Blue Grass Chemical Agent Destruction Pilot Plant

Clean Air Act

Air Permit Application

Submitted To:
The Kentucky Department for Environmental Protection,
Division for Air Quality
803 Schenkel Lane
Frankfort, Kentucky  40601

Submitted By:
Blue Grass Army Depot
2091 Kingston Highway
Richmond, Kentucky  40475-5060

Prepared By:
Bechtel Parsons Blue Grass
301 Highland Park Drive
Richmond, Kentucky  40475

September 2004
September 20, 2004

Environmental Office

Mr. Jim Morse  
Commonwealth of Kentucky  
Department for Environmental Protection  
Division for Air Quality  
Permit Review Branch, Permit Support Section  
803 Schenkel Lane  
Frankfort, KY 40601

RE: Blue Grass Chemical Agent-Destruction Pilot Plant  
Air Permit Application for Addition of New Facilities  
Blue Grass Army Depot ID # 21-151-00013

Dear Mr. Morse:

The Blue Grass Army Depot (BGAD) is submitting the enclosed air permit application for the addition of new facilities located in Richmond, Kentucky. The facilities are associated with the chemical agent-destruction pilot plant which is referred to as the Blue Grass Chemical Agent-Destruction Pilot Plant (BGCAPP). We are making specific requests regarding the processing of our BGCAPP air permit application and respectfully request your consideration in this matter.

Although the proposed BGCAPP facilities will be constructed at the Blue Grass Army Depot, they will be operated by Bechtel Parsons Blue Grass as a separate entity within the depot. We are requesting a separate stand-alone construction and Clean Air Act (CAA), Title V operating permit for BGCAPP. The stand-alone permit will enable more effective management of the monitoring, recordkeeping, and reporting activities for the BGCAPP air emission sources. In addition, when the BGCAPP operations are concluded and subsequently discontinued, and its Title V permit rescinded, the permit for BGAD would not be affected or require modification. We recognize that any regulatory applicability determinations for BGAD will be based on total emissions from the existing BGAD operations and the proposed BGCAPP operations. Basis for issuance of a separate Title V permit is provided in the U.S. Environmental Protection Agency Title V guidance memorandum, "Major.
Source Definition for Military Installations under the Air Toxics, New Source Review, and Title V Operating Permit Programs of the Clean Air Act," dated August 2, 1996.

We have completed the individual application forms to the best of our ability. In some limited instances, the data elements required for individual forms will not be available until engineering details have been finalized or equipment purchasing decisions have been made. Examples of the missing data elements are egress point information and equipment-specific data required on Form DEP7007N. We have entered "NA" or "to be determined" on the forms for these elements. Please note that the missing data elements do not relate to pollutant emissions and our emission data are complete. We will provide the missing data in an expeditious manner as it is obtained from the equipment supplier and the design team.

We would like to meet with the Division staff to discuss our application. We believe that such a meeting will be helpful in discussing the project scope and pertinent details that are not part of the application document. We will contact you in about two weeks to discuss the possibility and date for the proposed meeting. In the meantime, please call Mr. Joe Elliott at (859) 779-6021 or Mr. Todd Williams at (859) 779-6280 if you have any questions about our submittal. Thank you in advance for your cooperation.

Sincerely,

Martin A. Jacoby
Colonel, U.S. Army
Commanding Officer

Enclosures

Copies furnished without Enclosures:
Mr. Jim Richmond, ACWA
Mr. Chris Midgett, Bechtel Parsons Blue Grass

RECEIVED
SEP 17 2004

PERMIT REVIEW BRANCH
DIVISION FOR AIR QUALITY
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PERMIT APPLICATION

The completion of this form is required under Regulations 401 KAR 52:020, 52:030, and 52:040 pursuant to KRS 224. Applications are incomplete unless accompanied by copies of all plans, specifications, and drawings requested herein. Failure to supply information required or deemed necessary by the division to enable it to act upon the application shall result in denial of the permit and ensuing administrative and legal action. Applications shall be submitted in triplicate.

1) APPLICATION INFORMATION

Note: The applicant must be the owner or operator. (The owner/operator may be individual(s) or a corporation.)

Name: U. S. Department of the Army
Title: Phone: (859) 779-6246

Mailing Address: Blue Grass Army Depot
Company
Street or P.O. Box: 2091 Kingston Highway
City: Richmond State: KY Zip Code: 40475-5060

Is the applicant (check one): ☑ Owner ☐ Operator ☐ Owner & Operator ☐ Corporation/LLC* ☐ LP**
* If the applicant is a Corporation or a Limited Liability Corporation, submit a copy of the current Certificate of Authority from the Kentucky Secretary of State.
** If the applicant is a Limited Partnership, submit a copy of the current Certificate of Limited Partnership from the Kentucky Secretary of State.

Person to contact for technical information relating to application:
Name: Todd G. Williams
Title: Environmental Coordinator Phone: (859) 779-6280

2) OPERATOR INFORMATION

Note: The applicant must be the owner or operator. (The owner/operator may be individual(s) or a corporation.)

Name: Bechtel Parsons Blue Grass
Title: Phone: (859) 625-1665

Mailing Address: Bechtel Parsons Blue Grass
Company
Street or P.O. Box: 301 Highland Park Drive
City: Richmond State: KY Zip Code: 40475-3488
3) TYPE OF PERMIT APPLICATION

For new sources that currently do not hold any air quality permits in Kentucky and are required to obtain a permit prior to construction pursuant to 401 KAR 52:020, 52:030, or 52:040.

☐ Initial Operating Permit (the permit will authorize both construction and operation of the new source)

Type of Source (Check all that apply): ☐ Major ☐ Conditional Major ☐ Synthetic Minor ☐ Minor

For existing sources that do not have a source-wide Operating Permit required by 401 KAR 52:020, 52:030, or 52:040.

Type of Source (Check all that apply): ☐ Major ☐ Conditional Major ☐ Synthetic Minor ☐ Minor

(Check one only)
☐ Initial Source-wide Operating Permit ☐ Construction of New Facilities at Existing Plant
☐ Construction of New Facilities at Existing Plant ☐ Modification of Existing Facilities at Existing Plant
☐ Other (explain)

For existing sources that currently have a source-wide Operating Permit.

Type of Source (Check all that apply): ☐ Major ☐ Conditional Major ☐ Synthetic Minor ☐ Minor

Current Operating Permit # ☐ 86-12, S-99-46 (Note: S-99-46 is currently expired)

☐ Administrative Revision (describe type of revision requested, e.g. name change):

☐ Permit Renewal ☐ Significant Revision ☐ Minor Revision

☐ Addition of New Facilities ☐ Modification of Existing Facilities

For all construction and modification requiring a permit pursuant to 401 KAR 52:020, 52:030, or 52:040.

Proposed Date for Start of Construction or Modification: July 2005
Proposed date for Operation Start-up: January 2007

4) SOURCE INFORMATION

Source Name: Blue Grass Chemical Agent-Destruction Pilot Plant

Source Street Address: 2091 Kingston Highway

City: Richmond Zip Code: 40475-5060 County: Madison

Primary Standard Industrial Classification (SIC) Category: National Security (U.S. Army) Primary SIC #: 9711

Property Area (Acres or Square Feet): 14,596 Acres

Number of Employees: 1,450 (approx.)

Description of Area Surrounding Source (check one):
☐ Commercial Area ☐ Residential Area ☐ Industrial Area ☐ Industrial Park ☒ Rural Area ☐ Urban Area

Approximate Distance to Nearest Residence or Commercial Property: At Property Line

UTM or Standard Location Coordinates: (Include topographical map showing property boundaries)

UTM Coordinates: Zone 16 Horizontal (km) 744.324E Vertical (km) 4175.932N

Standard Coordinates: Latitude 37 Degrees 41 Minutes 53 Seconds
Longitude 84 Degrees 13 Minutes 44 Seconds
4) SOURCE INFORMATION (CONTINUED)

Is any part of the source located on federal land?  ☒ Yes  ☐ No

What other environmental permits or registrations does this source currently hold in Kentucky?

- NPDES/KPDES – KY0020737; KDEP Air Permits: O-86-12, S-99-046 (expired)
- RCRA – KY8-213-820-105; Water Withdrawal Permit # 1013

What other environmental permits or registrations does this source need to obtain in Kentucky?

Part A - Hazardous Waste Permit, Clean Air Act Title V operation permit.

5) OTHER REQUIRED INFORMATION

Indicate the type(s) and number of forms attached as part of this application.

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<thead>
<tr>
<th>Form Code</th>
<th>Description</th>
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</thead>
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<td>Indirect Heat Exchanger, Turbine, Internal Combustion Engine</td>
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<td>DEP7007B</td>
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<td>DEP7007J</td>
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<td>DEP7007V</td>
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<tr>
<td>DEP7007Y</td>
<td>Good Engineering Practice (GEP) Stack Height Determination</td>
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<tr>
<td>DEP7007AA</td>
<td>Compliance Schedule for Noncomplying Emission Units</td>
</tr>
<tr>
<td>DEP7007BB</td>
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</tr>
<tr>
<td>DEP7007CC</td>
<td>Compliance Certification</td>
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<tr>
<td>DEP7007DD</td>
<td>Insignificant Activities</td>
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</table>

Check other attachments that are part of this application.

<table>
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<th>Required Data</th>
<th>Supplemental Data</th>
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<tbody>
<tr>
<td>☒ Map or Drawing Showing Location</td>
<td>☐ Stack Test Report</td>
</tr>
<tr>
<td>☒ Process Flow Diagram and Description</td>
<td>☐ Certificate of Authority from the Secretary of State (for Corporations and Limited Liability Companies)</td>
</tr>
<tr>
<td>☒ Site Plan Showing Stack Data and Locations</td>
<td>☐ Certificate of Limited Partnership from the Secretary of State (for Limited Partnerships)</td>
</tr>
<tr>
<td>☒ Emission Calculation Sheets</td>
<td>☐ Claim of Confidentiality (See 400 KAR 1:060)</td>
</tr>
<tr>
<td>☒ Material Safety Data Sheets (MSDS)</td>
<td>☒ Other (Specify) Supporting Document with calculations</td>
</tr>
</tbody>
</table>

Indicate if you expect to emit, in any amount, hazardous or toxic materials or compounds or such materials into the atmosphere from any operation or process at this location.

- ☐ Pollutants regulated under 401 KAR 57:002 (NESHAP)
- ☒ Pollutants listed in 401 KAR 63:060 (HAPS)
- ☐ Pollutants listed in 40 CFR 68 Subpart F [112(r) pollutants]
- ☒ Other (Chemical Agents VX, GB, H)

Has your company filed an emergency response plan with local and/or state and federal officials outlining the measures that would be implemented to mitigate an emergency release?

- ☐ Yes  ☒ No

Check whether your company is seeking coverage under a permit shield. If “Yes” is checked, applicable requirements must be identified on Form DEP7007V. Identify any non-applicable requirements for which you are seeking permit shield coverage on a separate attachment to the application.

- ☐ Yes  ☒ No  ☒ A list of non-applicable requirements is attached
6) OWNER INFORMATION

Note: If the applicant is the owner, write “same as applicant” on the name line.

Name: Same as Applicant

Title: Phone:

Mailing Address: Company
Street or P.O. Box:
City: State: Zip Code:

List names of owners and officers of your company who have an interest in the company of 5% or more.

Name

Position (owner, partner, president, CEO, treasurer, etc.)

NA

(attach another sheet if necessary)

7) SIGNATURE BLOCK

I, the undersigned, hereby certify under penalty of law, that I am a responsible official, and that I have personally examined, and am familiar with, the information submitted in this document and all its attachments. Based on my inquiry of those individuals with primary responsibility for obtaining the information, I certify that the information is on knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false or incomplete information, including the possibility of fine or imprisonment.

BY: ________________________________     20 [Redacted]
(Authorized Signature) (Date)

Martin A. Jacoby
(Typed or Printed Name of Signatory)

Colonel, U.S. Army, Commanding Officer
(Title of Signatory)
Commonwealth of Kentucky
Natural Resources & Environmental Protection Cabinet
Department for Environmental Protection

DIVISION FOR AIR QUALITY

(Submit copies of this form for each individual unit.
Make additional copies as needed)

1) Type of Unit (Make, Model, Etc.): Natural Gas Boiler with No. 2 Fuel Oil Backup (Cleaver Brooks – or equivalent)

Date Installed: May 2006
Cost of Unit: N/A

(Date unit was installed, modified or reconstructed, whichever is later.)

Where more than one unit is present, identify with Company’s identification or code for this unit:

BGCAPP Process Boiler #1

2a) Kind of Unit (Check one):

1. Indirect Heat Exchanger
2. Gas Turbine for Electricity Generation
3. Pipe Line Compressor Engines:
   - Gas Turbine
   - Reciprocating engines
   - (a) 2-cycle lean burn
   - (b) 4-cycle lean burn
   - (c) 4-cycle rich burn

2b) Rated Capacity (Refer to manufacturer’s specifications):

1. Fuel input (mmBTU/hr): 34.50
2. Power output (hp): N/A
3. Power output (MW): N/A

4) Secondary Fuel (if any, specify type):

No. 2 Fuel Oil

5) Fuel Composition

<table>
<thead>
<tr>
<th>Type</th>
<th>Percent Ash</th>
<th>Percent Sulfur</th>
<th>Heat Content Corresponding to:</th>
<th>c. d</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary</td>
<td>Maximum</td>
<td>Maximum</td>
<td>Maximum Ash</td>
<td>1000 Btu/cuft</td>
</tr>
<tr>
<td>Secondary</td>
<td>0.4 Percent</td>
<td>137,030 Btu/gallon</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

a. As received basis. Proximate Analysis for Ash. (May use values in your fuel contract)
b. As received basis. Ultimate Analysis for Sulfur. (May use values in your fuel contract)
c. Higher Heating Value, BTU/Unit. (May use values in your fuel contract)
d. Suggested units are: Pounds for solid fuel, gallon for liquid fuels, and cu. Ft. for gaseous fuels. If other units are used, please specify.

6) Maximum Annual Fuel Usage Rate (please specify units)*: The boiler will burn No. 2 fuel oil only during periods of gas curtailment or gas supply emergencies. The No. 2 fuel oil consumption for the 4 facility boilers (PB1, PB2, SB1, and SB2) is estimated not to exceed 917,000 gal/yr, based on No. 2 fuel oil heat input of no more than 10% of the annual capacity.

7) Fuel Source or supplier: Local Suppliers

*Should be entered only if applicant requests operating restriction through federally enforceable limitations.

Page 1 A of 30 A
(Revised 06/00)
8) **MAXIMUM OPERATING SCHEDULE FOR THIS UNIT***

| 24 hours/day | 7 days/week | 52 weeks/year |

9) If this unit is multipurpose, describe percent in each use category:

| Space Heat | Process Heat | Power |

10) Control options for turbine/IC engine  

- (1) Water Injection  
- (3) Selective Catalytic Reduction (SCR)  
- (5) Combustion Modification  
- (2) Steam Injection  
- (3) Non-Selective Catalytic Reduction (NSCR)  
- (5) Other  

**IMPORTANT:** Form DEP7007N must also be completed for this unit.

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**SECTION II COMPLETE ONLY FOR INDIRECT HEAT EXCHANGERS**

11) **Coal-Fired Units**

- Pulverized Coal Fired:  
  - Dry Bottom  
  - Wet Bottom  
  - Tangentially Fired  

- Cyclone Furnace

- Overfeed Stoker

- Fluidized Bed Combustor:  
  - Circulating Bed
  - Bubbling Bed

- Spreader Stoker

- Underfeed Stoker

- Hand-fed

- Other

12) **Oil-Fired Unit**  

- Tangentially (Corner) Fired

- Horizontally Opposed (Normal) Fired

13) **Wood-Fired Unit**

- Fly-Ash Reinjection:  
  - Dutch Oven/Fuel Cell Oven

- Fluidized Bed Combustion (FBC)

14) **Natural Gas-Fired Units**

- Low NOx Burners:  
  - Yes  
  - No

- Flue Gas Recirculation:  
  - Yes  
  - No

---

*Should be entered only if applicant requests operating restriction through federally enforceable limitations.*
15) Combustion Air Draft: _____ Natural _____ Induced

   Forced Pressure _____ X _____ lbs/sq. in.

   Percent excess air (air supplied in excess of theoretical air) _________ %   N/A

SECTION III

16) Additional Stack Data

   A. Are sampling ports provided? ☐ Yes ☒ No
   B. If yes, are they located in accordance with 40 CFR 60*? ☐ Yes ☐ No
   C. List other units vented to this stack

17) Attach manufacturer’s specifications and guaranteed performance data for the indirect heat exchanger. Include information concerning fuel input, burners and combustion chamber dimensions.

18) Describe fuel transport, storage methods and related dust control measures, including ash disposal and control.

   No. 2 fuel oil will be delivered to the site and stored in 2 aboveground storage tanks, each with a capacity of 24,620 gallons.

*Applicant assumes responsibility for proper location of sampling ports if the Division for Air Quality requires a compliance demonstration stack test.
Commonwealth of Kentucky  
Natural Resources & Environmental Protection Cabinet  
Department for Environmental Protection  

DIVISION FOR AIR QUALITY

(Submit copies of this form for each individual unit.  
Make additional copies as needed)

1) Type of Unit (Make, Model, Etc.): Natural Gas Boiler with No. 2 Fuel Oil Backup (Cleaver Brooks – or equivalent)
   
   Date Installed: May 2006  
   Cost of Unit: N/A  
   
   Where more than one unit is present, identify with Company’s identification or code for this unit:  
   BGCAPP Process Boiler #2

2a) Kind of Unit (Check one):  
2b) Rated Capacity: (Refer to manufacturer’s specifications)
   1. Indirect Heat Exchanger  
   2. Gas Turbine for Electricity Generation  
   3. Pipe Line Compressor Engines:
      ___ Gas Turbine  
      ___ Reciprocating engines
         (a) 2-cycle lean burn  
         (b) 4-cycle lean burn  
         (c) 4-cycle rich burn  
   4. Industrial Engine

SECTION 1. FUEL

3) Type of Primary Fuel (Check):
   
   _____ A. Coal  
   _____ B. Fuel Oil # (Check one)  
   _____ 1  
   _____ 2  
   _____ 3  
   _____ 4  
   _____ 5  
   _____ 6  
   ____ X  
   ____ C. Natural Gas  
   ____ D. Propane  
   ____ E. Butane  
   ____ F. Wood  
   ____ G. Gasoline  
   ____ H. Diesel  
   ____ I. Other (specify)  

4) Secondary Fuel (if any, specify type): No. 2 Fuel Oil

5) Fuel Composition

<table>
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<tr>
<th>Type</th>
<th>Percent Ash</th>
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<td>Maximum</td>
<td>Maximum</td>
<td>Maximum Ash</td>
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<td>Secondary</td>
<td>0.4 Percent</td>
<td>1000 Btu/cuft</td>
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a. As received basis. Proximate Analysis for Ash. (May use values in your fuel contract)
b. As received basis. Ultimate Analysis for Sulfur. (May use values in your fuel contract)
c. Higher Heating Value, BTU/Unit. (May use values in your fuel contract)
   Suggested units are: Pounds for solid fuel, gallon for liquid fuels, and cu. Ft. for gaseous fuels. If other units are used, please specify.

6) Maximum Annual Fuel Usage Rate (please specify units)*: The boiler will burn No. 2 fuel oil only during periods of gas curtailment or gas supply emergencies. The No. 2 fuel oil consumption for the 4 facility process heat boilers (PB1, PB2, SB1, and SB2) is estimated not to exceed 917,000 gal/yr, based on No. 2 fuel oil heat input of no more than 10% of the annual capacity.

7) Fuel Source or supplier: Local Suppliers

*Should be entered only if applicant requests operating restriction through federally enforceable limitations.
8) **MAXIMUM OPERATING SCHEDULE FOR THIS UNIT***

| 24 hours/day | 7 days/week | 52 weeks/year |

9) If this unit is multipurpose, describe percent in each use category:

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10) **Control options for turbine/IC engine** (Check)

- (1) Water Injection
- (2) Steam Injection
- (3) Selective Catalytic Reduction (SCR)
- (4) Non-Selective Catalytic Reduction (NSCR)
- (5) Combustion Modification

**IMPORTANT:** Form DEP7007N must also be completed for this unit.

### SECTION II

**COMPLETE ONLY FOR INDIRECT HEAT EXCHANGERS**

11) **Coal-Fired Units**

- Pulverized Coal Fired:
  - Dry Bottom
  - Wet Bottom
  - Tangentially Fired

- Cyclone Furnace

- Overfeed Stoker

- Fluidized Bed Combustor:
  - Circulating Bed
  - Bubbling Bed

12) **Oil-Fired Unit**

- To be Determined

- Tangentially (Corner) Fired

- Horizontally Opposed (Normal) Fired

13) **Wood-Fired Unit**

- Fly-Ash Reinjection: No

- Dutch Oven/Fuel Cell Oven Stoker

- Suspension Firing

14) **Natural Gas-Fired Units**

- Low NOx Burners: No

- Flue Gas Recirculation: No

*Should be entered only if applicant requests operating restriction through federally enforceable limitations.
15) Combustion Air Draft: _______ Natural _______ Induced

Forced Pressure X ______ lbs/sq. in.

Percent excess air (air supplied in excess of theoretical air) ________% N/A

SECTION III

16) Additional Stack Data

A. Are sampling ports provided? ☐ Yes ☒ No
B. If yes, are they located in accordance with 40 CFR 60*? ☐ Yes ☐ No
C. List other units vented to this stack

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COMMONWEALTH OF KENTUCKY
NATURAL RESOURCES & ENVIRONMENTAL PROTECTION CABINET
DEPARTMENT FOR ENVIRONMENTAL PROTECTION
DIVISION FOR AIR QUALITY

(Submit copies of this form for each individual unit.
Make additional copies as needed)

1) Type of Unit (Make, Model, Etc.): Natural Gas Boiler with No. 2 Fuel Oil Backup (Cleaver Brooks – or equivalent)

Date Installed: May 2006  Cost of Unit: N/A
(Date unit was installed, modified or reconstructed, whichever is later.)

Where more than one unit is present, identify with Company’s identification or code for this unit:
BGCAPP Space Heat Boiler #1

2a) Kind of Unit (Check one): 2b) Rated Capacity: (Refer to manufacturer’s specifications)
1. Indirect Heat Exchanger X 1. Fuel input (mmBTU/hr): 37.26
2. Gas Turbine for Electricity Generation Power output (hp): N/A
3. Pipe Line Compressor Engines:
   _ Gas Turbine
   _ Reciprocating engines
      (a) 2-cycle lean burn
      (b) 4-cycle lean burn
      (c) 4-cycle rich burn
4. Industrial Engine

SECTION 1. FUEL

3) Type of Primary Fuel (Check):
   _ A. Coal   _ B. Fuel Oil # (Check one)   _ C. Natural Gas
   X   D. Propane   E. Butane   F. Wood   G. Gasoline
   H. Diesel   I. Other (specify)

4) Secondary Fuel (if any, specify type): No. 2 Fuel Oil

5) Fuel Composition

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d. Suggested units are: Pounds for solid fuel, gallon for liquid fuels, and cu. Ft. for gaseous fuels. If other units are used, please specify.

6) Maximum Annual Fuel Usage Rate (please specify units)*: The boiler will burn No. 2 fuel oil only during periods of gas curtailment or gas supply emergencies. The No. 2 fuel oil consumption for the 4 facility boilers (PB1, PB2, SB1, and SB2) is estimated not to exceed 917,000 gal/yr, based on No. 2 fuel oil heat input of no more than 10% of the annual capacity.

