emergency. AR 50-6

deals specifically with the shipment of chemical agents. Shipment of agents will be escorted in accordance with AR 740-32.

EMERGENCY ACCIDENT PRECAUTIONS AND PROCEDURES: See sections IV, VII, and VIII.

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