7) Fuel Source or supplier: Local Suppliers

*Should be entered only if applicant requests operating restriction through federally enforceable limitations.
8) **MAXIMUM OPERATING SCHEDULE FOR THIS UNIT***

<table>
<thead>
<tr>
<th>Hours/day</th>
<th>Days/week</th>
<th>Weeks/year</th>
</tr>
</thead>
<tbody>
<tr>
<td>24</td>
<td>7</td>
<td>52</td>
</tr>
</tbody>
</table>

9) If this unit is multipurpose, describe percent in each use category:

<table>
<thead>
<tr>
<th>Space Heat</th>
<th>Process Heat</th>
<th>Power</th>
</tr>
</thead>
<tbody>
<tr>
<td>100%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

10) Control options for turbine/IC engine (Check)

- (1) Water Injection
- (2) Steam Injection
- (3) Selective Catalytic Reduction (SCR)
- (4) Non-Selective Catalytic Reduction (NSCR)
- (5) Combustion Modification

**IMPORTANT:** Form DEP7007N must also be completed for this unit.

---

**SECTION II COMPLETE ONLY FOR INDIRECT HEAT EXCHANGERS**

11) **Coal-Fired Units**

<table>
<thead>
<tr>
<th>Pulverized Coal Fired:</th>
<th>Fly Ash Rejection:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dry Bottom</td>
<td>☐ Yes ☐ No</td>
</tr>
<tr>
<td>Wet Bottom</td>
<td></td>
</tr>
<tr>
<td>Wall Fired</td>
<td></td>
</tr>
<tr>
<td>Tangentially Fired</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Cyclone Furnace</th>
<th>Spreader Stoker</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Yes</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Overfeed Stoker</th>
<th>Underfeed Stoker</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Fluidized Bed Combustor:</th>
<th>Hand-fed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Circulating Bed</td>
<td></td>
</tr>
<tr>
<td>Bubbling Bed</td>
<td></td>
</tr>
<tr>
<td>Other (specify)</td>
<td></td>
</tr>
</tbody>
</table>

12) **Oil-Fired Unit**

To be Determined

<table>
<thead>
<tr>
<th>Tangentially (Corner) Fired</th>
<th>Horizontally Opposed (Normal) Fired</th>
</tr>
</thead>
</table>

13) **Wood-Fired Unit**

<table>
<thead>
<tr>
<th>Fly-Ash Reinjection:</th>
<th>☐ Yes ☐ No</th>
<th>Dutch Oven/Fuel Cell Oven Stoker</th>
<th>Suspension Firing</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Fluidized Bed Combustion (FBC)</th>
</tr>
</thead>
</table>

14) **Natural Gas-Fired Units**

<table>
<thead>
<tr>
<th>Low NOx Burners:</th>
<th>☐ Yes ☒ No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flue Gas Recirculation:</td>
<td>☐ Yes ☒ No</td>
</tr>
</tbody>
</table>

*Should be entered only if applicant requests operating restriction through federally enforceable limitations.*
15) Combustion Air Draft: ______ Natural ______ Induced

Forced Pressure _____ X _____ lbs/sq. in.

Percent excess air (air supplied in excess of theoretical air) _________ % N/A

SECTION III

16) Additional Stack Data

A. Are sampling ports provided? ☐ Yes ☒ No
B. If yes, are they located in accordance with 40 CFR 60*? ☐ Yes ☐ No
C. List other units vented to this stack

17) Attach manufacturer’s specifications and guaranteed performance data for the indirect heat exchanger. Include information concerning fuel input, burners and combustion chamber dimensions.

18) Describe fuel transport, storage methods and related dust control measures, including ash disposal and control.

No. 2 fuel oil will be delivered to the site and stored in 2 aboveground storage tanks, each with a capacity of 24,620 gallons.

*Applicant assumes responsibility for proper location of sampling ports if the Division for Air Quality requires a compliance demonstration stack test.
**Commonwealth of Kentucky**  
**Natural Resources & Environmental Protection Cabinet**  
**Department for Environmental Protection**  
**DIVISION FOR AIR QUALITY**

*(Submit copies of this form for each individual unit. Make additional copies as needed)*

---

1) **Type of Unit (Make, Model, Etc.):** Natural Gas Boiler with No. 2 Fuel Oil Backup (Cleaver Brooks – or equivalent)

   Date Installed: May 2006  
   Cost of Unit: N/A

   (Date unit was installed, modified or reconstructed, whichever is later.)

   Where more than one unit is present, identify with Company’s identification or code for this unit:
   
   **BGCAPP Space Heat Boiler #2**

2a) **Kind of Unit (Check one):**

2b) **Rated Capacity: (Refer to manufacturer’s specifications)**

1. Indirect Heat Exchanger  
   Fuel input (mmBTU/hr): 37.26

2. Gas Turbine for Electricity Generation  
   Power output (hp): N/A

3. Pipe Line Compressor Engines:
   Gas Turbine  
   Reciprocating engines
   (a) 2-cycle lean burn
   (b) 4-cycle lean burn
   (c) 4-cycle rich burn

4. Industrial Engine

---

**SECTION 1. FUEL**

3) **Type of Primary Fuel (Check):**

   - A. Coal
   - B. Fuel Oil # (Check one)  
     1 ______ 2 ______ 3 ______ 4 ______ 5 ______ 6
   - C. Natural Gas
   - D. Propane
   - E. Butane
   - F. Wood
   - G. Gasoline
   - H. Diesel
   - I. Other (specify)

4) **Secondary Fuel (if any, specify type):** No. 2 Fuel Oil

5) **Fuel Composition**

<table>
<thead>
<tr>
<th>Type</th>
<th>Percent Ash</th>
<th>Percent Sulfur</th>
<th>Heat Content Corresponding to:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Maximum</td>
<td>Maximum</td>
<td>Maximum Ash</td>
</tr>
<tr>
<td>Primary</td>
<td></td>
<td></td>
<td>1000 Btu/cuft</td>
</tr>
<tr>
<td>Secondary</td>
<td>0.4 Percent</td>
<td></td>
<td>137,030 Btu/gallon</td>
</tr>
</tbody>
</table>

   a. As received basis. Proximate Analysis for Ash. (May use values in your fuel contract)
   b. As received basis. Ultimate Analysis for Sulfur. (May use values in your fuel contract)
   c. Higher Heating Value, BTU/Unit. (May use values in your fuel contract)
   d. Suggested units are: Pounds for solid fuel, gallon for liquid fuels, and cu. Ft. for gaseous fuels. If other units are used, please specify.

6) **Maximum Annual Fuel Usage Rate (please specify units)*:** The boiler will burn No. 2 fuel oil only during periods of gas curtailment or gas supply emergencies. The No. 2 fuel oil consumption for the 4 facility boilers (PB1, PB2, SB1, and SB2) is estimated not to exceed 917,000 gal/yr, based on No. 2 fuel oil heat input of no more than 10% of the annual capacity.

7) **Fuel Source or supplier:** Local Suppliers

---

*Should be entered only if applicant requests operating restriction through federally enforceable limitations.*
8) MAXIMUM OPERATING SCHEDULE FOR THIS UNIT*

| 24 | hours/day | 7 | days/week | 52 | weeks/year |

9) If this unit is multipurpose, describe percent in each use category:

| Space Heat | 100% | Process Heat | % | Power | % |

10) Control options for turbine/IC engine (Check)

- (1) Water Injection
- (3) Non-Selective Catalytic Reduction (NSCR)
- (5) Other (Specify)

IMPORTANT: Form DEP7007N must also be completed for this unit.

SECTION II COMPLETE ONLY FOR INDIRECT HEAT EXCHANGERS

11) Coal-Fired Units

- Pulverized Coal Fired:
  - Dry Bottom
  - Wet Bottom
- Wall Fired
- Tangentially Fired

- Cyclone Furnace
- Spreader Stoker
- Overfeed Stoker
- Underfeed Stoker
- Fluidized Bed Combustor:
  - Circulating Bed
  - Bubbling Bed

- Fly Ash Rejection:
  - Yes
  - No

12) Oil-Fired Unit

- Tangentially (Corner) Fired
- Horizontally Opposed (Normal) Fired

13) Wood-Fired Unit

- Fly-Ash Reinjection:
  - Yes
  - No
- Dutch Oven/Fuel Cell Oven
- Fluidized Bed Combustion (FBC)

14) Natural Gas-Fired Units

- Low NOx Burners:
  - Yes
  - No
- Flue Gas Recirculation:
  - Yes
  - No

*Should be entered only if applicant requests operating restriction through federally enforceable limitations.
15) Combustion Air Draft: _______ Natural _______ Induced

Forced Pressure X ___ lbs/sq. in.

Percent excess air (air supplied in excess of theoretical air) _________ % N/A

SECTION III

16) Additional Stack Data

A. Are sampling ports provided? ☐ Yes ☒ No
B. If yes, are they located in accordance with 40 CFR 60*? ☐ Yes ☐ No
C. List other units vented to this stack ____________________________

17) Attach manufacturer’s specifications and guaranteed performance data for the indirect heat exchanger. Include information concerning fuel input, burners and combustion chamber dimensions.

18) Describe fuel transport, storage methods and related dust control measures, including ash disposal and control.

No. 2 fuel oil will be delivered to the site and stored in 2 aboveground storage tanks, each with a capacity of 24,620 gallons.

*Applicant assumes responsibility for proper location of sampling ports if the Division for Air Quality requires a compliance demonstration stack test.
Commonwealth of Kentucky
Natural Resources & Environmental Protection Cabinet
Department for Environmental Protection

DIVISION FOR AIR QUALITY

(Submit copies of this form for each individual unit. Make additional copies as needed)

---

1) Type of Unit (Make, Model, Etc.): Caterpillar Model D3612 (or equivalent)

   Date Installed: May 2006
   Cost of Unit: $1,700,000

   (Date unit was installed, modified or reconstructed, whichever is later.)

   Where more than one unit is present, identify with Company’s identification or code for this unit:

   IC Engine for Emergency Generator #1

2a) Kind of Unit (Check one):

   1. Indirect Heat Exchanger
   2. Gas Turbine for Electricity Generation
   3. Pipe Line Compressor Engines:

      ______ Gas Turbine
      ______ Reciprocating engines
      (a) 2-cycle lean burn
      (b) 4-cycle lean burn
      (c) 4-cycle rich burn
   4. Industrial Engine X

2b) Rated Capacity: (Refer to manufacturer’s specifications)

   1. Fuel input (mmBTU/hr): 29.5
   2. Power output (hp): 4,640
   3. Power output (MW): 3.3

---

SECTION 1. FUEL

3) Type of Primary Fuel (Check):

   _____ A. Coal
   X _____ B. Fuel Oil # (Check one)  _____ 1  _____ 2  _____ 3  _____ 4  _____ 5  _____ 6
   _____ C. Natural Gas
   _____ D. Propane
   _____ E. Butane
   _____ F. Wood
   _____ G. Gasoline
   _____ H. Diesel
   _____ I. Other (specify)

4) Secondary Fuel (if any, specify type):

5) Fuel Composition

<table>
<thead>
<tr>
<th>Type</th>
<th>Percent Ash(^a)</th>
<th>Percent Sulfur(^b)</th>
<th>Heat Content Corresponding to:(^{c,d})</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary</td>
<td>Maximum</td>
<td>Maximum</td>
<td>Maximum Ash</td>
</tr>
<tr>
<td>N/A</td>
<td>0.4</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>Secondary</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

\(a\) As received basis. Proximate Analysis for Ash. (May use values in your fuel contract)
\(b\) As received basis. Ultimate Analysis for Sulfur. (May use values in your fuel contract)
\(c\) Higher Heating Value, BTU/Unit. (May use values in your fuel contract)
\(d\) Suggested units are: Pounds for solid fuel, gallon for liquid fuels, and cu. Ft. for gaseous fuels. If other units are used, please specify.

6) Maximum Annual Fuel Usage Rate (please specify units)*: Total combined No. 2 fuel oil consumption for 4 Main Emergency IC engines (EG1, EG2, EG3, and EG4) will be limited to a maximum of 430,563 gallons per year.

7) Fuel Source or supplier: Local Suppliers

---

*Should be entered only if applicant requests operating restriction through federally enforceable limitations.
8) **MAXIMUM OPERATING SCHEDULE FOR THIS UNIT**

Emergency Generator: Total combined operating hours for 4 Main Emergency IC engines (EG1, EG2, EG3, and EG4) will be limited to a maximum of 2000 hours per year.

<table>
<thead>
<tr>
<th>Hours/day</th>
<th>Days/week</th>
<th>Weeks/year</th>
</tr>
</thead>
</table>

9) If this unit is multipurpose, describe percent in each use category:

<table>
<thead>
<tr>
<th>Space Heat</th>
<th>Process Heat</th>
<th>Power</th>
<th>100</th>
</tr>
</thead>
</table>

10) Control options for turbine/IC engine **(Check)**

- [ ] (1) Water Injection
- [X] (3) Selective Catalytic Reduction (SCR)
- [ ] (5) Combustion Modification

(2) Steam Injection
(3) Non-Selective Catalytic Reduction (NSCR)
(5) Other *(Specify)*

**IMPORTANT:** Form DEP7007N must also be completed for this unit.

**SECTION II**

COMPLETE ONLY FOR INDIRECT HEAT EXCHANGERS

11) **Coal-Fired Units**

- [ ] Pulverized Coal Fired:
  - [ ] Dry Bottom
  - [ ] Wet Bottom

- [ ] Wall Fired
- [ ] Tangentially Fired

Fly Ash Rejection:

- [ ] Yes
- [ ] No

Fluid Ash Rejection:

- [ ] Spreader Stoker
- [ ] Overfeed Stoker

- [ ] Underfeed Stoker

Fluidized Bed Combustor:

- [ ] Circulating Bed
- [ ] Bubbling Bed

Other *(Specify)*

12) **Oil-Fired Unit**

- [ ] Tangentially (Corner) Fired
- [ ] Horizontally Opposed (Normal) Fired

13) **Wood-Fired Unit**

Fly-Ash Reinjection:

- [ ] Yes
- [ ] No

Dutch Oven/Fuel Cell Oven

Stoker

Suspension Firing

Fluidized Bed Combustion (FBC)

14) **Natural Gas-Fired Units**

Low NOx Burners:

- [ ] Yes
- [ ] No

Flue Gas Recirculation:

- [ ] Yes
- [ ] No

*Should be entered only if applicant requests operating restriction through federally enforceable limitations.*
15) Combustion Air Draft: _____ Natural _____ Induced

Forced Pressure ______ lbs/sq. in.

Percent excess air (air supplied in excess of theoretical air) ________ %

SECTION III

16) Additional Stack Data

A. Are sampling ports provided? ☐ Yes ☒ No
B. If yes, are they located in accordance with 40 CFR 60*? ☐ Yes ☐ No
C. List other units vented to this stack ________ None

17) Attach manufacturer’s specifications and guaranteed performance data for the indirect heat exchanger. Include information concerning fuel input, burners and combustion chamber dimensions.

18) Describe fuel transport, storage methods and related dust control measures, including ash disposal and control.

No. 2 fuel oil will be delivered to the site and stored in 2 aboveground storage tanks, each with a capacity of 24,620 gallons.

*Applicant assumes responsibility for proper location of sampling ports if the Division for Air Quality requires a compliance demonstration stack test.
1) **Type of Unit (Make, Model, Etc.):** Caterpillar Model D3612 (or equivalent)
   
   **Date Installed:** May 2006  
   **Cost of Unit:** $1,700,000  
   (Date unit was installed, modified or reconstructed, whichever is later.)

   Where more than one unit is present, identify with Company’s identification or code for this unit:  
   IC Engine for Emergency Generator #2

2a) **Kind of Unit (Check one):**  
   1. Indirect Heat Exchanger  
   2. Gas Turbine for Electricity Generation  
   3. Pipe Line Compressor Engines:  
      ___ Gas Turbine  
      ___ Reciprocating engines  
      (a) 2-cycle lean burn  
      (b) 4-cycle lean burn  
      (c) 4-cycle rich burn  
   4. Industrial Engine ___ X

2b) **Rated Capacity:** (Refer to manufacturer’s specifications)  
   1. Fuel input (mmBTU/hr): ___ 29.5  
   2. Power output (hp): ___ 4,640  
   3. Power output (MW): ___ 3.3

**SECTION 1. FUEL**

3) **Type of Primary Fuel (Check):**  
   _____ A. Coal  
   X B. Fuel Oil # (Check one)  
   _____ 1 X 2 3 4 5 6  
   _____ C. Natural Gas  
   _____ D. Propane  
   _____ E. Butane  
   _____ F. Wood  
   _____ G. Gasoline  
   _____ H. Diesel  
   _____ I. Other (specify)  

4) **Secondary Fuel (if any, specify type):**

5) **Fuel Composition**
   
<table>
<thead>
<tr>
<th>Type</th>
<th>Percent Asha</th>
<th>Percent Sulfurb</th>
<th>Heat Content Corresponding to: c, d</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary</td>
<td>N/A</td>
<td>0.4</td>
<td>N/A</td>
</tr>
<tr>
<td>Secondary</td>
<td></td>
<td></td>
<td>137,030 Btu/gal</td>
</tr>
</tbody>
</table>

   a. As received basis. Proximate Analysis for Ash. (May use values in your fuel contract)  
   b. As received basis. Ultimate Analysis for Sulfur. (May use values in your fuel contract)  
   c. Higher Heating Value, BTU/Unit. (May use values in your fuel contract)  
   d. Suggested units are: Pounds for solid fuel, gallon for liquid fuels, and cu. Ft. for gaseous fuels. If other units are used, please specify.

6) **Maximum Annual Fuel Usage Rate (please specify units)*:**  
   Total combined No. 2 fuel oil consumption for 4 Main Emergency IC engines (EG1, EG2, EG3, and EG4) will be limited to a maximum of 430,563 gallons per year.

7) **Fuel Source or supplier:** Local Suppliers

*Should be entered only if applicant requests operating restriction through federally enforceable limitations.
8) **MAXIMUM OPERATING SCHEDULE FOR THIS UNIT***

Emergency Generator: Total combined operating hours for 4 Main Emergency IC engines (EG1, EG2, EG3, and EG4) will be limited to a maximum of 2000 hours per year.

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10) Control options for turbine/IC engine *(Check)*

- (1) Water Injection
- (2) Steam Injection
- (3) Selective Catalytic Reduction (SCR)
- (4) Selective Non-Catalytic Reduction (NSCR)
- (5) Combustion Modification

(3) Selective Catalytic Reduction (SCR) (Check)

**IMPORTANT:** Form DEP7007N must also be completed for this unit.

### SECTION II COMPLETE ONLY FOR INDIRECT HEAT EXCHANGERS

11) **Coal-Fired Units**

<table>
<thead>
<tr>
<th>Pulverized Coal Fired:</th>
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</tr>
</thead>
<tbody>
<tr>
<td><em>Dry Bottom</em></td>
<td><em>Wall Fired</em></td>
</tr>
<tr>
<td><em>Wet Bottom</em></td>
<td><em>Tangentially Fired</em></td>
</tr>
</tbody>
</table>

<table>
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<tr>
<th>Cyclone Furnace</th>
<th>Spreader Stoker</th>
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<td>Underfeed Stoker</td>
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</tbody>
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<thead>
<tr>
<th>Fluidized Bed Combustor:</th>
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</thead>
<tbody>
<tr>
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</tr>
<tr>
<td>Bubbling Bed</td>
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12) **Oil-Fired Unit**

<table>
<thead>
<tr>
<th>Tangentially (Corner) Fired</th>
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13) **Wood-Fired Unit**

<table>
<thead>
<tr>
<th>Fly-Ash Reinjection:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes □</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Dutch Oven/Fuel Cell Oven</th>
<th>Stoker</th>
<th>Suspension Firing</th>
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</thead>
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<thead>
<tr>
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</thead>
</table>

14) **Natural Gas-Fired Units**

<table>
<thead>
<tr>
<th>Low NOx Burners:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes □</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Flue Gas Recirculation:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes □</td>
</tr>
</tbody>
</table>

*Should be entered only if applicant requests operating restriction through federally enforceable limitations.
15) Combustion Air         Draft:   _______ Natural _______ Induced

Forced Pressure _______ lbs/sq. in.

Percent excess air (air supplied in excess of theoretical air) _______ %

SECTION III

16) Additional Stack Data

A. Are sampling ports provided? ☐ Yes ☒ No
B. If yes, are they located in accordance with 40 CFR 60*? ☐ Yes ☐ No
C. List other units vented to this stack  None

17) Attach manufacturer’s specifications and guaranteed performance data for the indirect heat exchanger. Include information concerning fuel input, burners and combustion chamber dimensions.

18) Describe fuel transport, storage methods and related dust control measures, including ash disposal and control.

No. 2 fuel oil will be delivered to the site and stored in 2 aboveground storage tanks, each with a capacity of 24,620 gallons.

*Applicant assumes responsibility for proper location of sampling ports if the Division for Air Quality requires a compliance demonstration stack test.
1) **Type of Unit (Make, Model, Etc.):** Caterpillar Model D3612 (or equivalent)

   **Date Installed:** May 2006
   **Cost of Unit:** $1,700,000

   (Date unit was installed, modified or reconstructed, whichever is later.)

   Where more than one unit is present, identify with Company’s identification or code for this unit:

   IC Engine for Emergency Generator #3

2a) **Kind of Unit (Check one):**

   1. Indirect Heat Exchanger
   2. Gas Turbine for Electricity Generation
   3. Pipe Line Compressor Engines:
   4. Industrial Engine

2b) **Rated Capacity:** (Refer to manufacturer’s specifications)

   1. Fuel input (mmBTU/hr): 29.5
   2. Power output (hp): 4,640
   3. Power output (MW): 3.3

3) **Type of Primary Fuel (Check):**

   A. Coal   X   B. Fuel Oil # (Check one)  1   2   3   4   5   6
   C. Natural Gas
   D. Propane
   E. Butane
   F. Wood
   G. Gasoline
   H. Diesel
   I. Other (specify)

4) **Secondary Fuel (if any, specify type):**

5) **Fuel Composition**

<table>
<thead>
<tr>
<th>Type</th>
<th>Percent Asha</th>
<th>Percent Sulfurb</th>
<th>Heat Content Corresponding to: c, d</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary</td>
<td>Maximum</td>
<td>Maximum</td>
<td>Maximum Ash</td>
</tr>
<tr>
<td>N/A</td>
<td>0.4</td>
<td>N/A</td>
<td>137,030 Btu/gal</td>
</tr>
<tr>
<td>Secondary</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

   a. As received basis. Proximate Analysis for Ash. (May use values in your fuel contract)
   b. As received basis. Ultimate Analysis for Sulfur. (May use values in your fuel contract)
   c. Higher Heating Value, BTU/Unit. (May use values in your fuel contract)
   d. Suggested units are: Pounds for solid fuel, gallon for liquid fuels, and cu. Ft. for gaseous fuels. If other units are used, please specify.

6) **Maximum Annual Fuel Usage Rate (please specify units)*:** Total combined No. 2 fuel oil consumption for 4 Main Emergency IC engines (EG1, EG2, EG3, and EG4) will be limited to a maximum of 430,563 gallons per year.

7) **Fuel Source or supplier:** Local Suppliers

*Should be entered only if applicant requests operating restriction through federally enforceable limitations.
8) **MAXIMUM OPERATING SCHEDULE FOR THIS UNIT***

   Emergency Generator: Total combined operating hours for 4 Main Emergency IC engines (EG1, EG2, EG3, and EG4) will be limited to a maximum of 2000 hours per year.
   
   _______ hours/day    _______ days/week    _______ weeks/year

9) If this unit is multipurpose, describe percent in each use category:

   
   Space Heat _______ %  Process Heat _______ %  Power _______ % 100

10) Control options for turbine/IC engine (Check)

   (1) Water Injection
   (2) Steam Injection
   (3) Selective Catalytic Reduction (SCR)
   (4) Non-Selective Catalytic Reduction (NSCR)
   (5) Combustion Modification
   (5) Other (Specify)

**IMPORTANT:** Form DEP7007N must also be completed for this unit.

<table>
<thead>
<tr>
<th>SECTION II</th>
<th>COMPLETE ONLY FOR INDIRECT HEAT EXCHANGERS</th>
</tr>
</thead>
</table>

11) **Coal-Fired Units**

   _______ Pulverized Coal Fired:
   
   _ Dry Bottom  _ Wall Fired
   _ Wet Bottom  _ Tangentially Fired

   _______ Cyclone Furnace
   _______ Overfeed Stoker
   _______ Fluidized Bed Combustor:
   _______ Circulating Bed
   _______ Bubbling Bed

   Fly Ash Rejection:
   
   □ Yes  □ No

12) **Oil-Fired Unit**

   _______ Tangentially (Corner) Fired  _______ Horizontally Opposed (Normal) Fired

13) **Wood-Fired Unit**

   Fly-Ash Reinjection:  □ Yes  □ No

   _______ Dutch Oven/Fuel Cell Oven  _______ Stoker  _______ Suspension Firing

   _______ Fluidized Bed Combustion (FBC)

14) **Natural Gas-Fired Units**

   _ Low NOx Burners:  □ Yes  □ No

   _ Flue Gas Recirculation:  □ Yes  □ No

*Should be entered only if applicant requests operating restriction through federally enforceable limitations.*
15) Combustion Air Draft: Natural Induced

Forced Pressure lbs/sq. in. NA

Percent excess air (air supplied in excess of theoretical air) %

SECTION III

16) Additional Stack Data

A. Are sampling ports provided? Yes No
B. If yes, are they located in accordance with 40 CFR 60*? Yes No
C. List other units vented to this stack None

17) Attach manufacturer’s specifications and guaranteed performance data for the indirect heat exchanger. Include information concerning fuel input, burners and combustion chamber dimensions.

18) Describe fuel transport, storage methods and related dust control measures, including ash disposal and control.

No. 2 fuel oil will be delivered to the site and stored in 2 aboveground storage tanks, each with a capacity of 24,620 gallons.

*Applicant assumes responsibility for proper location of sampling ports if the Division for Air Quality requires a compliance demonstration stack test.
1) Type of Unit (Make, Model, Etc.): Caterpillar Model D3612 (or equivalent)

Date Installed: May 2006  Cost of Unit: $1,700,000

Where more than one unit is present, identify with Company’s identification or code for this unit:
IC Engine for Emergency Generator #4

2a) Kind of Unit (Check one): 2b) Rated Capacity: (Refer to manufacturer’s specifications)

1. Indirect Heat Exchanger
2. Gas Turbine for Electricity Generation
3. Pipe Line Compressor Engines:
   ___ Gas Turbine
   ___ Reciprocating engines
      (a) 2-cycle lean burn
      (b) 4-cycle lean burn
      (c) 4-cycle rich burn
4. Industrial Engine X

SECTION 1. FUEL

3) Type of Primary Fuel (Check):

    _____ A. Coal  X  B. Fuel Oil # (Check one)  _____ 1  X  2  3  4  5  6
    _____ C. Natural Gas  _____ D. Propane  _____  E. Butane  _____  F. Wood  _____  G. Gasoline
    _____ H. Diesel  _____  I. Other (specify)  ______________________________

4) Secondary Fuel (if any, specify type):

5) Fuel Composition

<table>
<thead>
<tr>
<th>Type</th>
<th>Percent Ash(^a) Maximum</th>
<th>Percent Sulfur(^b) Maximum</th>
<th>Heat Content Corresponding to: (c, d)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary</td>
<td>N/A</td>
<td>0.4</td>
<td>137,030 Btu/gal</td>
</tr>
<tr>
<td>Secondary</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

a. As received basis. Proximate Analysis for Ash. (May use values in your fuel contract)
b. As received basis. Ultimate Analysis for Sulfur. (May use values in your fuel contract)
c. Higher Heating Value, BTU/Unit. (May use values in your fuel contract)
d. Suggested units are: Pounds for solid fuel, gallon for liquid fuels, and cu. Ft. for gaseous fuels. If other units are used, please specify.

6) Maximum Annual Fuel Usage Rate (please specify units)*: Total combined No. 2 fuel oil consumption for 4 Main Emergency IC engines (EG1, EG2, EG3, and EG4) will be limited to a maximum of 430,563 gallons per year.

7) Fuel Source or supplier: Local Suppliers

*Should be entered only if applicant requests operating restriction through federally enforceable limitations.
8) **MAXIMUM OPERATING SCHEDULE FOR THIS UNIT**

Emergency Generator: Total combined operating hours for 4 Main Emergency IC engines (EG1, EG2, EG3, and EG4) will be limited to a maximum of 2000 hours per year.

<table>
<thead>
<tr>
<th>hours/day</th>
<th>days/week</th>
<th>weeks/year</th>
</tr>
</thead>
</table>

9) If this unit is multipurpose, describe percent in each use category:

<table>
<thead>
<tr>
<th>Space Heat</th>
<th>Process Heat</th>
<th>Power</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>100</td>
</tr>
</tbody>
</table>

10) **Control options for turbine/IC engine (Check)**

<table>
<thead>
<tr>
<th>(1) Water Injection</th>
<th>(2) Steam Injection</th>
</tr>
</thead>
<tbody>
<tr>
<td>(3) Selective Catalytic Reduction (SCR)</td>
<td>(3) Non-Selective Catalytic Reduction (NSCR)</td>
</tr>
<tr>
<td>(5) Combustion Modification</td>
<td>(5) Other (Specify)</td>
</tr>
</tbody>
</table>

**IMPORTANT:** Form DEP7007N must also be completed for this unit.

**SECTION II COMPLETE ONLY FOR INDIRECT HEAT EXCHANGERS**

11) **Coal-Fired Units**

<table>
<thead>
<tr>
<th>Pulverized Coal Fired:</th>
<th>Fly Ash Rejection:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dry Bottom</td>
<td>Wall Fired</td>
</tr>
<tr>
<td>Wet Bottom</td>
<td>Tangentially Fired</td>
</tr>
<tr>
<td>Cyclone Furnace</td>
<td>Spreader Stoker</td>
</tr>
<tr>
<td>Overfeed Stoker</td>
<td>Underfeed Stoker</td>
</tr>
<tr>
<td>Fluidized Bed Combustor:</td>
<td>Hand-fed</td>
</tr>
<tr>
<td>Circulating Bed</td>
<td>Other (Specify)</td>
</tr>
<tr>
<td>Bubbling Bed</td>
<td></td>
</tr>
</tbody>
</table>

12) **Oil-Fired Unit**

<table>
<thead>
<tr>
<th>Tangentially (Corner) Fired</th>
<th>Horizontally Opposed (Normal) Fired</th>
</tr>
</thead>
</table>

13) **Wood-Fired Unit**

<table>
<thead>
<tr>
<th>Fly-Ash Reinjection:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Dutch Oven/Fuel Cell Oven</td>
<td>Stoker</td>
</tr>
<tr>
<td>Suspension Firing</td>
<td></td>
</tr>
<tr>
<td>Fluidized Bed Combustion (FBC)</td>
<td></td>
</tr>
</tbody>
</table>

14) **Natural Gas-Fired Units**

<table>
<thead>
<tr>
<th>Low NOx Burners:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Flue Gas Recirculation:</td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>No</td>
</tr>
</tbody>
</table>

*Should be entered only if applicant requests operating restriction through federally enforceable limitations.
<table>
<thead>
<tr>
<th>15)</th>
<th>Combustion Air Draft:</th>
<th>Natural</th>
<th>Induced</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Forced Pressure</td>
<td>NA</td>
<td></td>
</tr>
<tr>
<td></td>
<td>lbs/sq. in.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Percent excess air (air supplied in excess of theoretical air)</td>
<td>%</td>
<td></td>
</tr>
</tbody>
</table>

### SECTION III

16) **Additional Stack Data**

<table>
<thead>
<tr>
<th>A.</th>
<th>Are sampling ports provided?</th>
<th>☐ Yes</th>
<th>☒ No</th>
</tr>
</thead>
<tbody>
<tr>
<td>B.</td>
<td>If yes, are they located in accordance with 40 CFR 60*?</td>
<td>☐ Yes</td>
<td>☐ No</td>
</tr>
<tr>
<td>C.</td>
<td>List other units vented to this stack</td>
<td>None</td>
<td></td>
</tr>
</tbody>
</table>

17) Attach manufacturer’s specifications and guaranteed performance data for the indirect heat exchanger. Include information concerning fuel input, burners and combustion chamber dimensions.

18) **Describe fuel transport, storage methods and related dust control measures, including ash disposal and control.**

No. 2 fuel oil will be delivered to the site and stored in 2 aboveground storage tanks, each with a capacity of 24,620 gallons.

*Applicant assumes responsibility for proper location of sampling ports if the Division for Air Quality requires a compliance demonstration stack test.
1) Type of Unit (Make, Model, Etc.): Caterpillar or Equivalent

Date Installed: May 2006 Cost of Unit: N/A
(Date unit was installed, modified or reconstructed, whichever is later.)

Where more than one unit is present, identify with Company’s identification or code for this unit:
IC Engine for Secondary Power Back-up (Manual Start) Emergency Generator for MDB HVAC Filter System

2a) Kind of Unit (Check one): 2b) Rated Capacity: (Refer to manufacturer’s specifications)
1. Indirect Heat Exchanger
2. Gas Turbine for Electricity Generation
3. Pipe Line Compressor Engines:
   Gas Turbine
   Reciprocating engines
   (a) 2-cycle lean burn
   (b) 4-cycle lean burn
   (c) 4-cycle rich burn
4. Industrial Engine X

SECTION 1. FUEL

3) Type of Primary Fuel (Check):
   A. Coal X B. Fuel Oil # (Check one) 1 X 2 3 4 5 6
   C. Natural Gas D. Propane E. Butane F. Wood G. Gasoline
   H. Diesel I. Other (specify)

4) Secondary Fuel (if any, specify type):

5) Fuel Composition

<table>
<thead>
<tr>
<th>Type</th>
<th>Percent Ash</th>
<th>Percent Sulfur</th>
<th>Heat Content Corresponding to</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Maximum</td>
<td>Maximum</td>
<td>Maximum Ash</td>
</tr>
<tr>
<td>Primary</td>
<td>N/A</td>
<td>0.4</td>
<td>N/A</td>
</tr>
<tr>
<td>Secondary</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

a. As received basis. Proximate Analysis for Ash. (May use values in your fuel contract)
b. As received basis. Ultimate Analysis for Sulfur. (May use values in your fuel contract)
c. Higher Heating Value, BTU/Unit. (May use values in your fuel contract)
d. Suggested units are: Pounds for solid fuel, gallon for liquid fuels, and cu. Ft. for gaseous fuels. If other units are used, please specify.

6) Maximum Annual Fuel Usage Rate (please specify units)*: 24,432 gallons/yr

7) Fuel Source or supplier: Local Suppliers

*Should be entered only if applicant requests operating restriction through federally enforceable limitations.
8) MAXIMUM OPERATING SCHEDULE FOR THIS UNIT*

   Emergency Generator: Operation will be limited to no more than 500 hrs/yr.
   _____ hours/day  _____ days/week  _____ weeks/year

9) If this unit is multipurpose, describe percent in each use category:

   Space Heat  _____ %  Process Heat  _____ %  Power  _____ 100 %

10) Control options for turbine/IC engine  (Check)

   (1) Water Injection  (2) Steam Injection
   (3) Selective Catalytic Reduction (SCR)  (3) Non-Selective Catalytic Reduction (NSCR)
   (5) Combustion Modification  (5) Other (Specify) Good combustion design and operation

IMPORTANT: Form DEP7007N must also be completed for this unit.

SECTION II  COMPLETE ONLY FOR INDIRECT HEAT EXCHANGERS

11) Coal-Fired Units

   _____ Pulverized Coal Fired:  Fly Ash Rejection:
   _____ Dry Bottom  _____ Wall Fired  □ Yes  □ No
   _____ Wet Bottom  _____ Tangentially Fired
   _____ Cyclone Furnace
   _____ Overfeed Stoker  _____ Underfeed Stoker
   _____ Fluidized Bed Combustor:
   ______ Circulating Bed  Hand-fed
   ______ Bubbling Bed  Other (specify)

12) Oil-Fired Unit

   _____ Tangentially (Corner) Fired  _____ Horizontally Opposed (Normal) Fired

13) Wood-Fired Unit

   Fly-Ash Reinjection:  □ Yes  □ No
   _____ Dutch Oven/Fuel Cell Oven  _____ Stoker  _____ Suspension Firing
   _____ Fluidized Bed Combustion (FBC)

14) Natural Gas-Fired Units

   Low NOx Burners:  □ Yes  □ No
   Flue Gas Recirculation:  □ Yes  □ No

*Should be entered only if applicant requests operating restriction through federally enforceable limitations.
<table>
<thead>
<tr>
<th>15) Combustion Air Draft:</th>
<th>Natural</th>
<th>Induced</th>
</tr>
</thead>
<tbody>
<tr>
<td>Forced Pressure</td>
<td>NA</td>
<td></td>
</tr>
<tr>
<td>Percent excess air</td>
<td>NA</td>
<td></td>
</tr>
</tbody>
</table>

**SECTION III**

<table>
<thead>
<tr>
<th>16) Additional Stack Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. Are sampling ports provided?</td>
</tr>
<tr>
<td>B. If yes, are they located in accordance with 40 CFR 60*?</td>
</tr>
<tr>
<td>C. List other units vented to this stack</td>
</tr>
</tbody>
</table>

17) Attach manufacturer’s specifications and guaranteed performance data for the indirect heat exchanger. Include information concerning fuel input, burners and combustion chamber dimensions.

18) Describe fuel transport, storage methods and related dust control measures, including ash disposal and control.

No. 2 fuel oil will be delivered to the site and stored in 2 aboveground storage tanks, each with a capacity of 24,620 gallons.

*Applicant assumes responsibility for proper location of sampling ports if the Division for Air Quality requires a compliance demonstration stack test.
Commonwealth of Kentucky
Natural Resources & Environmental Protection Cabinet
Department for Environmental Protection

DIVISION FOR AIR QUALITY

(Submit copies of this form for each individual unit. Make additional copies as needed)

1) Type of Unit (Make, Model, Etc.): Caterpillar or Equivalent

Date Installed: May 2006
Cost of Unit: N/A

Make additional copies as needed

Where more than one unit is present, identify with Company’s identification or code for this unit:
IC Engine for Emergency Water and Firewater Pump

2a) Kind of Unit (Check one):
2b) Rated Capacity: (Refer to manufacturer’s specifications)
1. Indirect Heat Exchanger
2. Gas Turbine for Electricity Generation
3. Pipe Line Compressor Engines:
   ___ Gas Turbine
   ___ Reciprocating engines
   (a ) 2-cycle lean burn
   (b) 4-cycle lean burn
   (c) 4-cycle rich burn
4. Industrial Engine X

SECTION 1. FUEL

3) Type of Primary Fuel (Check):

   X A. Coal
   X B. Fuel Oil # (Check one)
   1 X 2 3 4 5 6
   X C. Natural Gas
   D. Propane
   E. Butane
   F. Wood
   G. Gasoline
   H. Diesel
   I. Other (specify)

4) Secondary Fuel (if any, specify type):

5) Fuel Composition

<table>
<thead>
<tr>
<th>Type</th>
<th>Percent Asha</th>
<th>Percent Sulfurb</th>
<th>Heat Content Corresponding to: c, d</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary</td>
<td>N/A</td>
<td>0.4</td>
<td>Maximum Ash</td>
</tr>
<tr>
<td>Secondary</td>
<td></td>
<td></td>
<td>Maximum Sulfur</td>
</tr>
</tbody>
</table>

a. As received basis. Proximate Analysis for Ash. (May use values in your fuel contract)
b. As received basis. Ultimate Analysis for Sulfur. (May use values in your fuel contract)
c. Higher Heating Value, BTU/Unit. (May use values in your fuel contract)
d. Suggested units are: Pounds for solid fuel, gallon for liquid fuels, and cu. Ft. for gaseous fuels. If other units are used, please specify.

6) Maximum Annual Fuel Usage Rate (please specify units)*: 24,432 gallons/yr

7) Fuel Source or supplier: Local Suppliers

*Should be entered only if applicant requests operating restriction through federally enforceable limitations.
### 8) MAXIMUM OPERATING SCHEDULE FOR THIS UNIT*

Emergency Generator: Operation will be limited to no more than 500 hrs/yr.

<table>
<thead>
<tr>
<th>hours/day</th>
<th>days/week</th>
<th>weeks/year</th>
</tr>
</thead>
</table>

### 9) If this unit is multipurpose, describe percent in each use category:

- Space Heat: ________%
- Process Heat: ________%
- Power: 100%

### 10) Control options for turbine/IC engine (Check)

- (1) Water Injection
- (2) Steam Injection
- (3) Selective Catalytic Reduction (SCR)
- (4) Non-Selective Catalytic Reduction (NSCR)
- (5) Other (Specify) Good combustion design and operation

**IMPORTANT:** Form DEP7007N must also be completed for this unit.

### SECTION II COMPLETE ONLY FOR INDIRECT HEAT EXCHANGERS

#### 11) Coal-Fired Units

- Pulverized Coal Fired: 
  - Dry Bottom
  - Wet Bottom
  - Cyclone Furnace
  - Overfeed Stoker
  - Fluidized Bed Combustor:
    - Circulating Bed
    - Bubbling Bed
    - Other (specify)

- Fly Ash Rejection:
  - Wall Fired
  - Tangentially Fired
  - Spreader Stoker
  - Underfeed Stoker
  - Hand-fed
  - Other (specify)

#### 12) Oil-Fired Unit

- Tangentially (Corner) Fired
- Horizontally Opposed (Normal) Fired

#### 13) Wood-Fired Unit

- Fly-Ash Reinjection: 
  - Dutch Oven/Fuel Cell Oven
  - Stoker
  - Suspension Firing
  - Fluidized Bed Combustion (FBC)

#### 14) Natural Gas-Fired Units

- Low NOx Burners: 
  - Yes
  - No
  - Flue Gas Recirculation: 
    - Yes
    - No

*Should be entered only if applicant requests operating restriction through federally enforceable limitations.
15) **Combustion Air Draft:**
   - Natural
   - Induced
   - Forced Pressure: [N/A] lbs/sq. in.
   - Percent excess air (air supplied in excess of theoretical air): [N/A]%

### SECTION III

#### 16) Additional Stack Data

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>A. Are sampling ports provided?</td>
<td>☒ No</td>
</tr>
<tr>
<td>B. If yes, are they located in accordance with 40 CFR 60*?</td>
<td>☐ Yes ☐ No</td>
</tr>
<tr>
<td>C. List other units vented to this stack</td>
<td>None</td>
</tr>
</tbody>
</table>

#### 17) Attach manufacturer’s specifications and guaranteed performance data for the indirect heat exchanger. Include information concerning fuel input, burners and combustion chamber dimensions.

#### 18) Describe fuel transport, storage methods and related dust control measures, including ash disposal and control.

No. 2 fuel oil will be delivered to the site and stored in 2 aboveground storage tanks, each with a capacity of 24,620 gallons.

---

*Applicant assumes responsibility for proper location of sampling ports if the Division for Air Quality requires a compliance demonstration stack test.*
<table>
<thead>
<tr>
<th>Emission Point # (1)</th>
<th>Process Description (2)</th>
<th>Continuous or Batch (3)</th>
<th>Maximum Operating Schedule (Hours/Day, Days/Week, Weeks/Year) (4)</th>
<th>Process Equipment (Make, Model, Etc.) (5)</th>
<th>Date Installed (6)</th>
</tr>
</thead>
<tbody>
<tr>
<td>MDB</td>
<td>Munitions Demilitarization Building (MDB) Operations</td>
<td>C</td>
<td>24, 7, 52</td>
<td>See Supporting Documentation Section 4</td>
<td>May 2006</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Emission Point # (1)</th>
<th>List Raw Material(s) Used (7)</th>
<th>Maximum Quantity Input Of Each Raw Material (Specify Units/Hour) (8) See Item 18</th>
<th>Type of Products (9) See Item 18</th>
<th>Quantity Output* (Specify Units)</th>
</tr>
</thead>
<tbody>
<tr>
<td>MDB</td>
<td>Rockets</td>
<td>2,750 lb/hr</td>
<td>Liquid Waste (hydrolysate)</td>
<td>30,852 lb/hr</td>
</tr>
<tr>
<td></td>
<td>Projectiles</td>
<td>2,509 lb/hr</td>
<td>Metal (MPT Residue)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Dunnage</td>
<td>336 lb/hr</td>
<td>Rocket Parts (HDC Residue)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Reagent</td>
<td>25,257 lb/hr</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>30,852 lb/hr</td>
<td></td>
<td>30,852 lb/hr</td>
</tr>
</tbody>
</table>

*(10a) Rated Capacity of Equipment (10b) Should be entered only if applicant requests operating restrictions through federally enforceable limitations
**IMPORTANT:** Form DEP7007N, Emission, Stacks, and Controls Information must be completed for each emission unit listed below.

<table>
<thead>
<tr>
<th>Emission Point # (1)</th>
<th>Fuel Type for Process Heat (11)</th>
<th>Rated Burner Capacity (BTU/Hour) (12)</th>
<th>Fuel Composition</th>
<th>Fuel Usage Rates</th>
<th>Note:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>% Sulfur (13a)</td>
<td>% Ash (13b)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Maximum Hourly (14a)</td>
<td>Maximum Annual* (14b)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

16) Make a complete list of all wastes generated by each process (e.g. wastewater, scrap, rejects, cleanup waste, etc.). List the hourly (or daily) and annual quantities of each waste and the method of final disposal. (Use a separate sheet of paper, if necessary)

- **Brine Reduction System (BRS) Filter Cake:** sent to hazardous waste landfill; BGCAPP facility lifetime total waste quantity of 15,700,000 pounds with maximum annual quantity of 7,300,000 pounds
- **Aluminum Filtration System (AFS) Filter Cake:** sent to hazardous waste landfill; BGCAPP facility lifetime total waste quantity of 11,400,000 pounds with maximum annual quantity of 7,200,000 pounds
- **Heated Discharge Conveyor (HDC) Residue:** sent to hazardous waste/TSCA landfill; BGCAPP facility lifetime total waste quantity of 10,300,000 pounds with maximum annual quantity of 7,200,000 pounds
- **Metal Parts Treater (MPT) Residue:** recycled or other means of off-site disposal; BGCAPP facility lifetime total waste quantity of 28,300,000 pounds with maximum annual quantity of 14,500,000 pounds

17) IMPORTANT: Submit a process flow diagram. Label all materials, equipment and emission point numbers.

18) Material Safety Data Sheets with complete chemical compositions are required for each process.

*(14b) Should be entered only if applicant requests operating restrictions through federally enforceable permit conditions.
### SECTION I. Emissions Unit and Emission Point Information

<table>
<thead>
<tr>
<th>KyEIS ID #</th>
<th>Emissions Unit and Emission Point Descriptions</th>
<th>Maximum Operating Parameters</th>
<th>Permitted Operating Parameters</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Hourly Operating Rate (SCC Units/hr)</td>
<td>Annual Operating Hours (hrs/yr)</td>
</tr>
<tr>
<td><strong>MDB</strong></td>
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- **Pollutant (lb/SCC Units)**
- **Emission Factor Basis**
- **Control Equipment Association**
- **Pollutant Overall Efficiency (%)**
- **Uncontrolled Unlimited Potential**
- **Controlled Limited Potential**
- **Allowable Unlimited Potential**
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Applicant Name: U.S. Department of the Army, BGAD Log #
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Applicant Name: U. S. Department of the Army, BGAD

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Commonwealth of Kentucky
Natural Resources & Environmental Protection Cabinet
Department for Environmental Protection

DIVISION FOR AIR QUALITY

Applicant Name: U. S. Department of the Army, BGAD

DEP7007N
Emissions, Stacks, and Controls Information

Emissions Unit and Emission Point Information

Maximum Operating Parameters
Permitted Operating Parameters

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Division Use Only: F ___ Reviewer ___________ Supervisor ___________ Page 33 N of 67 N

Revision 6/00
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**Emission Unit Name:** IC Engine for Emergency Water and Firewater Pump - 0.75 MW

**Date Constructed:** May, 2006

**HAPs present?** Yes

**Source ID:**

**SCC Code:** 2-02-004-01

**SCC Units:** 1000 Gallons Burned

**KyEIS Stack #:** EG6

**Fuel Ash Content:** NA

**Fuel Sulfur Content:** 0.4

**Fuel Heat Content Ratio:** 1

**Applicable Regulations:** See DEP7007V
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<td>Emergency Generator IC Engine 6 Stack</td>
<td>Details to be determined</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### SECTION III. Control Equipment Information for Other Type of Control Equipment

<table>
<thead>
<tr>
<th>KyEIS Control ID #</th>
<th>Control Equipment Description</th>
<th>Manufacturer</th>
<th>Model Name and Number</th>
<th>Date Installed</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>MDBF1</td>
<td>Custom Designed Filtration System Bank #1 for Munition Demilitarization Building Operations</td>
<td>Custom Designed</td>
<td>NA</td>
<td>May 2006</td>
<td>NA</td>
</tr>
</tbody>
</table>

**Inlet Gas Stream Data**

- **Temperature:** 
  - 70 °F 21 °C
- **Flowrate (scfm at 68°F):** 128,000
- **Gas density (lb/ft³):** 0.08
- **Particle density (lb/ft³) or Specific Gravity:** NA
- **Average particle diameter (µm):** NA
  (or attach a particle size distribution table)

**Equipment Physical Data**

> The control equipment manufacturer’s equipment specifications and recommended operating procedures may be submitted in place of this information.

**Type of control equipment (give descriptions and a sketch with dimensions):**

See Supporting Documentation - Drawing 24915-08-M5-HVAC-00002

**Equipment Operational Data**

- **Pressure drop across unit (inches water gauge):** To be determined
- **Pollutants collected/controlled:** Agent, PM/PT, TOC, HAPs
- **Pollutant removal/destruction efficiency (%):**
  - PT/PM >99%
  - TOC 99.9999%
### SECTION III. Control Equipment Information for Other Type of Control Equipment

<table>
<thead>
<tr>
<th>KyEIS Control ID #</th>
<th>Control Equipment Description</th>
<th>Manufacturer</th>
<th>Model Name and Number</th>
<th>Date Installed</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>MDBF2</td>
<td>Custom Designed Filtration System Bank #2 for Munition Demilitarization Building Operations</td>
<td>Custom Designed</td>
<td>NA</td>
<td>May 2006</td>
<td>NA</td>
</tr>
</tbody>
</table>

#### Inlet Gas Stream Data

- **Temperature:**
  - 70 °F  21 °C

- **Flowrate (scfm at 68°F):** 128,000

- **Gas density (lb/ft³):** 0.08

- **Particle density (lb/ft³) or Specific Gravity:** NA

- **Average particle diameter (µm):** NA

#### Equipment Physical Data

The control equipment manufacturer's equipment specifications and recommended operating procedures may be submitted in place of this information.

#### Type of control equipment (give descriptions and a sketch with dimensions):

See Supporting Documentation - Drawing 24915-08-M5-HVAC-00002

#### Equipment Operational Data

- **Pressure drop across unit (inches water gauge):** To be determined

- **Pollutants collected/controlled:** Agent, PM/PT, TOC, HAPs

- **Pollutant removal/destruction efficiency (%):**
  - PT/PM >99%
  - TOC 99.9999%
## Control Equipment Information for Other Type of Control Equipment

<table>
<thead>
<tr>
<th>KyEIS Control ID #</th>
<th>Control Equipment Description</th>
<th>Manufacturer</th>
<th>Model Name and Number</th>
<th>Date Installed</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>SCR1</td>
<td>Selective Catalytic Reduction System for IC Engine for Emergency Generator #1 (EG1)</td>
<td>Caterpillar or Equivalent</td>
<td>To be determined</td>
<td>May 2006</td>
<td>$312,900</td>
</tr>
</tbody>
</table>

### Inlet Gas Stream Data

- Temperature: __°F__ __°C__
- Flowrate (scfm at 68°F): To be determined
- Gas density (lb/ft³): To be determined
- Particle density (lb/ft³) or Specific Gravity: To be determined
- Average particle diameter (µm): To be determined
- (or attach a particle size distribution table)

### Equipment Physical Data

The control equipment manufacturer's equipment specifications and recommended operating procedures may be submitted in place of this information.

Type of control equipment (give descriptions and a sketch with dimensions):

- Urea selective catalytic reduction

### Equipment Operational Data

- Pressure drop across unit (inches water gauge): N/A
- Pollutants collected/controlled: CO, NOx, PT/PM, TOC/VOC
- Pollutant removal/destruction efficiency (%):
  - CO: 70%
  - NOx: 90%
  - PT/PM: 70%
  - TOC/VOC: 70%
### Control Equipment Information for Other Type of Control Equipment

<table>
<thead>
<tr>
<th>KyEIS Control ID #</th>
<th>Control Equipment Description</th>
<th>Manufacturer</th>
<th>Model Name and Number</th>
<th>Date Installed</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>SCR2</td>
<td>Selective Catalytic Reduction System for IC Engine for Emergency Generator #2 (EG2)</td>
<td>Caterpillar or Equivalent</td>
<td>To be determined</td>
<td>May 2006</td>
<td>$312,900</td>
</tr>
</tbody>
</table>

### Inlet Gas Stream Data

- **Temperature:** To be determined
- **Flowrate (scfm at 68°F):** To be determined
- **Gas density (lb/ft³):** To be determined
- **Particle density (lb/ft³) or Specific Gravity:** To be determined
- **Average particle diameter (µm):** (or attach a particle size distribution table)

### Equipment Physical Data

The control equipment manufacturer's equipment specifications and recommended operating procedures may be submitted in place of this information.

Type of control equipment (give descriptions and a sketch with dimensions):

Urea selective catalytic reduction

### Equipment Operational Data

- **Pressure drop across unit (inches water gauge):** N/A
- **Pollutants collected/controlled:** CO, NOx, PT/PM, TOC/VOC
- **Pollutant removal/destruction efficiency (%):**
  - CO: 70%
  - NOx: 90%
  - PT/PM: 70%
  - TOC/VOC: 70%
### CONTROL EQUIPMENT INFORMATION FOR OTHER TYPE OF CONTROL EQUIPMENT

<table>
<thead>
<tr>
<th>KyEIS Control ID #</th>
<th>Control Equipment Description</th>
<th>Manufacturer</th>
<th>Model Name and Number</th>
<th>Date Installed</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>SCR3</td>
<td>Selective Catalytic Reduction System for IC Engine for Emergency Generator #3 (EG3)</td>
<td>Caterpillar or Equivalent</td>
<td>To be determined</td>
<td>May 2006</td>
<td>$312,900</td>
</tr>
</tbody>
</table>

**Inlet Gas Stream Data**

- **Temperature:** To be determined
- **Flowrate (scfm at 68°F):** To be determined
- **Gas density (lb/ft³):** To be determined
- **Particle density (lb/ft³) or Specific Gravity:** To be determined
- **Average particle diameter (µm):** To be determined

**Equipment Physical Data**

*The control equipment manufacturer's equipment specifications and recommended operating procedures may be submitted in place of this information.*

**Type of control equipment (give descriptions and a sketch with dimensions):**

*Urea selective catalytic reduction*

**Equipment Operational Data**

- **Pressure drop across unit (inches water gauge):** N/A
- **Pollutants collected/controlled:** CO, NOx, PT/PM, TOC/VOC
- **Pollutant removal/destruction efficiency (%):**
  - CO: 70%
  - NOx: 90%
  - PT/PM: 70%
  - TOC/VOC: 70%
### SECTION III. Control Equipment Information for Other Type of Control Equipment

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<tr>
<th>KyEIS Control ID #</th>
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<th>Model Name and Number</th>
<th>Date Installed</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>SCR4</td>
<td>Selective Catalytic Reduction System for IC Engine for Emergency Generator #4 (EG4)</td>
<td>Caterpillar or Equivalent</td>
<td>To be determined</td>
<td>May 2006</td>
<td>$312,900</td>
</tr>
</tbody>
</table>

#### Inlet Gas Stream Data

- Temperature: [ ] °F [ ] °C
- Flowrate (scfm at 68°F): [ ]
- Gas density (lb/ft³) or Specific Gravity: [ ]
- Particle density (lb/ft³): [ ]
- Average particle diameter (µm): [ ]
  (or attach a particle size distribution table)

#### Equipment Physical Data

The control equipment manufacturer's equipment specifications and recommended operating procedures may be submitted in place of this information.

- Type of control equipment (give descriptions and a sketch with dimensions):
  - Urea selective catalytic reduction

#### Equipment Operational Data

- Pressure drop across unit (inches water gauge): N/A
- Pollutants collected/controlled: CO, NOx, PT/PM, TOC/VOC
- Pollutant removal/destruction efficiency (%):
  - CO: 70%
  - NOx: 90%
  - PT/PM: 70%
  - TOC/VOC: 70%
### SECTION I. EMISIION AND OPERATING STANDARD(S) AND LIMITATION(S)

<table>
<thead>
<tr>
<th>KYEIS No.(1)</th>
<th>Emission Unit Description(2)</th>
<th>Origin of Requirement or Standard(4)</th>
<th>Applicable Requirement, Standard, Restriction, Limitation, or Exemption(5)</th>
<th>Method of Determining Compliance with the Emission and Operating Requirement(s)(6)</th>
</tr>
</thead>
<tbody>
<tr>
<td>MDB</td>
<td>Munitions Demilitarization Building Operations</td>
<td>Particulate Matter</td>
<td>401 KAR 59:010 Section 3(1) Opacity &lt; 20% *</td>
<td>If requested by KDAQ, use of USEPA Method 9, Kentucky Method 150 (F-1), or comparable method selected by BGAD and approved by KDAQ. Continuous operation of emission control system when process is in operation. If requested by KDAQ, USEPA Method 5.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Particulate Matter</td>
<td>401 KAR 59:010 Section 3(2) Mass Emission Rate for Particulate Matter &lt; 19.45 lbs/hr PWR = 15.26 tons/hr</td>
<td>USEPA Publication AP-42. If requested by KDAQ, use of USEPA Method 9, Kentucky Method 150 (F-1), or comparable method selected by BGAD and approved by KDAQ.</td>
</tr>
<tr>
<td>PB1</td>
<td>BGCAPP Process Boiler #1</td>
<td>Particulate Matter</td>
<td>401 KAR 59:015 Section 4(1) Opacity ≤ 20%</td>
<td>If requested by KDAQ, use of USEPA Method 9, Kentucky Method 150 (F-1), or comparable method selected by BGAD and approved by KDAQ. USEPA Publication AP-42. If requested by KDAQ, USEPA Method 6.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>401 KAR 59:015 Section 4(2) Mass Emission Rate for Particulate Matter &lt; 0.30 lb/MMBtu</td>
<td>USEPA Publication AP-42. If requested by KDAQ, USEPA Method 6.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>SO2</td>
<td>401 KAR 59:015 Section 5(1) SO2 ≤ 1.00 lb/MMBtu</td>
<td>USEPA Publication AP-42. If requested by KDAQ, USEPA Method 6.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>SO2</td>
<td>40 CFR 60.42c(d) SO2 ≤ 0.5 lbs/MMBtu or sulfur content ≤ 0.5 % by weight</td>
<td>No. 2 fuel oil sulfur content monitoring. Certificates of No. 2 fuel oil sulfur content analysis from the vendor will be kept on record and available for inspection. If requested by KDAQ, USEPA Method 6.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>40 CFR 60.42c(d) SO2 ≤ 0.5 lbs/MMBtu or sulfur content ≤ 0.5 % by weight</td>
<td>No. 2 fuel oil sulfur content monitoring. Certificates of No. 2 fuel oil sulfur content analysis from the vendor will be kept on record and available for inspection. If requested by KDAQ, USEPA Method 6.</td>
</tr>
<tr>
<td>PB2</td>
<td>BGCAPP Process Boiler #2</td>
<td>Particulate Matter</td>
<td>401 KAR 59:015 Section 4(1) Opacity ≤ 20%</td>
<td>If requested by KDAQ, use of USEPA Method 9, Kentucky Method 150 (F-1), or comparable method selected by BGAD and approved by KDAQ. USEPA Publication AP-42. If requested by KDAQ, USEPA Method 6.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>401 KAR 59:015 Section 4(2) Mass Emission Rate for Particulate Matter &lt; 0.30 lb/MMBtu</td>
<td>USEPA Publication AP-42. If requested by KDAQ, use of USEPA Method 9, Kentucky Method 150 (F-1), or comparable method selected by BGAD and approved by KDAQ.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>SO2</td>
<td>401 KAR 59:015 Section 5(1) SO2 ≤ 1.00 lb/MMBtu</td>
<td>USEPA Publication AP-42. If requested by KDAQ, USEPA Method 6.</td>
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<td>SO2</td>
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<td>40 CFR 60.42c(d) SO2 ≤ 0.5 lbs/MMBtu or sulfur content ≤ 0.5 % by weight</td>
<td>No. 2 fuel oil sulfur content monitoring. Certificates of No. 2 fuel oil sulfur content analysis from the vendor will be kept on record and available for inspection. If requested by KDAQ, USEPA Method 6.</td>
</tr>
<tr>
<td>SB1</td>
<td>BGCAPP Space Heat Boiler #1</td>
<td>Particulate Matter</td>
<td>401 KAR 59:015 Section 4(1) Opacity ≤ 20%</td>
<td>If requested by KDAQ, use of USEPA Method 9, Kentucky Method 150 (F-1), or comparable method selected by BGAD and approved by KDAQ. USEPA Publication AP-42. If requested by KDAQ, USEPA Method 6.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>401 KAR 59:015 Section 4(2) Mass Emission Rate for Particulate Matter &lt; 0.30 lb/MMBtu</td>
<td>USEPA Publication AP-42. If requested by KDAQ, use of USEPA Method 9, Kentucky Method 150 (F-1), or comparable method selected by BGAD and approved by KDAQ.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>SO2</td>
<td>401 KAR 59:015 Section 5(1) SO2 ≤ 1.00 lb/MMBtu</td>
<td>USEPA Publication AP-42. If requested by KDAQ, USEPA Method 6.</td>
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<tr>
<td></td>
<td></td>
<td>SO2</td>
<td>40 CFR 60.42c(d) SO2 ≤ 0.5 lbs/MMBtu or sulfur content ≤ 0.5 % by weight</td>
<td>No. 2 fuel oil sulfur content monitoring. Certificates of No. 2 fuel oil sulfur content analysis from the vendor will be kept on record and available for inspection. If requested by KDAQ, USEPA Method 6.</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>40 CFR 60.42c(d) SO2 ≤ 0.5 lbs/MMBtu or sulfur content ≤ 0.5 % by weight</td>
<td>No. 2 fuel oil sulfur content monitoring. Certificates of No. 2 fuel oil sulfur content analysis from the vendor will be kept on record and available for inspection. If requested by KDAQ, USEPA Method 6.</td>
</tr>
</tbody>
</table>

* Emissions exhaust through 2 stacks.
### SECTION I. EMISSION AND OPERATING STANDARD(S) AND LIMITATION(S)

<table>
<thead>
<tr>
<th>KYEIS No.(1)</th>
<th>Emission Unit Description</th>
<th>Contaminant(3)</th>
<th>Origin of Requirement or Standard(4)</th>
<th>Applicable Requirement, Standard, Restriction, Limitation, or Exemption(5)</th>
<th>Method of Determining Compliance with the Emission and Operating Requirement(s)(6)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>SO2</td>
<td>401 KAR 59:015 Section 5(1)</td>
<td>SO2 &lt; 1.00 lb/MMBtu</td>
<td>USEPA Publication AP-42. If requested by KDAQ, USEPA Method 6. No. 2 fuel oil sulfur content monitoring. Certificates of No. 2 fuel oil sulfur content analysis from the vendor will be kept on record and available for inspection. If requested by KDAQ, USEPA Method 6.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>SO2</td>
<td>40 CFR 60.42c(d)</td>
<td>SO2 ≤ 0.5 lbs/MMBtu or sulfur content ≤ 0.5 % by weight.</td>
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</tr>
<tr>
<td>EG1</td>
<td>IC Engine for Emergency Generator #1</td>
<td>Particulate Matter</td>
<td>401 KAR 59:010 Section 3(1)</td>
<td>Opacity &lt; 20%</td>
<td>If requested by KDAQ, use of USEPA Method 9, Kentucky Method 150 (F-1), or comparable method selected by BGAD and approved by KDAQ.</td>
</tr>
<tr>
<td>EG2</td>
<td>IC Engine for Emergency Generator #2</td>
<td>Particulate Matter</td>
<td>401 KAR 59:010 Section 3(1)</td>
<td>Opacity &lt; 20%</td>
<td>If requested by KDAQ, use of USEPA Method 9, Kentucky Method 150 (F-1), or comparable method selected by BGAD and approved by KDAQ.</td>
</tr>
<tr>
<td>EG3</td>
<td>IC Engine for Emergency Generator #3</td>
<td>Particulate Matter</td>
<td>401 KAR 59:010 Section 3(1)</td>
<td>Opacity &lt; 20%</td>
<td>If requested by KDAQ, use of USEPA Method 9, Kentucky Method 150 (F-1), or comparable method selected by BGAD and approved by KDAQ.</td>
</tr>
<tr>
<td>EG4</td>
<td>IC Engine for Emergency Generator #4</td>
<td>Particulate Matter</td>
<td>401 KAR 59:010 Section 3(1)</td>
<td>Opacity &lt; 20%</td>
<td>If requested by KDAQ, use of USEPA Method 9, Kentucky Method 150 (F-1), or comparable method selected by BGAD and approved by KDAQ.</td>
</tr>
<tr>
<td>EG5</td>
<td>IC Engine for Secondary Power Back-up (Manual Start) Emergency Generator for MDB HVAC Filter System</td>
<td>Particulate Matter</td>
<td>401 KAR 59:010 Section 3(1)</td>
<td>Opacity &lt; 20%</td>
<td>If requested by KDAQ, use of USEPA Method 9, Kentucky Method 150 (F-1), or comparable method selected by BGAD and approved by KDAQ.</td>
</tr>
<tr>
<td>EG6</td>
<td>IC Engine for Emergency Water and Firewater Pump</td>
<td>Particulate Matter</td>
<td>401 KAR 59:010 Section 3(1)</td>
<td>Opacity &lt; 20%</td>
<td>If requested by KDAQ, use of USEPA Method 9, Kentucky Method 150 (F-1), or comparable method selected by BGAD and approved by KDAQ.</td>
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</table>

* Emissions exhaust through 2 stacks.
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<th>KEYS No. (1)</th>
<th>Emission Unit Description (2)</th>
<th>Contaminant (3)</th>
<th>Origin of Requirement or Standard (4)</th>
<th>Parameter Monitored (5)</th>
<th>Description of Monitoring (6)</th>
</tr>
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<tbody>
<tr>
<td>MDB</td>
<td>Munitions Demilitarization Building Operations</td>
<td>Particulate Matter</td>
<td>401 KAR 59:010 Section 3(1)</td>
<td>None</td>
<td>None required by the underlying applicable requirements.</td>
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<td></td>
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<td>401 KAR 59:010 Section 3(2)</td>
<td>None</td>
<td>None required by the underlying applicable requirements.</td>
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<tr>
<td>PB1</td>
<td>BGCAPP Process Boiler #1</td>
<td>Particulate Matter</td>
<td>401 KAR 59:015 Section 4(1)</td>
<td>None</td>
<td>None required by the underlying applicable requirements.</td>
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<td></td>
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<td>401 KAR 59:015 Section 4(2)</td>
<td>None</td>
<td>None required by the underlying applicable requirements.</td>
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<td></td>
<td></td>
<td>SO2</td>
<td>401 KAR 59:015 Section 5(1)</td>
<td>40 CFR 60.42 c(d)</td>
<td>Certification of No. 2 fuel oil sulfur content for each shipment from supplier.</td>
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<tr>
<td>PB2</td>
<td>BGCAPP Process Boiler #2</td>
<td>Particulate Matter</td>
<td>401 KAR 59:015 Section 4(1)</td>
<td>None</td>
<td>None required by the underlying applicable requirements.</td>
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<td></td>
<td></td>
<td></td>
<td>401 KAR 59:015 Section 4(2)</td>
<td>None</td>
<td>None required by the underlying applicable requirements.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>SO2</td>
<td>401 KAR 59:015 Section 5(1)</td>
<td>40 CFR 60.42 c(d)</td>
<td>Certification of No. 2 fuel oil sulfur content for each shipment from supplier.</td>
</tr>
<tr>
<td>SB1</td>
<td>BGCAPP Space Heat Boiler #1</td>
<td>Particulate Matter</td>
<td>401 KAR 59:015 Section 4(1)</td>
<td>None</td>
<td>None required by the underlying applicable requirements.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>401 KAR 59:015 Section 4(2)</td>
<td>None</td>
<td>None required by the underlying applicable requirements.</td>
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<tr>
<td></td>
<td></td>
<td>SO2</td>
<td>401 KAR 59:015 Section 5(1)</td>
<td>40 CFR 60.42 c(d)</td>
<td>Certification of No. 2 fuel oil sulfur content for each shipment from supplier.</td>
</tr>
<tr>
<td>SB2</td>
<td>BGCAPP Space Heat Boiler #2</td>
<td>Particulate Matter</td>
<td>401 KAR 59:015 Section 4(1)</td>
<td>None</td>
<td>None required by the underlying applicable requirements.</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>401 KAR 59:015 Section 4(2)</td>
<td>None</td>
<td>None required by the underlying applicable requirements.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>SO2</td>
<td>401 KAR 59:015 Section 5(1)</td>
<td>40 CFR 60.42 c(d)</td>
<td>Certification of No. 2 fuel oil sulfur content for each shipment from supplier.</td>
</tr>
<tr>
<td>EG1</td>
<td>IC Engine for Emergency Generator #1</td>
<td>Particulate Matter</td>
<td>401 KAR 59:010 Section 3(1)</td>
<td>None</td>
<td>None required by the underlying applicable requirements.</td>
</tr>
<tr>
<td>EG2</td>
<td>IC Engine for Emergency Generator #2</td>
<td>Particulate Matter</td>
<td>401 KAR 59:010 Section 3(1)</td>
<td>None</td>
<td>None required by the underlying applicable requirements.</td>
</tr>
<tr>
<td>EG3</td>
<td>IC Engine for Emergency Generator #3</td>
<td>Particulate Matter</td>
<td>401 KAR 59:010 Section 3(1)</td>
<td>None</td>
<td>None required by the underlying applicable requirements.</td>
</tr>
<tr>
<td>EG4</td>
<td>IC Engine for Emergency Generator #4</td>
<td>Particulate Matter</td>
<td>401 KAR 59:010 Section 3(1)</td>
<td>None</td>
<td>None required by the underlying applicable requirements.</td>
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</table>
## SECTION II. MONITORING REQUIREMENTS

<table>
<thead>
<tr>
<th>KYEIS No.</th>
<th>Emission Unit Description</th>
<th>Contaminant</th>
<th>Origin of Requirement or Standard</th>
<th>Parameter Monitored</th>
<th>Description of Monitoring</th>
</tr>
</thead>
<tbody>
<tr>
<td>EG5</td>
<td>IC Engine for Secondary Power Backup (Manual Start) Emergency Generator for MDB HVAC Filter System</td>
<td>Particulate Matter</td>
<td>401 KAR 59:010 Section 3(1)</td>
<td>None</td>
<td>None required by the underlying applicable requirements.</td>
</tr>
<tr>
<td>EG6</td>
<td>IC Engine for Emergency Water and Firewater Pump</td>
<td>Particulate Matter</td>
<td>401 KAR 59:010 Section 3(1)</td>
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### SECTION III. RECORDKEEPING REQUIREMENTS

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<tr>
<th>KYEIS No.(1)</th>
<th>Emission Unit Description(2)</th>
<th>Contaminant(3)</th>
<th>Origin of Requirement or Standard(4)</th>
<th>Parameter Recorded(9)</th>
<th>Description of Recordkeeping(10)</th>
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<td>MDB</td>
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<td>Records of No. 2 fuel oil sulfur content and supplier certifications monitored for 5 years per 40 CFR 60.48c(e)(11) requirements.</td>
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<td>Description of Reporting(12)</td>
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<td>None required by the underlying applicable requirements. Annual certification of compliance with Title V permit requirements per 401 KAR 52:020 Section 3(e) upon issuance of the final Title V permit by KDAQ</td>
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<td>None required by the underlying applicable requirements. Annual certification of compliance with Title V permit requirements per 401 KAR 52:020 Section 3(e) upon issuance of the final Title V permit by KDAQ</td>
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<td>Particulate Matter</td>
<td>401 KAR 59:010 Section 3(1)</td>
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## SECTION V. TESTING REQUIREMENTS

<table>
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<th>KYEIS No. (1)</th>
<th>Emission Unit Description (2)</th>
<th>Contaminant (3)</th>
<th>Origin of Requirement or Standard (4)</th>
<th>Parameter Tested (13)</th>
<th>Description of Testing (14)</th>
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<td>401 KAR 59:010 Section 3(1)</td>
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<td>None required by the underlying applicable requirements.</td>
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</table>
An application for a permit must contain a certification of compliance signed by a responsible official. This form must be submitted with the original application as well as each annual report. *This form does not have to be completed for sources applying to construct with original application.*

<table>
<thead>
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<th>1) Source Name</th>
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<tr>
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<td>2) Source Street Address</td>
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<tr>
<td>2091 Kingston Highway</td>
</tr>
<tr>
<td>3) City</td>
</tr>
<tr>
<td>Richmond</td>
</tr>
<tr>
<td>6) Permit Number(s) (If known)</td>
</tr>
<tr>
<td>7) Submittal Information</td>
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<tr>
<td>Is this the first submittal of this form? [ ] Yes [ ] No</td>
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</table>
8) IDENTIFICATION OF EMISSION UNITS

8a)(1) Emission Units in Compliance. The following emission units are in compliance with applicable requirements such as emission standards, emission control requirements, emission testing, court requirements, work practices, or enhanced monitoring, based on the compliance methods specified below and will continue to comply. If additional space is needed, attach and label as exhibit DEP7007CC 8a)(1)

<table>
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<tr>
<th>Emission Point ID#</th>
<th>Emission Unit ID#</th>
<th>Permit Condition or Applicable Regulation</th>
<th>Emission Unit Description</th>
<th>Permit Limit</th>
<th>Actual Emissions</th>
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</tbody>
</table>
8a)(2) Emission Units in Compliance but Subject to Future Compliance Dates. The following emission units, which are currently in compliance with all applicable requirements, will achieve compliance on a timely basis and maintain compliance with future compliance dates as they become applicable during the permit term.

*If additional space is needed, attach and label as exhibit DEP7007CC 8a)(2)*

<table>
<thead>
<tr>
<th>ID #</th>
<th>Emission Point ID#</th>
<th>Emission Unit ID#</th>
<th>Future Compliance Schedule</th>
<th>Emission Unit Description</th>
<th>Reason for Future Compliance Date</th>
</tr>
</thead>
<tbody>
<tr>
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</tbody>
</table>
**8b(1) Emission Units Not in Compliance.** The following emission units were not in compliance with applicable requirements such as emission standards, emission control requirements, emission testing, court requirements, work practices, or enhanced monitoring, based on the compliance methods specified below. *If additional space is needed, attach and label as exhibit DEP7007CC 8b(1)*

<table>
<thead>
<tr>
<th>Emission Point ID#</th>
<th>Emission Unit ID#</th>
<th>Permit Condition or Applicable Regulation</th>
<th>Emission Unit Description</th>
<th>Permit Limit</th>
<th>Actual Emissions</th>
<th>Method used for Determining Compliance (such as test methods, monitoring procedures, recordkeeping and reporting)</th>
</tr>
</thead>
</table>
8b(2) Emission Units Not in Compliance. For the above listed emission units that were not in continuous compliance since the last reporting period, state the reasons for noncompliance. If additional space is needed, attach and label as exhibit DEP7007CC 8b)(2)

<table>
<thead>
<tr>
<th>Emission Point ID#</th>
<th>Emission Unit ID#</th>
<th>Reason's) for NonCompliance</th>
</tr>
</thead>
<tbody>
<tr>
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</tbody>
</table>
9) SIGNATURE BLOCK

I, THE UNDERSIGNED, HEREBY CERTIFY UNDER PENALTY OF LAW, THAT I AM A RESPONSIBLE OFFICIAL, AND THAT I HAVE PERSONALLY EXAMINED, AND AM FAMILIAR WITH, THE INFORMATION SUBMITTED IN THIS DOCUMENT AND ALL ITS ATTACHMENTS. BASED ON MY INQUIRY OF THOSE INDIVIDUALS WITH PRIMARY RESPONSIBILITY FOR OBTAINING THE INFORMATION, I CERTIFY THAT THE INFORMATION IS ON KNOWLEDGE AND BELIEF, TRUE, ACCURATE, AND COMPLETE. I AM AWARE THAT THERE ARE SIGNIFICANT PENALTIES FOR SUBMITTING FALSE OR INCOMPLETE INFORMATION, INCLUDING THE POSSIBILITY OF FINE OR IMPRISONMENT.

BY: ____________________________
AUTHORIZED SIGNATURE

Date: 20 ________

Martin A. Jacoby

Colonel, U.S. Army, Commanding Officer

TITLE OF SIGNATORY
### Insignificant Activity Criteria

1. Emissions from insignificant activities shall be counted toward the source's potential to emit;
2. Emissions from the activity shall not be subject to a federally enforceable requirement other than generally applicable requirements that apply to all activities and affected facilities such as 401 KAR 59:010, 61:020, 63:010, and others deemed generally applicable by the Cabinet;
3. The potential to emit a regulated air pollutant from the activity or affected facility shall not exceed 5 tons/yr.
4. The potential to emit of a hazardous air pollutant from the activity or affected facility shall not exceed 1,000 pounds/yr., or the deminimis level established under Section 112(g) of the Act, whichever is less;
5. The activity shall be included in the permit application, identifying generally applicable and state origin requirements.

<table>
<thead>
<tr>
<th>Description of Activity Including Rated Capacity</th>
<th>Generally Applicable Regulations Or State Origin Requirements</th>
<th>Does the Activity meet the Insignificant Activity Criteria Listed Above?</th>
</tr>
</thead>
<tbody>
<tr>
<td>IC Engine (211 HP) for Emergency Generator (EG7) for Entry Control Facility (ECF)</td>
<td>401 KAR 59:010 Section 3(1)</td>
<td>Yes</td>
</tr>
<tr>
<td>2 Agent Hydrolysate 245,000 Gallon Storage Tanks</td>
<td>None</td>
<td>Yes</td>
</tr>
<tr>
<td>Agent Hydrolysate 60,000 Gallon Storage Tank</td>
<td>None</td>
<td>Yes</td>
</tr>
<tr>
<td>4 Energetics Hydrolysate 475,000 Gallon Storage Tanks</td>
<td>None</td>
<td>Yes</td>
</tr>
<tr>
<td>Aluminum Precipitation and Filtration Building HVAC Filters System Exhaust</td>
<td>None</td>
<td>Yes</td>
</tr>
<tr>
<td>Supercritical Water Oxidation Process Building (SPB) HVAC Filter System Exhaust</td>
<td>401 KAR 59:010 Section 3(1)</td>
<td>Yes</td>
</tr>
<tr>
<td>MPT Residual Cooldown Conveyor</td>
<td>None</td>
<td>Yes</td>
</tr>
<tr>
<td>Laboratory HVAC Filter Stack</td>
<td>None</td>
<td>Yes</td>
</tr>
<tr>
<td>HCl (37%) 8,500 Gallon and 1,125 Gallon Storage Tanks</td>
<td>None</td>
<td>Yes</td>
</tr>
<tr>
<td>Isopropyl Alcohol (IPA) 39,500 Gallon Storage Tank</td>
<td>None</td>
<td>Yes</td>
</tr>
<tr>
<td>Sulfuric Acid 4,500 Gallon Storage Tank</td>
<td>None</td>
<td>Yes</td>
</tr>
<tr>
<td>2 No. 2 Fuel Oil 24,620 Gallon Storage Tanks</td>
<td>None</td>
<td>Yes</td>
</tr>
<tr>
<td>Description of Activity Including Rated Capacity</td>
<td>Generally Applicable Regulations Or State Origin Requirements</td>
<td>Does the Activity meet the Insignificant Activity Criteria Listed Above?</td>
</tr>
<tr>
<td>-------------------------------------------------</td>
<td>---------------------------------------------------------------</td>
<td>---------------------------------------------------------------------</td>
</tr>
<tr>
<td>2 Sodium Hydroxide (50%) 50,000 Gallon Storage Tanks</td>
<td>None</td>
<td>Yes</td>
</tr>
<tr>
<td>Sodium Hydroxide (18%) 6,000 Gallon Storage Tank</td>
<td>None</td>
<td>Yes</td>
</tr>
<tr>
<td>Sodium Hydroxide (1%) 3,100 Gallon Storage Tank</td>
<td>None</td>
<td>Yes</td>
</tr>
<tr>
<td>Sodium Hypochlorite/Sodium Hydroxide (1%) 10,500 Gallon Storage Tank</td>
<td>None</td>
<td>Yes</td>
</tr>
<tr>
<td>Personnel Maintenance Building HVAC Filter Stack Clinic Decon Room</td>
<td>None</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Note: Please see Table 4.2, Air Permit Support Data for capacities, throughputs, and number of units of each insignificant activity.

SIGNATURE BLOCK

1. THE UNDERSIGNED, HEREBY CERTIFY UNDER PENALTY OF LAW, THAT I AM A RESPONSIBLE OFFICIAL, AND THAT I HAVE PERSONALLY EXAMINED, AND AM FAMILIAR WITH, THE INFORMATION SUBMITTED IN THIS DOCUMENT AND ALL ITS ATTACHMENTS. BASED ON MY INQUIRY OF THOSE INDIVIDUALS WITH PRIMARY RESPONSIBILITY FOR OBTAINING THE INFORMATION, I CERTIFY THAT THE INFORMATION IS ON KNOWLEDGE AND BELIEF, TRUE, ACCURATE, AND COMPLETE. I AM AWARE THAT THERE ARE SIGNIFICANT PENALTIES FOR SUBMITTING FALSE OR INCOMPLETE INFORMATION, INCLUDING THE POSSIBILITY OF FINE OR IMPRISONMENT.

BY__________________________
Authorized Signature

Martin A. Jacoby
Typed or Printed Name of Signatory

Colonel, U.S. Army, Commanding Officer
Title of Signatory

09/20/04
Date
Section 8
Air Permit Application
Support Data
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<th>Acronym</th>
<th>Definition</th>
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<tbody>
<tr>
<td>ACB</td>
<td>access control building</td>
</tr>
<tr>
<td>ACWA</td>
<td>Assembled Chemical Weapons Alternatives</td>
</tr>
<tr>
<td>AFB</td>
<td>aluminum filtration building</td>
</tr>
<tr>
<td>AFS</td>
<td>aluminum filtration system</td>
</tr>
<tr>
<td>ANCDF</td>
<td>Anniston Chemical Weapons Disposal Facility</td>
</tr>
<tr>
<td>ANR</td>
<td>agent neutralization reactor</td>
</tr>
<tr>
<td>ANS</td>
<td>agent neutralization system</td>
</tr>
<tr>
<td>APR</td>
<td>aluminum precipitation reactor</td>
</tr>
<tr>
<td>APS</td>
<td>aluminum precipitation system</td>
</tr>
<tr>
<td>BC</td>
<td>brine concentrator</td>
</tr>
<tr>
<td>BGAD</td>
<td>Blue Grass Army Depot</td>
</tr>
<tr>
<td>BGCAPP</td>
<td>Blue Grass Chemical Agent Pilot Plant</td>
</tr>
<tr>
<td>CA</td>
<td>chemical agent</td>
</tr>
<tr>
<td>CHB</td>
<td>container handling building</td>
</tr>
<tr>
<td>CO</td>
<td>carbon monoxide</td>
</tr>
<tr>
<td>DA</td>
<td>Department of the Army</td>
</tr>
<tr>
<td>DA-PAM</td>
<td>Department of the Army Pamphlet</td>
</tr>
<tr>
<td>decon</td>
<td>decontamination</td>
</tr>
<tr>
<td>DOT</td>
<td>Department of Transportation</td>
</tr>
<tr>
<td>dscm</td>
<td>dry cubic meter</td>
</tr>
<tr>
<td>DSH</td>
<td>dunnage shredding and handling</td>
</tr>
<tr>
<td>EBH</td>
<td>energetics batch hydrolyzer</td>
</tr>
<tr>
<td>EC</td>
<td>evaporator/crystallizer</td>
</tr>
<tr>
<td>ECF</td>
<td>entry control facility</td>
</tr>
<tr>
<td>ENR</td>
<td>energetics neutralization reactor</td>
</tr>
<tr>
<td>ENS</td>
<td>energetics neutralization system</td>
</tr>
<tr>
<td>EONC</td>
<td>enhanced onsite container</td>
</tr>
<tr>
<td>EPA</td>
<td>Environmental Protection Agency</td>
</tr>
<tr>
<td>GB</td>
<td>nerve agent sarin, isopropyl methyl phosphonofluoridate (C₄H₁₀FO₂P)</td>
</tr>
<tr>
<td>H</td>
<td>blister agent mustard made by the Levinstein process, bis(2-chloroethyl) sulfide or 2,2'-dichlorodiethyl sulfide (C₄H₈Cl₂S₁.₅)</td>
</tr>
<tr>
<td>HAP</td>
<td>hazardous air pollutant</td>
</tr>
<tr>
<td>HDC</td>
<td>heated discharge conveyor</td>
</tr>
<tr>
<td>HEPA</td>
<td>high-efficiency particulate air (filter)</td>
</tr>
<tr>
<td>HP</td>
<td>high-pressure</td>
</tr>
<tr>
<td>HSA</td>
<td>hydrolysate storage area</td>
</tr>
<tr>
<td>HVAC</td>
<td>heating, ventilating, and air conditioning</td>
</tr>
<tr>
<td>IC</td>
<td>internal combustion</td>
</tr>
<tr>
<td>IPA</td>
<td>isopropyl alcohol</td>
</tr>
<tr>
<td>KAR</td>
<td>Kentucky Administrative Regulation</td>
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<tr>
<td>KDAQ</td>
<td>Kentucky Department of Environmental Protection, Division for Air Quality</td>
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<td>KDEP</td>
<td>Kentucky Department of Environmental Protection</td>
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### Acronyms

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<thead>
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<th>Acronym</th>
<th>Definition</th>
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</thead>
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<tr>
<td>MDB</td>
<td>munitions demilitarization building</td>
</tr>
<tr>
<td>MPT</td>
<td>metal parts treater</td>
</tr>
<tr>
<td>MWS</td>
<td>munitions washout station</td>
</tr>
<tr>
<td>Na₂SO₄</td>
<td>sodium sulfate</td>
</tr>
<tr>
<td>NaCl</td>
<td>sodium chloride</td>
</tr>
<tr>
<td>NaF</td>
<td>sodium fluoride</td>
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<tr>
<td>NaH₂PO₄</td>
<td>sodium monophosphate</td>
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<tr>
<td>NaOH</td>
<td>sodium hydroxide</td>
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<tr>
<td>NCRS</td>
<td>nose closure removal station</td>
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<tr>
<td>NOx</td>
<td>nitrous oxides</td>
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<tr>
<td>OTS</td>
<td>offgas treatment system</td>
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<td>PAH</td>
<td>polycyclic aromatic hydrocarbon</td>
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<td>PFD</td>
<td>process flow diagram</td>
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<td>projectile handling system</td>
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<tr>
<td>PM</td>
<td>particulate matter</td>
</tr>
<tr>
<td>PM₁₀</td>
<td>particulate matter of less than 10 microns in diameter</td>
</tr>
<tr>
<td>PMD</td>
<td>projectile mortar disassembly</td>
</tr>
<tr>
<td>POM</td>
<td>particulate organic matter</td>
</tr>
<tr>
<td>PPE</td>
<td>personnel protective clothing</td>
</tr>
<tr>
<td>PTE</td>
<td>potential to emit</td>
</tr>
<tr>
<td>RO</td>
<td>reverse osmosis</td>
</tr>
<tr>
<td>RSM</td>
<td>rocket shear machine</td>
</tr>
<tr>
<td>SCWO</td>
<td>supercritical water oxidation</td>
</tr>
<tr>
<td>SDG</td>
<td>standby diesel generator</td>
</tr>
<tr>
<td>SDS</td>
<td>spent decontamination solution</td>
</tr>
<tr>
<td>SO₂</td>
<td>sulfur dioxide</td>
</tr>
<tr>
<td>SPB</td>
<td>SCWO process building</td>
</tr>
<tr>
<td>THC</td>
<td>total hydrocarbon</td>
</tr>
<tr>
<td>TOC</td>
<td>total organic carbon</td>
</tr>
<tr>
<td>TOCDF</td>
<td>Tooele Chemical Agent Disposal Facility</td>
</tr>
<tr>
<td>TSDF</td>
<td>treatment, storage, and disposal facility</td>
</tr>
<tr>
<td>TSP</td>
<td>total suspended particulates</td>
</tr>
<tr>
<td>UPA</td>
<td>unpack area</td>
</tr>
<tr>
<td>VOC</td>
<td>volatile organic compound</td>
</tr>
<tr>
<td>VX</td>
<td>nerve agent, O-ethyl S-(2-diisopropylaminoethyl) methylphosphonothiolate (C₁₁H₂₆NO₂PS)</td>
</tr>
<tr>
<td>WRS</td>
<td>water recovery system</td>
</tr>
</tbody>
</table>
1 Introduction

The Blue Grass Army Depot (BGAD) is submitting an air permit application to the Kentucky Department of Environmental Protection (KDEP), Division for Air Quality (KDAQ) for construction and operation of the Blue Grass Chemical Agent Destruction Pilot Plant (BGCAPP) in Richmond, Kentucky. This report documents the basis for estimating emissions for the proposed BGCAPP facility and provides other relevant supporting data to facilitate KDEP/DAQ’s processing of the BGCAPP air permit application. This supporting document constitutes a part of BGAD’s air permit application for the BGCAPP. This document consists of the following sections:

1. Introduction
2. Site Location and Facility Layout
3. Process Description
4. Air Emission Sources and Controls
5. References for Emission Factor Estimates
2 Site Location and Facility Layout

The BGAD site location address is 2091 Kingston Highway, Richmond, Kentucky. The site is approximately 5 miles southeast of Richmond, Kentucky, in Madison County. The BGAD occupies approximately 14,596 acres of the area bounded by Kingston Highway/State Route 421 on the west, State Route 52 on the north, Speedwell Road/State Route 374 on the east, and Crooksville Road on the south. Figure 2-1 shows the BGAD site area on the topographical map. The BGCAPP facility will be located in the northeast portion of the BGAD site.

The BGAD has approximately 850 employees on site. At its peak (during systemization and startup), the BGCAPP is expected to employ 600 people on site and at nearby offices facilities, thus raising the peak number of employees to approximately 1,450.

Figure 2-2 shows the general layout of BGCAPP and indicates the main process area, auxiliary operational areas, and facility support areas, and emission points.
Figure 2-1—BGCAPP Site Location
Figure 2-2—Facility Layout
3 Process Description

The BGAD is an active depot with existing emission sources such as boilers and paint spray booths, as well as other processes that are normally found in a heavy equipment refurbishing and repair operation. The BGCAPP is located wholly within the BGAD’s boundary. It is built and operated for the sole function of destroying the chemical weapons stockpile stored at the BGAD. All chemical weapons and chemical agent (CA)-contaminated materials will be processed and all CA will be neutralized in the munitions demilitarization building (MDB). The products of CA neutralization (hydrolysate) are stored in the hydrolysate storage area (HSA) tanks and then treated in the supercritical water oxidation (SCWO) process building (SPB), where it is converted into an inorganic filter cake and high purity water that will be reused in the plant. Waste treatment residues are shipped offsite for disposal or recycling.

The BGCAPP has the following significant air emission sources:

1. In the MDB, all emissions pass through the MDB heating, ventilating, and air conditioning (HVAC) filter system and are released through two stacks (MDB1 and MDB2).
2. Two gas-fired process boilers (PB1 and PB2) and two space-heat boilers (SB1 and SB2). All four boilers use No. 2 fuel oil as a backup fuel if the natural gas supply is interrupted.
3. Six emergency generators (EG1 through EG6) with diesel-cycle internal combustion (IC) engines operate on No. 2 fuel oil. They are used only to maintain critical operations and safety systems during a power failure. A seventh emergency generator with IC engine is an insignificant activity.

The remaining air emission sources are all insignificant activities as described in 401 KAR 52:020 Section 6(1).

3.1 Wastes Treated

The wastes to be treated at BGCAPP consist primarily of M55 rockets, M56 warheads, and projectiles (8 in. and 155 mm). CA-contaminated secondary waste (including contaminated wooden pallets, metal banding, used personnel safety gear, and replaced process parts) is also treated at the plant. Table 3-1 lists the types and quantities of the munitions in the BGAD stockpile.

<table>
<thead>
<tr>
<th>Munition</th>
<th>Agent Type</th>
<th>Type</th>
<th>Caliber</th>
</tr>
</thead>
<tbody>
<tr>
<td>M55</td>
<td>GB</td>
<td>Rocket</td>
<td>115 mm</td>
</tr>
<tr>
<td>M56</td>
<td>GB</td>
<td>Warhead</td>
<td>115 mm</td>
</tr>
<tr>
<td>M426</td>
<td>GB</td>
<td>Projectile</td>
<td>8 in.</td>
</tr>
<tr>
<td>Ton container</td>
<td>GB</td>
<td>Nonstockpile</td>
<td>NA</td>
</tr>
<tr>
<td>M55</td>
<td>VX</td>
<td>Rocket</td>
<td>115 mm</td>
</tr>
<tr>
<td>M56</td>
<td>VX</td>
<td>Warhead</td>
<td>115 mm</td>
</tr>
<tr>
<td>M121A1</td>
<td>VX</td>
<td>Projectile</td>
<td>155 mm</td>
</tr>
<tr>
<td>M110</td>
<td>H</td>
<td>Projectile</td>
<td>155 mm</td>
</tr>
<tr>
<td>DOT(^*) bottle</td>
<td>H</td>
<td>Nonstockpile</td>
<td>NA</td>
</tr>
<tr>
<td>DOT bottle</td>
<td>VX</td>
<td>Nonstockpile</td>
<td>NA</td>
</tr>
</tbody>
</table>

\(^*\) DOT = Department of Transportation
3.1.1 Projectiles

Projectiles are CA-containing shells that are fired from guns or cannons. They have a roughly cylindrical steel body with a tapered nose and a hollow cylindrical tube (known as the burster well) running down the center of the shell. This tube holds the burster, an explosive charge that disperses the CA on detonation. The liquid agent is contained in the annular region between the burster well and the shell wall. The 155-mm H projectiles contain energetic material (composed of tetrytol) in the burster well (see Figure 3-1). The 8-in GB projectiles (designated as M426) and the 155-mm VX projectiles (designated as M121A1) do not have a burster.

3.1.2 M55 Rockets

A rocket is an airborne weapon propelled by a mixture of a fuel and an oxidizer. The only rocket type in the chemical stockpile is the 115-mm-diameter M55 rocket. This rocket is 1.98 m long and has a mass of about 26 kg (see Figure 3-2). It consists of two sections:

1. An aluminum-alloy warhead section, which contains the CA, two bursters, and the fuze
2. A steel motor section, which contains the propellant grain, the igniter assembly, and the nozzle and fins

Both GB and VX M55 rockets are part of the BGAD chemical weapons stockpile. The bursters contain Composition B (Comp B) explosive. The propellant is double base M28 (nitroglycerin/nitrocellulose). The rockets are stored in individual shipping and firing tubes (SFTs) made of fiberglass-reinforced resin. M56 warheads are similar to the M55 rockets except that they do not include the motor section (item 2 in the above list); thus, M56 warheads do not contain M28 propellant or igniter assemblies.

3.1.3 Nonstockpile Items

Four nonstockpile items are stored at BGAD and will be processed at BGCAPP:

1. One GB ton container
2. One VX Department of Transportation (DOT) bottle
3. Two H DOT bottles

3.1.4 Secondary Wastes

Six major types of secondary waste will be treated at BGCAPP:

1. Contaminated wood pallets, which are associated with leaking munitions
2. CA-contaminated plastic and personnel protective equipment (PPE)
3. Miscellaneous CA-contaminated metal parts
4. CA-contaminated spent activated carbon
5. Spent decontamination (decon) solution (SDS)
6. Closure wastes

3.2 Waste Treatment Processes

The process destroys the agent stored at the BGAD by neutralization via hydrolysis, whereby the agent or CA-contaminated material is mixed in an enclosed vessel with hot water or hot caustic (i.e., sodium hydroxide ([NaOH]). The chemical reaction destroys the agent. Hydrolysis has been shown to achieve the required performance for agent destruction.
Figure 3-1—155-mm Projectile

Figure 3-2—M55 Rocket
Water is recycled via a water recovery system (WRS) that produces water of a quality suitable to recycle back into the process. Excess water is released to the atmosphere as steam in the WRS.

3.2.1 Processing Sequence

Drawing 24915-00-HK-00-00003 is a process block flow diagram for the hazardous waste processing units. The figure shows the flow of munitions from the container handling building (CHB) through the various systems, the regulated processes discussed in Section 3, and the air emission points discussed in Section 4.

Palletized munitions are stored in igloos. Munitions are transported from the igloos to the BGCAPP via enhanced onsite containers (EONCs) to the CHB. The EONCs are airtight vessels that are specifically designed to contain munitions during transport from the BGAD storage igloos to the CHB. The EONC is a well-established design that is currently used safely at both the Tooele Chemical Agent Disposal Facility (TOCDF) in Utah and the Anniston Chemical Agent Disposal Facility (ANCDF) in Alabama.

The EONC is received in the CHB, where it is stored until its contents are to be treated. At that time, it is transferred via a conveyor to the unpack area (UPA) and the air in the sealed EONC is monitored for CA vapors. If CA is detected (indicating a leaking munition), the EONC is moved to an area of the MDB where the ventilation system is designed to handle agent vapors. The EONC is opened by personnel wearing appropriate PPE, and the munitions are removed and placed on the appropriate processing line for that munition. All pallets and metal straps from the contaminated EONC are assumed to be contaminated and are transferred to the appropriate waste handling system for treatment. The EONC is then decontaminated and released for further use.

If CA monitoring indicates that the EONC does not contain leaking munitions, the EONC is opened in the UPA, and the munitions are unpacked and placed on conveyors that take them through the treatment process for that particular munition.

The CA, propellants, and explosives are destroyed within the MDB. All treatment processes located in the MDB vent to the MDB’s HVAC system. All munition treatment steps in the MDB are performed by remotely controlled systems.

Chemical demilitarization of the BGAD stockpile has the following major processing steps, all of which occur in the MDB, the aluminum filtration building (AFB) and SCWO process building (SPB). These steps are detailed in the following sections.

3.2.1.1 Agent and Energetics Access (mechanical)

1. **PMD Machine** (Dwg. 24915-07-M5-PHS-0001). The PMD machine removes the nose closures and bursters from the 155-mm H projectiles. After the nose closure and burster are removed, the projectile is conveyed out of the explosive containment room (ECR), loaded onto a munition tray, and conveyed to the munitions washout station (MWS).

   The PMD processes the 155-mm H projectiles by first unscrewing the nose closure and removing the burster and miscellaneous components. The nose closures and miscellaneous components are conveyed out of the ECR with the projectile and are placed on a munition tray for processing through the metal parts treater (MPT). The bursters are transferred to the EBH for deactivation by hydrolysis.

---

1 The drawing numbers refer to the Process Flow Diagrams (PFDs), which have been submitted as part of this application. Note that design calculations associated with each PFD are on the subsequent pages of the drawing, which are not submitted to KDAQ.
2. **Nose Closure Removal Station (NCRS)** (Dwg. 24915-07-M5-NCR-0001). The NCRS removes the nose closures from the unburstered projectiles (GB and VX) by unscrewing them from the nose of the projectile. After the nose closures have been removed from all the projectiles on the munition tray, the tray is moved to the MWS for further processing. The removed nose closures are processed through the MPT.

3. **MWS** (Dwg. 24915-07-M5-MWS-00001). The projectile is moved to the MWS, where the agent cavity is accessed, free liquid agent is drained, and the agent cavity washed out with high-pressure water. After the cavity is flushed, the projectile is placed back on the munition tray upright (nose up) and transferred to the MPT.

4. **RSM** (Dwg. 24915-07-M5-RHS-00001). Rockets are processed in the RSM, which disassembles the rocket warhead, accesses the agent cavity, and drains and washes it in a manner similar to the projectile handling system (PHS) and MWS. The rocket’s solid propellant section is then cut into small sections for treatment in the energetics hydrolysis treatment system.

### 3.2.1.2 Agent Neutralization (Dwg. 24915-07-M5-ACS-00001 and -ANS-00001)

The collected CA and CA-contaminated washwater from the MWS and RSM are neutralized by hydrolysis in the ANRs. Hydrolysis is a liquid-phase process, operated at 90° to 95°C (near but below the boiling point of the solution) whereby the CA or CA-contaminated material is mixed in an enclosed vessel with hot water or hot caustic (NaOH). The chemical reaction destroys the CA. The reaction products are tested for CA; if the concentration is below the target release level, the hydrolysate is transferred to the hydrolysate storage tanks (Drawing 24915-11-M5-HSS-00001). If not, the hydrolysate is further treated until the CA concentration is below the target release level.

### 3.2.1.3 Energetics Neutralization (Dwg. 24915-07-M5-EBH-00001, -ENS-00001 and –OTE-00001)

The energetics (explosives and pieces of rocket propellant) are processed in the Energetic Batch Hydrolyzers (EBH) where the energetics and any residual agent that may be present are treated by caustic hydrolysis. After treatment in the EBHs, the solid components of the rockets (fiberglass and steel) are sent to a heated discharge conveyor. The liquid goes to the Energetics Neutralization Reactors (ENRs) for further treatment. If the agent concentration is below the target release level, the hydrolysate is transferred to the hydrolysate storage tanks (Drawing 24915-11-M5-HSS-00002). If not, it is further treated until the agent concentration is below the target release level.

### 3.2.1.4 MPT (Dwg. 24915-07-M5-MPT-00001, –MPTC-00001 and –OTM-00001)

Metal projectile parts and other miscellaneous contaminated metal solids (e.g., banding from pallets that were exposed to agent) are decontaminated by being heated to a minimum of 1,000°F for 15 minutes in the electrically heated MPTs. This process has been demonstrated to be sufficient to destroy any residual CA that may be present. The decontaminated metal components are shipped off site for either recycling or proper disposal.

### 3.2.1.5 HDC (Dwg. 24915-07-M5-EBH-00001)

Solid rocket residues are treated in one of the two HDCs, which are electrically heated conveyors that bring the material to a minimum of 1,000°F for 15 minutes to ensure that the residual agent has been destroyed. The decontaminated rocket components are shipped off site for proper disposal.
3.2.1.6 **Aluminum Precipitation System (APS)**

The energetics hydrolysate is further processed by adjusting the pH to precipitate the aluminum hydroxide\(^2\) in the APS (Dwg. 24915-21-M5-APS-00001) and is then filtered in the aluminum filtration system (AFS) (Dwg. 24915-21-M5-AFS-00001). The filter cake is disposed of off site at a permitted hazardous waste disposal facility. The process takes place in the AFB. Aluminum precipitation and filtration are insignificant activities as described in 401 KAR 52:020 Section 6(1). However, as a precaution, the design incorporates activated carbon filtration on the AFB vent.

3.2.1.7 **SCWO**

The energetics hydrolysate from the AFS and agent hydrolysate from the HSA are transferred to holding tanks where they are blended before they are transferred to the SCWO reactors. SCWO is an enclosed oxidation process that destroys organic constituents in an aqueous stream. SCWO processing is an insignificant activity as described in 401 KAR 52:020 Section 6(1).

The SCWO process is based on the unique properties of water at conditions above its thermodynamic critical point of 374°C (705°F) and 3,206 psia. At these supercritical conditions, organic materials and oxidant gases are generally completely miscible in water and the elevated pressure increases the mixture density in the reactor, thus allowing rapid and complete oxidation reactions.

The material to be reacted is pumped with air through the feed nozzle at the top of the reactor. The feed material is supplemented with additional organic feed (supplemental fuel) to increase its heating value as required to maintain an autogenous chemical reaction. Isopropyl alcohol (IPA) is the supplemental fuel of choice at the BGCAPP.

The effluent from the SCWO reactor has a very low concentration of organics. It is pumped to a WRS consisting of the following components:

1. Reverse osmosis (RO) system (Dwg. 24915-10-HK-TWR-0001)
2. Evaporator/crystallizer (EC) (Dwg. 24915-10-HK-TNBE-00001)
3. Brine concentrator (BC) (Dwg. 24915-10-HK-TNBC-00001)

All components vent into a common duct that vents into the SPB HVAC system (see Section 4.2.5). To the maximum extent possible, the water from the WRS is recycled and reused in the facility. Excess water is released to the atmosphere as steam in the WRS.

3.2.1.8 **CA-Contaminated Secondary Wastes**

CA-contaminated secondary wastes (e.g., agent contaminated pallets, PPE, and spent activated carbon) are treated in the dunnage shredding and handling (DSH) system (Drawings 24915-07-M5-DWS-00001, -DCS-00001, -DPS-00001) followed by SCWO; some secondary wastes (e.g., miscellaneous metal parts, metal reinforced hoses, piping, valves, and tools) may be processed through the MPT or the HDC. Secondary wastes that are not CA-contaminated are not processed in the BGCAPP; they will be managed by appropriate means to minimize waste.

---

\(^2\) Aluminum components of the rockets react with the caustic to form soluble aluminum salts. pH adjustment precipitates the aluminum hydroxide.
4 Air Emission Sources and Controls

The process block flow diagram (Dwg. 24915-00-HK-00-00003) identifies the air emission sources associated with BGCAPP and includes the following primary sources:

1. Treatment processes inside the MDB\(^3\), which vent completely through the MDB HVAC filter system.
2. Agent and energetics hydrolysate storage tank vents, which are insignificant activities as specified in 401 KAR 52:020, Section 6(1); as a precaution, however, the vents will be controlled by activated carbon adsorption units.
3. SCWO system and WRS vents, which are insignificant activities as described in 401 KAR 52:020, Section 6(1), vent to the SPB HVAC filter system described in Section 4.2.5.
4. Steam boilers.
5. Emergency electrical generators driven by diesel IC engines.

Table 4-1 presents the identification number for each regulated air emission point and emission source. The insignificant activities do not have identification numbers; however, their emissions are included in the potential to emit (PTE) calculations presented in Table 4-2.

Table 4-1—Emission Point and Emission Source IDs for Air Permit

<table>
<thead>
<tr>
<th>Emission Point ID</th>
<th>Emission Unit ID</th>
<th>Emission Stack ID</th>
<th>Source Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>MDB</td>
<td>MDB</td>
<td>MDB1, MDB2</td>
<td>MDB HVAC filter stacks (twin stacks, flows shown as total)</td>
</tr>
<tr>
<td>PB1, PB2</td>
<td>PB1, PB2</td>
<td>PB1, PB2</td>
<td>Process boilers</td>
</tr>
<tr>
<td>SB1, SB2</td>
<td>SB1, SB2</td>
<td>SB1, SB2</td>
<td>Space heat boilers</td>
</tr>
<tr>
<td>EG1, EG2, EG3, EG4, EG5, EG6, EG7</td>
<td>EG1, EG2, EG3, EG4, EG5, EG6, EG7</td>
<td>EG1, EG2, EG3, EG4, EG5, EG6, EG7</td>
<td>Diesel engine for main emergency diesel generator No. 1, Diesel engine for main emergency diesel generator No. 2, Diesel engine for main emergency diesel generator No. 3, Diesel engine for main emergency diesel generator No. 4, Diesel engine for backup (manual start) emergency diesel generator for MDB filter system, Diesel engine for emergency water and firewater pumps, Diesel engine for emergency diesel generator for ECF</td>
</tr>
</tbody>
</table>

The following sections discuss BGCAPP’s emissions sources and their associated controls, as well as the pollutants and their emission rates.

Table 4-2 summarizes the results of the PTE calculations for the BGCAPP. The supporting information for these results are presented in the subsequent subsections and tables. Table 4-3 summarizes the results of the PTE calculations for the combustion sources (i.e., boilers and emergency generators).

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\(^3\) Because all processes within the MDB vent directly to the MDB HVAC filter system, the processing units in the MDB are considered as one emission source for this application.
### Table 4-2—Summary of BGCAPP Air Emission Sources

<table>
<thead>
<tr>
<th>Source Name</th>
<th>Number of Emission Points</th>
<th>Processes Throughput Rate (Gal/hr)</th>
<th>Gas Flow Rate (Gal/hr)</th>
<th>Particulate Matter (&lt;10 µm, lb/hr)</th>
<th>SO₂, lb/hr</th>
<th>Total Sulfated Fuels, lb/hr</th>
<th>CO₂, lb/hr</th>
<th>Total Organic Compounds, lb/hr</th>
<th>Total HAPs, lb/hr</th>
<th>Operation, hr/yr</th>
</tr>
</thead>
<tbody>
<tr>
<td>MDB</td>
<td>1 2</td>
<td>30,519</td>
<td>256,000</td>
<td>0</td>
<td>0.68</td>
<td>0.57</td>
<td>8.64</td>
<td>8.84</td>
<td>0.00</td>
<td>1.19E-05</td>
</tr>
<tr>
<td>PBI, PBD, SB1, SB2, ES1-7</td>
<td>13 13</td>
<td>Total combustion sources (see Table 4-3)</td>
<td>57.39</td>
<td>91.24</td>
<td>6.90</td>
<td>5.72</td>
<td>38.73</td>
<td>38.73</td>
<td>0.00</td>
<td>5.22E-05</td>
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<tr>
<td>Total significant activities</td>
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<td></td>
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<td></td>
<td></td>
<td></td>
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<td>Total insignificant activities</td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
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</table>

### INSIGNIFICANT ACTIVITIES

<table>
<thead>
<tr>
<th>Source Name</th>
<th>Number of Emission Points</th>
<th>Processes Throughput Rate (Gal/hr)</th>
<th>Gas Flow Rate (Gal/hr)</th>
<th>Particulate Matter (&lt;10 µm, lb/hr)</th>
<th>SO₂, lb/hr</th>
<th>Total Sulfated Fuels, lb/hr</th>
<th>CO₂, lb/hr</th>
<th>Total Organic Compounds, lb/hr</th>
<th>Total HAPs, lb/hr</th>
<th>Operation, hr/yr</th>
</tr>
</thead>
<tbody>
<tr>
<td>APB and AFB HVAC filter</td>
<td>0 4,093 550</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>8,760</td>
</tr>
<tr>
<td>APS, MV-APS-0101-0102</td>
<td>2 0</td>
<td>500</td>
<td>7.81</td>
<td>6.90</td>
<td>≠549</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>8,760</td>
</tr>
<tr>
<td>APS, MV-APP-0140-0140</td>
<td>2 0 2,047 600</td>
<td>0 0</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>8,760</td>
</tr>
<tr>
<td>SPB HVAC filter</td>
<td>1 1</td>
<td>10,499 17 1,408 717</td>
<td>0.12</td>
<td>0.00</td>
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<td>0.13</td>
<td>0.13</td>
<td>8,760</td>
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<tr>
<td>SCWO vents to SPB HVAC filter</td>
<td>0 6</td>
<td>9,410 33</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>5.35E-01</td>
</tr>
<tr>
<td>WRS, total water recovery mode</td>
<td>2 0 9,410 33</td>
<td>9,410 33</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
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<td>0.00</td>
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<td>5.35E-01</td>
</tr>
<tr>
<td>WRS vents to SPB HVAC filter</td>
<td>2 0 9,410 33</td>
<td>9,410 33</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>5.35E-01</td>
</tr>
<tr>
<td>MPT residue cool down conveyor</td>
<td>2 1 5,261 42</td>
<td>2,047</td>
<td>0.13</td>
<td>0.13</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>5.35E-01</td>
</tr>
<tr>
<td>Agent hydrolysate storage tanks MT-HSS-0105/0106</td>
<td>2 2</td>
<td>245,000</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>5.35E-01</td>
</tr>
<tr>
<td>Agent hydrolysate storage tank MT-HSS-0104</td>
<td>1 1</td>
<td>60,000</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>5.35E-01</td>
</tr>
<tr>
<td>Energetics hydrolysate storage tanks MT-HSS-0054/0055/0067</td>
<td>4 4</td>
<td>475,000</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>5.35E-01</td>
</tr>
<tr>
<td>Hydrochloric acid (HCl) storage tank MT-HCL-0107</td>
<td>1 1</td>
<td>8,500</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>5.35E-01</td>
</tr>
<tr>
<td>HCl day tank</td>
<td>1 1</td>
<td>2,500</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>5.35E-01</td>
</tr>
<tr>
<td>IPA storage tank (pressurized vessel; filling losses only, no breathing losses)</td>
<td>1 1</td>
<td>38,500</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>5.35E-01</td>
</tr>
<tr>
<td>Sulfuric acid storage tank MT-MAS-0104</td>
<td>1 1</td>
<td>4,500</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>5.35E-01</td>
</tr>
<tr>
<td>No. 2 diesel fuel storage tank</td>
<td>2 2</td>
<td>24,620</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>5.35E-01</td>
</tr>
<tr>
<td>NaOH 50% storage tanks MT-NAH01-0101/0201</td>
<td>2 2</td>
<td>50,000</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>5.35E-01</td>
</tr>
<tr>
<td>NaOH 18% storage tank MT-NAH01-0102</td>
<td>1 1</td>
<td>8,000</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>5.35E-01</td>
</tr>
<tr>
<td>Sodium hypochlorite (NaOCl) (VX campaign) or NaOH 1% (GB, H campaign) storage tank MT-NAH01-0205</td>
<td>1 1</td>
<td>10,500</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
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<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>5.35E-01</td>
</tr>
<tr>
<td>NaOCl 1% storage tanks MT-NAH01-0105</td>
<td>1 1</td>
<td>3,100</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>5.35E-01</td>
</tr>
<tr>
<td>Laboratory HVAC filter stack</td>
<td>1 1</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>5.35E-01</td>
</tr>
<tr>
<td>Personnel maintenance building HVAC filter stack decon room</td>
<td>1 1</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>5.35E-01</td>
</tr>
</tbody>
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### Table 4-3—PTE Summary Combustion Sources

<table>
<thead>
<tr>
<th>Process</th>
<th>Space-Heat</th>
<th>Main</th>
<th>MDB</th>
<th>Water and Firewater</th>
<th>Entry Control Facility</th>
<th>Total BGCAPP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boilers</td>
<td>Boilers</td>
<td>Standby</td>
<td>MDB</td>
<td>Pump</td>
<td>Facility</td>
<td></td>
</tr>
<tr>
<td>PB1, PB2</td>
<td>SB1, SB2</td>
<td>EG1-4</td>
<td>EG5</td>
<td>EG6</td>
<td>Insignificant</td>
<td></td>
</tr>
<tr>
<td>kW, each</td>
<td>3,300</td>
<td>750</td>
<td>750</td>
<td>150</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MMBTU/hr, each</td>
<td>34.50</td>
<td>37.26</td>
<td>30.10</td>
<td>7.26</td>
<td>7.26</td>
<td>1.45</td>
</tr>
<tr>
<td>hrs operation/yr</td>
<td>8,760</td>
<td>8,760</td>
<td>500</td>
<td>500</td>
<td>500</td>
<td>500</td>
</tr>
<tr>
<td>Number</td>
<td>2</td>
<td>2</td>
<td>4</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Annual oil consumption (all units) MM gal/yr</td>
<td>0.441</td>
<td>0.476</td>
<td>0.4300</td>
<td>0.0244</td>
<td>0.0244</td>
<td>0.0049</td>
</tr>
<tr>
<td>Annual gas consumption (all units) MM cu ft/yr</td>
<td>604</td>
<td>653</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>Estimated emissions, tons/yr</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Carbon monoxide (CO)</td>
<td>25.39</td>
<td>27.42</td>
<td>1.42</td>
<td>1.42</td>
<td>1.42</td>
<td>0.32</td>
</tr>
<tr>
<td>Nitrogen oxides (NOx)</td>
<td>31.61</td>
<td>34.14</td>
<td>13.30</td>
<td>5.36</td>
<td>5.36</td>
<td>1.48</td>
</tr>
<tr>
<td>Total suspended particulate (TSP)</td>
<td>2.80</td>
<td>3.02</td>
<td>0.64</td>
<td>0.17</td>
<td>0.17</td>
<td>0.10</td>
</tr>
<tr>
<td>Particulate matter &lt;10 µm (PM10)</td>
<td>2.43</td>
<td>2.63</td>
<td>0.37</td>
<td>0.10</td>
<td>0.10</td>
<td>0.10</td>
</tr>
<tr>
<td>Sulfur dioxide (SO2)</td>
<td>12.69</td>
<td>13.71</td>
<td>11.90</td>
<td>0.68</td>
<td>0.68</td>
<td>0.10</td>
</tr>
<tr>
<td>Total organic compounds (TOCs)/VOCs</td>
<td>3.32</td>
<td>3.59</td>
<td>0.43</td>
<td>0.15</td>
<td>0.15</td>
<td>0.12</td>
</tr>
</tbody>
</table>

#### 4.1 MDB and MDB HVAC Filter System

The MDB is equipped with high-efficiency control systems that meet the stringent specifications of the U.S. Department of Army. These Army specifications and requirements result in extremely low air emissions from the munition and waste treatment operations inside the MDB and the hydrolysate and water recovery system operations.

The following treatment processes are located in the MDB:

1. Munitions disassembly, energetics access and removal, and agent access and draining in the remotely controlled PMD machine, MWS, and RSM
2. Washout of agent from the munitions cavity with high-pressure (HP) water in the projectile and rocket washout stations
3. Dissolution and hydrolysis of explosive components removed from the munitions in the EBHs (16 identical EBHs in two parallel trains)
4. Heat treatment of metal parts from munitions and other potentially contaminated parts in the MPTs (two identical units)
5. Heat treatment of rocket components exiting the EBHs in the HDCs (two identical units)
6. Chemical reaction of energetics hydrolysis in the ENR (four identical reactors)
7. Chemical decomposition (neutralization) of the drained and washed out agent in the ANR (four identical reactors)
8. Transfer of tested hydrolysate to the hydrolysate storage area (HSA) tanks outside the MDB
9. Shredding, grinding, and slurrying of contaminated wood in the DSH system for direct processing in the SCWO systems
10. Grinding and slurrying of contaminated plastic, other secondary wastes, and spent activated carbon in the DSH for direct processing in the SCWO systems
All processing equipment of the EBH, ENR, and HDC, as well as their ancillary equipment, vent to the EBH/ENR offgas treatment systems (OTGs). The ANR and the MPT vent to the MPT OTS. The shredder, grinders, micronizer, hydropulper, and other processing equipment associated with the DSH vent to the baghouse. The offgases from the EBH/ENR OTS, MPT OTS, and the baghouse vent to the MDB HVAC filter system before they are released to the atmosphere, as does all of the ventilating air in the MDB. The MDB HVAC filter system serves a fourfold purpose:

1. Capture and contain agent vapor from the mechanical processing, and washing of the munitions (which includes accessing, draining, and washing the agent cavity of the rockets and projectiles) by maintaining a negative pressure environment in the MDB.
2. Control agent contamination by maintaining the flow of air from areas of low contamination probability to areas of higher contamination probability.
3. Remove agent vapors from the exhaust before it is discharged to the atmosphere.

The release or spread of contamination is prevented by cascaded pressure control. This arrangement ensures a flow of air from the areas with the least agent contamination to the areas with the most contamination in the MDB and ensures containment within the MDB.

To minimize the spread of contamination and maintain the toxic boundaries, the number of air changes per room is higher for areas likely to be contaminated. Airflow is controlled by the following means:

1. Modulating the supply air into the building
2. Modulating the exhaust flow of air out of the building
3. Setting weighted dampers throughout the building

The MDB HVAC filter system consists of 16 modules operating in parallel with a combined design airflow of 256,000 acfm (16,000 acfm per filter unit). In addition, two units are maintained on standby in case one unit must be removed from service for maintenance. Dampers are provided to isolate any unit for maintenance. These dampers are designed to maintain draft within the isolated unit through the other operating filters to prevent the release of contaminants during maintenance. Drawing 24915-08-M5-HVAC-00001 shows the PFD for one bank of nine filter units (8 operating and one spare) of the HVAC filter system. The HVAC filter system consists of two such banks of nine filter units each for a total of 18 filter units (16 operating and 2 standby).

Each filter unit has its own independently operating fan. To maintain negative pressure in the MDB, up to four primary standby diesel generators (SDGs) maintain power to the MDB HVAC filter fans during commercial power outages as described in Section 4.4. A fifth secondary SDG will be installed to maintain negative pressure in the MDB if the primary SDGs do not start or if a problem arises in the power distribution system. This level of redundancy provides a high level of protection to prevent the release of CA and other air emissions from the MDB.

Each MDB HVAC filter unit consists of the following components (see Dwg. 24915-08-M5-HVAC-00001):

1. One particulate prefilter (HIGH)
2. One high-efficiency particulate air (HEPA) filter
3. Six carbon filter banks in series (CHAR)
4. One final HEPA filter

---

4 Hence the term “Cascade Ventilating System.”
The prefilter and HEPA filter provide extremely effective removal of particulates. The six banks of carbon filters provide better than 99.9999% removal efficiency for hydrocarbons and other gaseous contaminants (see discussion below for the basis of this estimate).

The particulate matter (PM) emission rate for the MDB filter system is based on an assumed outlet grain loading of 0.001 grain/acf. This assumption is based on the fact that all air has passed through multiple air pollution control devices, including two layers of HEPA filters. This assumption results in a PM emission rate of 2.19 lb/hr and a maximum annual emission of 9.6 tons/yr based on an operating schedule of 24 hr/day, 365 days/yr. Table 4-4 shows the emissions estimates for PM for the MDB. The particulate matter with a diameter of less than 10µm (PM₁₀) emission rate for the MDB HVAC filter stacks is assumed (as a worst-case) to be the same as the PM emission rate. Table 4-4 also presents the process input rates for the MDB.

The total hydrocarbon (THC) emission rate from the MDB filter system is based on an assumed worst-case inlet loading of 10 ppm THC into the MDB HVAC filters. This assumption is a worst-case scenario based on the following characteristics of the design:

1. All sources of THC are controlled by one of the OTSs.
2. The DSH is a mechanical size reduction and slurrying system and does not produce THC.
3. The majority of the gas processed through the MDB HVAC system consists of ambient air from the MDB. No processes in the MDB release THC directly to the air.

The air flows through six activated carbon units, each of which corresponds to an adsorber. The adsorption efficiency of the carbon adsorption units is calculated based on the Environmental Protection Agency’s (EPA’s) report Preferred and Alternative Methods for Estimating Air Emissions From Surface Coating Operations.⁵ Table 7.2.2 of this document specifies that the minimum hydrocarbon adsorption efficiency for carbon adsorbers be 90%. At this minimum removal efficiency for each adsorber, the six adsorbers in series result in a removal efficiency of 100% (90% to 100%), which equates to a 99.9999% removal efficiency. Table 4-4 shows the THC emission rate for the MDB calculated on this basis. For the emission inventory, the hazardous air pollutant (HAP) emission rate is assumed to be equal to the THC emission rate.

The MPT is the only source of carbon monoxide (CO) in the MDB; its CO emission rate is estimated by calculations using Aspen modeling. Assuming 90% destruction of CO in the catalytic oxidizer system of the OTS, results of the estimated CO emission rate are shown in Table 4-4. Table 7.2.2 of Preferred and Alternative Methods for Estimating Air Emissions From Surface Coating Operations shows a 95% removal efficiency for catalytic oxidizers. The CO emission rate for the MDB calculated on this basis is given in Table 4-4.

The NOx emission rate from the MPT is estimated by calculations using Aspen modeling; Table 4-4 shows the results.

The MDB filter system is an integral part of the demilitarization process; the filter system will always be in operation during the life of the facility.

### 4.2 Process/Storage Vents

The BGCAPP emissions sources include process/storage vents associated with liquid treatment areas. These sources include agent hydrolysate storage, energetics hydrolysate storage, APS and AFS, SCWO system, and WRS. These vents are breathing vents only: the air emissions from these vents are insignificant as described in 401 KAR 52:020 Section 6(1): the liquid streams being processed/stored have negligible volatile organic compounds (VOCs).

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⁵ This report was prepared for EPA under the Emission Inventory Improvement Program. It is available from the U.S. EPA Air Chief Website at http://www.epa.gov/ttnchie1/eiip/techreport/volume02/ii07_july2001.pdf.
Table 4-4—Summary of Criteria Pollutant and Process Input Rates for MDB

<table>
<thead>
<tr>
<th>NOx Release Rate (lb/hr)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>MPT OTS</td>
<td>0.013</td>
</tr>
<tr>
<td>EBH/ENR OTS</td>
<td>0.08</td>
</tr>
<tr>
<td>DSH</td>
<td>0</td>
</tr>
<tr>
<td>Total NOx from MDB (lb/hr)</td>
<td>0.093</td>
</tr>
<tr>
<td>Total NOx from MDB (ton/yr)</td>
<td>0.398</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CO Release Rate (lb/hr)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Uncontrolled MPT</td>
<td>66.81</td>
</tr>
<tr>
<td>OTS Efficiency</td>
<td>95%</td>
</tr>
<tr>
<td>MPT OTS per unit</td>
<td>3.3405</td>
</tr>
<tr>
<td>Number of MPTs</td>
<td>2</td>
</tr>
<tr>
<td>Total CO from all MPTs (lb/hr)</td>
<td>6.681</td>
</tr>
<tr>
<td>Total CO from all MPTs (ton/yr)</td>
<td>28.59</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Total Particulate Emission Estimate</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>CFM</td>
<td>256,000</td>
</tr>
<tr>
<td>Particulate concentration, gr/scf</td>
<td>0.001</td>
</tr>
<tr>
<td>Total TSP from MDB (BGCAPP1) (lb/hr)</td>
<td>2.19</td>
</tr>
<tr>
<td>Total TSP from MDB (BGCAPP1) (tons/yr)</td>
<td>8.84</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Total Hydrocarbon Emission Estimate</th>
<th></th>
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<tbody>
<tr>
<td>CFM</td>
<td>256,000</td>
</tr>
<tr>
<td>THC Conc. ppm (assumed)</td>
<td>10</td>
</tr>
<tr>
<td>THC Release Rate (cu ft/hr)</td>
<td>153.6</td>
</tr>
<tr>
<td>THC Release Rate (mol/hr)</td>
<td>0.396899225</td>
</tr>
<tr>
<td>Total Uncontrolled Hydrocarbons from MDB (lb/hr) (calculated as ethane)</td>
<td>11.91</td>
</tr>
<tr>
<td>HC Removal Efficiency of 1 Stage of HVAC Filter</td>
<td>90.00%</td>
</tr>
<tr>
<td>Number of Stages in each HVAC filter unit</td>
<td>6</td>
</tr>
<tr>
<td>Total THC removal efficiency of HVAC filter unit</td>
<td>99.999900%</td>
</tr>
<tr>
<td>Total THC from MDB</td>
<td>1.1907E-05</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Process Input Rate for MDB</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Input Stream</td>
<td></td>
</tr>
<tr>
<td>M55 Rockets (VX) munitions per hour</td>
<td>48</td>
</tr>
<tr>
<td>lb per M55 Rocket</td>
<td>57.3</td>
</tr>
<tr>
<td>Total lb M55 rockets per hour</td>
<td>2,750</td>
</tr>
<tr>
<td>155 Projectiles (VX)</td>
<td>26</td>
</tr>
<tr>
<td>lb per 155 Projectile</td>
<td>96.5</td>
</tr>
<tr>
<td>Total lb projectiles per hour</td>
<td>2,509</td>
</tr>
<tr>
<td>Dunnage (lbs/hr)</td>
<td>336</td>
</tr>
<tr>
<td>EBH Reagent (50% NaOH solution) (lb/hr)</td>
<td>24,584</td>
</tr>
<tr>
<td>VX-ANR Reagent (50% NaOH solution) (lb/hr)</td>
<td>673</td>
</tr>
<tr>
<td>Total reagent feed rate</td>
<td>25,257</td>
</tr>
<tr>
<td>Total MDB processing rate (munitions + reagent)</td>
<td>30,852</td>
</tr>
<tr>
<td>Total MDB processing rate (ton/yr)</td>
<td>15.43</td>
</tr>
</tbody>
</table>
4.2.1 Hydrolysate Storage Area (HSA)

The agent and energetics hydrolysate leaving the MDB are stored in tanks in the HSA. All hydrolysates going from the MDB to the HSA are verified to be below the target release level for agent. Based on this release criterion, agent monitoring is not required in the hydrolysate storage tank vents; therefore, the SCWO and downstream operations do not vent through the MDB HVAC system. The hydrolysate is an aqueous solution of organic compounds with negligible levels of VOCs. Table 4-2 lists the numbers and sizes of the HSA tanks. As shown in Table 4-2, no measurable emissions are expected from the HSA tanks. To minimize odors, the exhaust from each agent and energetics hydrolysate storage tank is vented through a carbon adsorber system before it is discharged to the atmosphere. The tanks in the HSA are an insignificant activity as described in 401 KAR 52:020 Section 6(1).

4.2.2 Aluminum Precipitation and Filtration

The aluminum precipitation reactor (APR) and the aluminum filtration equipment are located in the AFB. To control odor, the air in the AFB and all equipment are vented to an AFB HVAC filter system. Table 4-2 presents the process operating rates for the APS and AFS. As shown in Table 4-2, no measurable emissions of regulated substances are expected from the processes in the AFB.

The aluminum SFTs and other aluminum components of the rockets react with caustic in the EBH to form soluble aluminum salts in the energetics hydrolysates. Before the hydrolysates are treated by SCWO, these salts must be removed in the aluminum precipitation and filtration system in the AFB. Aluminum precipitation is the first step in the aluminum removal process.

The energetics hydrolysate from the storage tanks in the HSA is fed to the APR, where the pH is adjusted to near neutral by adding hydrochloric acid (HCl) and sulfuric acid (H₂SO₄). The APR is a stirred tank reactor that vents to the atmosphere through a carbon canister. At this lower pH, the aluminum salts form an aluminum hydroxide precipitate. The pH-adjusted hydrolysate and aluminum hydroxide precipitate are transferred from the APR to a filter that removes the aluminum hydroxide as a filter cake. The filter cake is sent to an offsite hazardous waste treatment, storage, and disposal facility (TSDF). The filtrate is pumped to the SCWO system for treatment. This type of wet processing in enclosed equipment does not produce emissions of any regulated pollutants. These processes are, therefore, insignificant activities as described in 401 KAR 52:020 Section 6(1).

4.2.3 SCWO Reactors

The SCWO reactor systems and the WRSs (Section 4.2.4) are located in the SPB. To control odor, the air in the SPB and all equipment vents to an SPB HVAC filter system.

Testing has shown that the SCWO system has very low emissions. The gas streams exiting the SCWO unit were very low in THC (<20 ppm). The CO concentrations were consistently less than 20 ppm; particulates were less than 0.015 grains/dry standard cubic foot (dscf). SCWO produces small quantities of nitrous oxide (N₂O), which is not regulated as a criteria pollutant in accordance with 401 KAR 51:001, “Definitions for 401 KAR Chapter 51.” The gas streams are an insignificant source of air emissions.

The concentrations identified above were measured during the small-scale system demonstration programs. To date, the data demonstrates that the system is safe and protective of the environment. Table 4-2 presents the number of SCWO units, the total gas flow rate from each SCWO unit and the estimated emissions based on the above concentrations and flow rates.

The SCWO reactors produce insignificant emissions as described in 401 KAR 52:020 Section 6(1); however, as a precaution, all SCWO reactor vents are ducted to the SPB HVAC filter system.
system before release to the atmosphere. The potential to emit (PTE) calculation does not include the emission reduction by the SPB HVAC filter system.

4.2.4 WRS

The WRS is located in the SPB. The WRS receives the liquid effluent from the SCWO system and water treatment systems and then separates the water from the salts for recycling or disposal. The WRS comprises a reverse osmosis (RO) unit, a brine concentrator (BC), an evaporator/crystallizer (EC), and two solid separation units. The SCWO effluent is a salt solution comprised primarily of sodium sulfate (Na$_2$SO$_4$), sodium chloride (NaCl), sodium fluoride (NaF), and monosodium phosphate (NaH$_2$PO$_4$). The WRS package is designed to concentrate the salts into a solid phase that will be characterized and shipped to a permitted disposal facility.

Reverse osmosis recovers a portion of the water that supplies the SCWO quench requirement. The brine rejected from the RO and the water that is surplus to the quench water requirement is treated by the BC and EC. The high-quality water is recycled to the plant as process water and is used in the process systems and as makeup water for the water cooling system. This water can also be evaporated to the atmosphere.

The only air emissions that may result from the WRS are particulates from the evaporator. Based on the material balance calculations, these emissions are expected to be very low: when the water is fully recycled, the BC and EC vent gases are completely condensed and essentially do not flow to the atmosphere. During periods of changeover from one type of agent to another when recycled water might not be needed, the steam can be discharged directly to the atmosphere.

As shown in the PFDs (Dwg. 24915-10-HK-TWR-00001, -TNBE-00001, and -TNBC-00001), all process modules are combined through a condenser into stream 1056. Table 4-2 shows that the total wet gas flow rates through this stream are exceptionally low. As a result, the uncontrolled emissions from the WRS qualify as an insignificant activity as specified in 401 KAR 52:020 Section 6(1); however, as a precaution, the entire WRS process is vented to the SPB HVAC filter system. Table 4-2 provides the PTE estimates for the WRS before further treatment by the SPB HVAC filter system.

4.2.5 SPB HVAC Filters

The SCWO reactors and the WRSs are all insignificant activities as described in 401 KAR 52:020 Section 6(1); however, as a precaution, the SPB (in which the processes are contained) is equipped with a negative pressure HVAC system that incorporates two HVAC filter units similar to the MDB HVAC filter units described in Section 4.1.

4.2.6 MPT Cooldown Conveyor

The MPT cooldown conveyor accepts the metal projectile parts that have been heat treated in the MPT. Air is blown past the conveyor to cool the parts. The hot air is exhausted through the MPT cooldown conveyor vent. The material being treated consists of the following large metal pieces that have been previously cleaned:

1. Empty projectile bodies
2. Metal banding from munitions pallets
3. Metal fittings that have been cut from PPE
4. Pump and other equipment parts that have been removed from agent service
5. Miscellaneous metal pieces that require decontamination in the MPT

Because the MPT cooldown conveyor receives only cleaned metal parts, no regulated (both criteria and HAPs) pollutants are expected to be produced or released from the vent. Therefore, it is an insignificant activity as described in 401 KAR 52:020 Section 6(1).
4.3 Boilers

The BGCAPP scope includes installation of four natural gas boilers: two for process and two for space heat. The boilers use No. 2 fuel oil as a backup fuel if natural gas is not available. The PTE estimates are based on the assumption that No. 2 fuel oil comprises 10% of the total heat input capacity. Tables 4-5 and 4-6 show the operating parameters and the results of the PTE estimates for criteria pollutants for the process and space heat boilers, respectively. Table 4-7 shows the total hazardous air pollutants (HAPs) for the process and space heat boilers.

The sulfur content of the fuel oil is based on information provided by BGAD’s current vendor. The fuel oil vendor for the BGCAPP will be selected by a procedure that is consistent with U.S. Government procurement requirements. The sulfur content and environmental performance will be equivalent or superior to that specified herein.

The emission estimates for PB1, PB2, SB1, and SB2 are based on the information provided by the vendor for the model specified. Note that the vendor and model number in this application are given solely for the purpose of design. The manufacturer and model that will ultimately be installed will be selected by a procedure that is consistent with U.S. Government procurement requirements. Its environmental performance will be equivalent or superior to the model that is specified herein.

4.4 Standby Diesel Generators (SDGs)

The plant is equipped with seven IC-engine-driven standby diesel generator (SDG) sets that provide emergency backup power during a power outage. The four primary SDG sets (EG1, EG2, EG3, and EG4) supply electricity to critical operations and safety equipment when the power supply to the facility is interrupted. Each of the four primary SDGs produces 3,300 kW. Table 4-8 presents the generator specifications as provided by the manufacturer. Each is equipped with emission reduction and air impeachment to reduce NOx and CO emissions. The generators are sized so that two of the four can meet the plant’s environmental protection and safety requirements. The following is the sequence of operation and anticipated operation for SDGs EG1 through EG4:

1. All four units start on loss of utility power.
2. Three units operate in parallel, sharing the 6,500-kW essential load; the fourth unit shuts down after 15 minutes.
3. If one of the three units shuts down because of a malfunction, the other two units on line continue to supply the 6,500-kW load.

EG5 is installed next to the MDB HVAC filter system. It provides an additional level of redundancy to maintain draft in the MDB if the primary SDGs do not start or if a problem arises in the power distribution system.

EG6 is installed near the water storage tanks. If power is interrupted, it provides backup power to critical process water pumps and for emergency firefighting water.

EG7 is installed next to the entry control facility (ECF) and provides emergency power to the security systems. The ECF provides security at the entrance to the BGCAPP’s chemical limited area.

The emission estimates for EG1, EG2, EG3, and EG4 are based on the information provided by the vendor for the model specified. Note that the vendor and model number in this application are given solely for the purpose of design. The manufacturer and model that will ultimately be installed will be selected by a procedure that is consistent with U.S. Government procurement requirements. Its environmental performance will be equivalent or superior to the model that is specified herein.
Table 4-5—Process Boiler Criteria Pollutant Emission Data

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<th>Number of boilers</th>
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<td>Heat input rating for each boiler, MMBtu/hr</td>
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<td>Total heat input rating, MMBtu/hr</td>
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<td>Secondary/backup fuel</td>
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<tr>
<td>Natural gas heating value, Btu/scf</td>
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<tr>
<td>No. 2 Oil heating value, Btu/gal</td>
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<tr>
<td>Fuel oil sulfur content, %</td>
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<td>Hourly oil consumption, gal/hr</td>
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<tr>
<td>Maximum annual oil consumption, gal/yr</td>
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| Natural gas emission factors, lb/MMscf | CO 84.00 | NOx 100.00 | TSP 7.60 | PM10 7.60 | SO2 0.60 | TOC 11.00 | VOC 5.50 |
| Natural gas emission rate, lb/MMBtu | CO 0.0840 | NOx 0.1000 | TSP 0.0076 | PM10 0.0076 | SO2 0.0006 | TOC 0.0110 | VOC 0.0055 |
| No. 2 oil emission factors, lb/MMBtu | CO 0.0365 | NOx 0.1460 | TSP 0.0241 | PM10 0.0120 | SO2 0.4145 | TOC 0.0018 | VOC 0.0015 |
| Natural Gas Per Unit Emission Rates, lb/hr | CO 2.8980 | NOx 3.4500 | TSP 0.2622 | PM10 0.2622 | SO2 0.0207 | TOC 0.3795 | VOC 0.1898 |
Table 4-5 (Contd)

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### Table 4-6—Space Heat Boiler Criteria Pollutant Emission Data

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<td>No. 2 oil heating value, Btu/gal</td>
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<td>1.20E-09</td>
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<td>1.20E-09</td>
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<td>1.75E-06</td>
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Table 4-7 (Contd)

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<td>lb/MMBtu</td>
<td>lb/hr</td>
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<td>Formaldehyde</td>
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<td>Hexane</td>
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<td>2.58E-01</td>
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<td>Indeno(1,2,3-cd)pyrene</td>
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<td>2.58E-07</td>
<td>1.13E-06</td>
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<td>Lead</td>
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<td>7.18E-04</td>
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<td>Manganese</td>
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<td>5.45E-05</td>
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<td>Mercury</td>
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<td>3.73E-05</td>
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<td>Naphthalene</td>
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<td>Nickel</td>
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<tr>
<td>o-Xylene</td>
<td>0.00E+00</td>
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<td>Phenanthrene</td>
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<td>1.19E+00</td>
<td>8.29E-02</td>
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September 2004

Air Permit Support Data
**Table 4-8—Vendor Specifications for Standby Generators**

<table>
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<tr>
<th>Description</th>
<th>Caterpillar D3612</th>
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<td>Fuel used</td>
<td>Diesel</td>
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<tr>
<td>Rating at 950 ft, 93°F</td>
<td>3,300 eKW</td>
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<tr>
<td>Break horsepower / unit</td>
<td>4,640.00</td>
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<tr>
<td>Enclosure requirements for each unit</td>
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<tr>
<td>Type of enclosure</td>
<td>Self Contained</td>
</tr>
<tr>
<td>Size of enclosure</td>
<td>50'L X 20'W X12'H Ea</td>
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<td>Radiator mounting</td>
<td>Remote</td>
</tr>
<tr>
<td>Time to start</td>
<td>10 Sec</td>
</tr>
<tr>
<td>Time to assume full load</td>
<td>90 Sec Loading</td>
</tr>
<tr>
<td>Fuel rate / generator @ full load</td>
<td>215 Gallons / Hour</td>
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<tr>
<td>Exhaust emissions / unit</td>
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<tr>
<td>NOx</td>
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<tr>
<td>CO</td>
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<td>HC</td>
<td>0.140 g/bhp-hr</td>
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<td>PM</td>
<td>0.21 g/bhp-hr</td>
</tr>
<tr>
<td>Exhaust emissions after-treatment / unit</td>
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<tr>
<td>Type of reduction</td>
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<tr>
<td>NOx reduction %</td>
<td>90% or 1.30 g/bhp-hr</td>
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<td>CO reduction %</td>
<td>70% or 0.14 g/bhp-hr</td>
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<tr>
<td>HC reduction %</td>
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<td>PM Reduction %</td>
<td>70% or 0.06 g/bhp-hr</td>
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</table>

The sulfur content of the fuel oil is based on information provided by BGAD’s current vendor. The fuel oil vendor for the BGCAPP will be selected by a procedure that is consistent with U.S. Government procurement requirements. The sulfur content and environmental performance will be equivalent or superior to that specified herein.

In accordance with EPA AP-42, all of the SDGs’ operating hours were assumed to be 500 hr/yr to calculate the PTE. Table 4-9 summarizes the operating data and emission rates for the SDG IC engines.

Table 4-10 summarizes the HAP emissions from the IC engines associated with the SDGs. The emission estimates for EG5 and EG6 are based on AP-42, Table 3.4.1, Section 3.4.

---

#### Table 4-9—Criteria Pollutant Emissions from IC Engines

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<th>Emergency Generator Duty</th>
<th>Main Standby</th>
<th>MDB</th>
<th>Water and Firewater Pump</th>
<th>ECF</th>
<th>Total/Weighted Average</th>
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<td>EG5</td>
<td>EG6</td>
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<td>Number of generators</td>
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<td>1</td>
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<td>750</td>
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<td>0.026</td>
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<tr>
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<td>0.082</td>
<td>0.082</td>
<td>0.360</td>
<td>0.024</td>
</tr>
<tr>
<td>Per Unit Emission Rates, lb/hr</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CO</td>
<td>1.42</td>
<td>5.69</td>
<td>5.69</td>
<td>1.27</td>
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<tr>
<td>NOx</td>
<td>13.30</td>
<td>21.43</td>
<td>21.43</td>
<td>5.91</td>
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<tr>
<td>TSP</td>
<td>0.64</td>
<td>0.67</td>
<td>0.67</td>
<td>0.42</td>
<td></td>
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<tr>
<td>PM&lt;sub&gt;10&lt;/sub&gt;</td>
<td>0.37</td>
<td>0.38</td>
<td>0.38</td>
<td>0.42</td>
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<tr>
<td>SO&lt;sub&gt;2&lt;/sub&gt;</td>
<td>11.90</td>
<td>2.71</td>
<td>2.71</td>
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<tr>
<td>TOC</td>
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<td>0.60</td>
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<tr>
<td>VOC</td>
<td>0.39</td>
<td>0.55</td>
<td>0.55</td>
<td>0.48</td>
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Table 4-9 (Contd)

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<tr>
<th></th>
<th>Manufacturer g/BHP-hr</th>
<th>AP-42 lb/MMBtu</th>
<th>AP-42 lb/MMBtu</th>
<th>AP-42 lb/MMBtu</th>
<th>Total/ Weighted Average</th>
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</thead>
<tbody>
<tr>
<td><strong>Per unit emission rates, tons/yr</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>CO</td>
<td>0.35</td>
<td>1.42</td>
<td>1.42</td>
<td>0.32</td>
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<tr>
<td>NOx</td>
<td>3.32</td>
<td>5.36</td>
<td>5.36</td>
<td>1.48</td>
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<tr>
<td>TSP</td>
<td>0.16</td>
<td>0.17</td>
<td>0.17</td>
<td>0.10</td>
<td></td>
</tr>
<tr>
<td>PM&lt;sub&gt;10&lt;/sub&gt;</td>
<td>0.09</td>
<td>0.10</td>
<td>0.10</td>
<td>0.10</td>
<td></td>
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<tr>
<td>SO&lt;sub&gt;2&lt;/sub&gt;</td>
<td>2.98</td>
<td>0.68</td>
<td>0.68</td>
<td>0.10</td>
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<tr>
<td>TOC</td>
<td>0.11</td>
<td>0.15</td>
<td>0.15</td>
<td>0.12</td>
<td></td>
</tr>
<tr>
<td>VOC</td>
<td>0.10</td>
<td>0.14</td>
<td>0.14</td>
<td>0.12</td>
<td></td>
</tr>
<tr>
<td><strong>Total emission rates, tons/yr</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>CO</td>
<td>1.42</td>
<td>1.42</td>
<td>1.42</td>
<td>0.32</td>
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<td>NOx</td>
<td>13.30</td>
<td>5.36</td>
<td>5.36</td>
<td>1.48</td>
<td>25.49</td>
</tr>
<tr>
<td>TSP</td>
<td>0.64</td>
<td>0.17</td>
<td>0.17</td>
<td>0.10</td>
<td>1.08</td>
</tr>
<tr>
<td>PM&lt;sub&gt;10&lt;/sub&gt;</td>
<td>0.37</td>
<td>0.10</td>
<td>0.10</td>
<td>0.10</td>
<td>0.66</td>
</tr>
<tr>
<td>SO&lt;sub&gt;2&lt;/sub&gt;</td>
<td>11.90</td>
<td>0.68</td>
<td>0.68</td>
<td>0.10</td>
<td>13.35</td>
</tr>
<tr>
<td>TOC</td>
<td>0.43</td>
<td>0.15</td>
<td>0.15</td>
<td>0.12</td>
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<tr>
<td>VOC</td>
<td>0.39</td>
<td>0.14</td>
<td>0.14</td>
<td>0.12</td>
<td>0.79</td>
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Table 4-10—HAP Emissions from IC Engines

<table>
<thead>
<tr>
<th></th>
<th>AP-42 Factor, lb/MMBtu</th>
<th>Emission Rate, lb/hr</th>
<th>Emission Rate, tons/yr</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Large Engines (EG1–EG6)</td>
<td>Main Standby (EG1–EG4)</td>
<td>Water and Firewater Pump (EG6)</td>
</tr>
<tr>
<td>1,3-Butadiene</td>
<td>NA</td>
<td>3.91E-05</td>
<td>0.00E+00</td>
</tr>
<tr>
<td>Acetaldehyde</td>
<td>2.52E-05</td>
<td>7.67E-04</td>
<td>2.97E-03</td>
</tr>
<tr>
<td>Acrolein</td>
<td>7.88E-06</td>
<td>9.25E-05</td>
<td>9.29E-04</td>
</tr>
<tr>
<td>Benzene</td>
<td>7.76E-04</td>
<td>9.33E-04</td>
<td>9.14E-02</td>
</tr>
<tr>
<td>Formaldehyde</td>
<td>7.89E-05</td>
<td>9.30E-03</td>
<td>9.30E-03</td>
</tr>
<tr>
<td>Naphthalene</td>
<td>1.30E-04</td>
<td>8.48E-05</td>
<td>1.53E-02</td>
</tr>
<tr>
<td>Total PAH</td>
<td>2.12E-04</td>
<td>1.68E-04</td>
<td>2.50E-02</td>
</tr>
<tr>
<td>Toluene</td>
<td>2.81E-04</td>
<td>4.09E-04</td>
<td>3.31E-02</td>
</tr>
<tr>
<td>Xylenes</td>
<td>1.93E-04</td>
<td>2.85E-04</td>
<td>2.27E-02</td>
</tr>
<tr>
<td>Total HAPs</td>
<td></td>
<td>2.01E-01</td>
<td>1.14E-02</td>
</tr>
</tbody>
</table>
4.5 Miscellaneous Tanks and Vents

Table 4-2 lists the miscellaneous bulk chemicals storage tanks and vents of the BGCAPP. All tanks (except those for No. 2 fuel oil and IPA) contain aqueous mineral acids and caustics that do not release any regulated substances (Drawing 24915-13-M5-BCS-00001). The IPA tank (Drawing 24915-10-M6-IPA-00001) vent is maintained under 14.9 psig of pressure; therefore, its losses are restricted to filling (working) losses and are vented through the SPB HVAC filters. Appendix A, Tables A-1, A-2, and A-3 present the results of the TANKS calculation for the IPA tank, the No. 2 Fuel oil tanks and the HCl tank, respectively. TANKS is based on the emission estimation procedures in EPA AP-427.

4.6 HAP Emission Summary

Tables 4-5 and 4-8 present the air toxic and HAP emission rates for the boilers and IC engines, respectively. The remaining HAP emission sources are extremely small and do not contribute measurably to the overall HAP emission load produced by the BGCAPP.

---

5 References for Emission Factor Estimates

2. Boiler Natural Gas PM/PM\textsubscript{10}, SO\textsubscript{2}, TOC, and VOC: AP-42, 5th Edition, Table 1.4-2 (7/98).
5. Boiler Natural Gas Metal HAPs (lead only): AP-42, 5th Edition, Table 1.4-2 (7/98).
6. Boiler Distillate Oil CO, NOx, and SO\textsubscript{2}: AP-42, 5th Edition, Table 1.3-1 (9/98).
8. Boiler Distillate Oil PM\textsubscript{10}: AP-42, 5th Edition, Table 1.3-6 (PM\textsubscript{10} fraction 0.5)(9/98).
12. Boiler Distillate Oil Metal HAPs: AP-42, 5th Edition, Table 1.3-10 (9/98).
13. Large IC Engine (EG1–EG4) Distillate Oil CO, NOx, PM, and TOC: Manufacturer data.
15. Large IC Engine (EG5 and EG6 only) Distillate Oil CO, NOx, PM, SO\textsubscript{2}, TOC, and VOC: AP-42, 5th Edition, Table 3.4-1 (10/96).
16. Large IC Engine (EG1–EG6) Distillate Oil PM\textsubscript{10}: AP-42, 5th Edition, Table 3.4-2 (10/96).
17. Large IC Engine (EG1–EG6) Distillate Oil HAPs (except naphthalene and total polycyclic aromatic hydrocarbons [PAHs]): AP-42, 5th Edition, Table 3.4-3 (10/96).
18. Large IC Engine (EG1–EG6) Distillate Oil HAPs (naphthalene and total PAHs only): AP-42, 5th Edition, Table 3.4-3 (10/96).
19. Small IC Engine (ECF generator only) Distillate Oil CO, NOx, PM/P\textsubscript{10}, SO\textsubscript{2}, and TOC/VOC: AP-42, 5th Edition, Table 3.3-1 (10/96).
## Table A-1—IPA Tank

### TANKS 4.0

Emissions Report - Detail Format

Tank Identification and Physical Characteristics

<table>
<thead>
<tr>
<th>Identification</th>
<th>User Identification: BGCAPP 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>City</td>
<td>Richmond</td>
</tr>
<tr>
<td>State</td>
<td>Kentucky</td>
</tr>
<tr>
<td>Company</td>
<td>BGCAPP</td>
</tr>
<tr>
<td>Type of Tank</td>
<td>Vertical Fixed Roof Tank</td>
</tr>
<tr>
<td>Description</td>
<td>33500 GAL TANK</td>
</tr>
</tbody>
</table>

### Tank Dimensions

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Shell Height (ft)</td>
<td>17.00</td>
</tr>
<tr>
<td>Diameter (ft)</td>
<td>20.00</td>
</tr>
<tr>
<td>Liquid Height (ft)</td>
<td>16.81</td>
</tr>
<tr>
<td>Avg. Liquid Height (ft)</td>
<td>16.81</td>
</tr>
<tr>
<td>Volume (gallons)</td>
<td>33,500.00</td>
</tr>
<tr>
<td>Turnovers</td>
<td>23.32</td>
</tr>
<tr>
<td>Net Throughput (gal/yr)</td>
<td>1,000,000.00</td>
</tr>
<tr>
<td>Is Tank Heated (y/n)</td>
<td>N</td>
</tr>
</tbody>
</table>

### Paint Characteristics

| Shell Color/Style:        | Gray/Medium |
| Shell Condition:          | Good        |
| Roof Color/Style:         | Gray/Medium |
| Roof Condition:           | Good        |

### Roof Characteristics

| Type:                     | Cone |
| Height (ft):              | 0.00 |
| Slope (ft/ft) (Cone Roof) | 2.06 |

### Breather Vent Settings

| Vacuum Settings (psig)    | -0.03 |
| Pressure Settings (psig)  | 0.03  |

Meteorological Data used in Emissions Calculations: Louisville, Kentucky (Avg Atmospheric Pressure = 14.5 psia)
### Table A-1 (Contd)

**TANKS 4.0**  
**Emissions Report - Detail Format**  
**Liquid Contents of Storage Tank**

<table>
<thead>
<tr>
<th>Medium/Component</th>
<th>Month</th>
<th>Daily Liquid Sump Temperature (Avg °F)</th>
<th>Liquid Bulk Temp (avg °F)</th>
<th>Vapor Pressure (psia)</th>
<th>Liquid Mol. Weight</th>
<th>Vapor Mol. Weight</th>
<th>Mol.-weight Calculations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leporexol alcohol</td>
<td>All</td>
<td>64.76  54.95  74.55</td>
<td>59.11</td>
<td>0.5095</td>
<td>0.3995</td>
<td>0.9049</td>
<td>62.0600</td>
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</tbody>
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*Vertical Fixed Roof Tank  
Richmond, Kentucky*
## Table A-1 (Contd)

**TANKS 4.0**

**Emissions Report - Detail Format**

**Detail Calculations (AP-42)**

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
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<tbody>
<tr>
<td>Vapor Space Volume (bu ft)</td>
<td>125.1401</td>
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<tr>
<td>Vapor Density (lbm/cu ft)</td>
<td>0.0001</td>
</tr>
<tr>
<td>Vapor Space Expansion Factor</td>
<td>0.0005</td>
</tr>
<tr>
<td>Venting Vapor Saturation Factor</td>
<td>0.0001</td>
</tr>
<tr>
<td>Tank Diameter (ft)</td>
<td>35.0000</td>
</tr>
<tr>
<td>Roof Diameter (ft)</td>
<td>2.0000</td>
</tr>
<tr>
<td>Roof Height (ft)</td>
<td>17.0000</td>
</tr>
<tr>
<td>Average Liquid Height (ft)</td>
<td>15.3100</td>
</tr>
<tr>
<td>Roof Outlet (ft)</td>
<td>2.0003</td>
</tr>
<tr>
<td>Roof Outlet (cone roof)</td>
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</tr>
<tr>
<td>Roof Height (ft)</td>
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</tr>
<tr>
<td>Roof Slope (ft)</td>
<td>0.0025</td>
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<tr>
<td>Shell Radius (ft)</td>
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<tr>
<td>Vapor Density</td>
<td>0.0001</td>
</tr>
<tr>
<td>Vapor Molecular Weight (lbm/lbm)</td>
<td>60.0000</td>
</tr>
<tr>
<td>Vapor Pressure at Daily Average Liquid Surface Temperature (psia)</td>
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</tr>
<tr>
<td>Daily Avg. Liquid Surface Temp (deg F)</td>
<td>62.4490</td>
</tr>
<tr>
<td>Daily Average Ambient Temp (deg F)</td>
<td>59.5320</td>
</tr>
<tr>
<td>Head-Os Constiant</td>
<td>16.721</td>
</tr>
<tr>
<td>Liquid Dk/Temp (deg F)</td>
<td>510.7752</td>
</tr>
<tr>
<td>Tank Paint Solar Absorance (Shell)</td>
<td>0.8900</td>
</tr>
<tr>
<td>Tank Paint Solar Absorance (Roof)</td>
<td>0.8900</td>
</tr>
<tr>
<td>Daily Total Solar Irradiation Factor (Btu/hr/ft²)</td>
<td>1,265.0373</td>
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<tr>
<td>Vapor Space Expansion Factor</td>
<td>0.0005</td>
</tr>
<tr>
<td>Daily Vapor Temperature Range (deg F)</td>
<td>20.2419</td>
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<tr>
<td>Daily Vapor Pressure Range (psia)</td>
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<tr>
<td>Breather Vent Press Setpoint Range (psig)</td>
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<tr>
<td>Vapor Pressure at Daily Maximum Liquid Surface Temperature (psia)</td>
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</tr>
<tr>
<td>Vapor Pressure at Daily Minimum Liquid Surface Temperature (psia)</td>
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<tr>
<td>Vapor Pressure of Daily Maximum Liquid Surface Temperature (psia)</td>
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<tr>
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<td>Daily Max. Liquid Surface Temp (deg F)</td>
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<td>Daily Ambient Temp. Range (deg F)</td>
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<tr>
<td>Venting Vapor Saturation Factor</td>
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<tr>
<td>Vapor Pressure at Daily Average Liquid Surface Temperature (psia)</td>
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<td>Vapor Space Collar (ft)</td>
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<tr>
<td>Working Losses (lb)</td>
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<tr>
<td>Vapor Molecular Weight (lbm/lbm)</td>
<td>60.5900</td>
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<tr>
<td>Vapor Pressure at Daily Average Liquid Surface Temperature (psia)</td>
<td>0.5706</td>
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Table A-1 (Contd)

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<tr>
<td>Emissions Report - Detail Format</td>
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<tr>
<td>Detail Calculations (AP-42)- (Continued)</td>
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</tr>
<tr>
<td>Annual Net Throughput (gals/yr)</td>
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<tr>
<td>Annual Turnover</td>
<td>25.2166</td>
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<tr>
<td>Turnover Factor</td>
<td>1.0000</td>
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<tr>
<td>Maximum Liquid Volume (gall)</td>
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<tr>
<td>Minimum Liquid Weight (g)</td>
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<tr>
<td>Visco-Gravity (1/gal)</td>
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<tr>
<td>Working Liquid Product Factor</td>
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<tr>
<td>Total Losses (gal)</td>
<td>843,757.77</td>
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Table A-1 (Contd)

TANKS 4.0
Emissions Report - Detail Format
Individual Tank Emission Totals

Annual Emissions Report

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<thead>
<tr>
<th>Component</th>
<th>Working Loss</th>
<th>Breathing Loss</th>
<th>Total Emissions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Isopropyl alcohol</td>
<td>516.30</td>
<td>27.40</td>
<td>543.70</td>
</tr>
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</table>
# Table A-2—No. 2 Fuel Oil

## TANKS 4.0

### Emissions Report - Detail Format

**Tank Identification and Physical Characteristics**

<table>
<thead>
<tr>
<th>Identification</th>
<th>Details</th>
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<tbody>
<tr>
<td>User Identification</td>
<td>BGCAPP Diesel tank</td>
</tr>
<tr>
<td>City</td>
<td>Richmond</td>
</tr>
<tr>
<td>State</td>
<td>Kentucky</td>
</tr>
<tr>
<td>Company</td>
<td>BGCAPP</td>
</tr>
<tr>
<td>Type of Tank</td>
<td>Vertical Fixed Roof Tank</td>
</tr>
<tr>
<td>Description</td>
<td>24,620 gal No. 2 Fuel Oil Tank</td>
</tr>
</tbody>
</table>

### Tank Dimensions

<table>
<thead>
<tr>
<th>Measurement</th>
<th>Value</th>
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<tbody>
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<td>Shell Height (ft)</td>
<td>34.63</td>
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<tr>
<td>Diameter (ft)</td>
<td>11.00</td>
</tr>
<tr>
<td>Liquid Height (ft)</td>
<td>34.00</td>
</tr>
<tr>
<td>Avg. Liquid Height (ft)</td>
<td>33.00</td>
</tr>
<tr>
<td>Volume (gallons)</td>
<td>24,620.00</td>
</tr>
<tr>
<td>Turnovers</td>
<td>28.48</td>
</tr>
<tr>
<td>Net Throughput (gal/yr)</td>
<td>700,375.00</td>
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<tr>
<td>Is Tank Heated (y/n)</td>
<td>N</td>
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</tbody>
</table>

### Paint Characteristics

<table>
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<tr>
<th>Characteristic</th>
<th>Value</th>
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</thead>
<tbody>
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<td>Shell Color/Sheen</td>
<td>Gray/Medium</td>
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<tr>
<td>Shell Condition</td>
<td>Good</td>
</tr>
<tr>
<td>Roof Color/Sheen</td>
<td>Gray/Medium</td>
</tr>
<tr>
<td>Roof Condition</td>
<td>Good</td>
</tr>
</tbody>
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### Roof Characteristics

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Value</th>
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</thead>
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<tr>
<td>Type</td>
<td>Cone</td>
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<tr>
<td>Height (ft)</td>
<td>0.00</td>
</tr>
<tr>
<td>Slope (ft/ft) (Cone Roof)</td>
<td>0.06</td>
</tr>
</tbody>
</table>

### Breather Vent Settings

<table>
<thead>
<tr>
<th>Setting</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vacuum Setting (psia)</td>
<td>0.03</td>
</tr>
<tr>
<td>Pressure Setting (psig)</td>
<td>0.03</td>
</tr>
</tbody>
</table>

Meteorological Data used in Emissions Calculations: Louisville, Kentucky (Avg Atmospheric Pressure = 14.5 psia)
Table A-2 (Contd)

TANKS 4.0
Emissions Report - Detail Format
Liquid Contents of Storage Tank

<table>
<thead>
<tr>
<th>Mixture/Component</th>
<th>Month</th>
<th>Daily Liquid Start Temp (Temp. (deg F))</th>
<th>Liquid Bulk Temp (deg F)</th>
<th>Vapor Pressure (psia)</th>
<th>Vapor Mole Fract</th>
<th>Liquid Mass Fract</th>
<th>Mole Weight</th>
<th>Basis for Vapor Pressure Calculations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Distillate fuel oil no. 2</td>
<td>All</td>
<td>84.76</td>
<td>54.35</td>
<td>74.58</td>
<td>59.11</td>
<td>0.0070</td>
<td>0.0025</td>
<td>0.0100</td>
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</tbody>
</table>
### Table A-2 (Contd)

**TANKS 4.0**  
**Emissions Report - Detail Format**  
**Detail Calculations (AP-42)**

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Annual Emission Calculations</td>
<td></td>
</tr>
<tr>
<td>Blending Losses (%)</td>
<td>0.0752</td>
</tr>
<tr>
<td>Vapor Space Volume (cu ft)</td>
<td>405.3885</td>
</tr>
<tr>
<td>Vapor Density (lb/m³)</td>
<td>0.0503</td>
</tr>
<tr>
<td>Vapor Space Expansion Factor</td>
<td>0.0770</td>
</tr>
<tr>
<td>Vapor Total Volume (cu ft)</td>
<td>405.3885</td>
</tr>
<tr>
<td>Tank Vapor Space Volume</td>
<td>151.9865</td>
</tr>
<tr>
<td>Tank Diameter (ft)</td>
<td>11.0000</td>
</tr>
<tr>
<td>Tank Height (ft)</td>
<td>1.7407</td>
</tr>
<tr>
<td>Tank Shell Height (ft)</td>
<td>54.6322</td>
</tr>
<tr>
<td>Average Liquid Height (ft)</td>
<td>32.0000</td>
</tr>
<tr>
<td>Air Outage (%)</td>
<td>0.1146</td>
</tr>
<tr>
<td>Roof Outage (Concrete Roof)</td>
<td></td>
</tr>
<tr>
<td>Roof Outage (%)</td>
<td>0.1146</td>
</tr>
<tr>
<td>Roof Height (ft)</td>
<td>6.0000</td>
</tr>
<tr>
<td>Roof Slope (deg)</td>
<td>0.0625</td>
</tr>
<tr>
<td>Shell Radius (ft)</td>
<td>5.0000</td>
</tr>
<tr>
<td>Vapor Density</td>
<td></td>
</tr>
<tr>
<td>Vapor Density (lb/ft³)</td>
<td>0.0902</td>
</tr>
<tr>
<td>Vapor Mole Volume Weight (lb/m³)</td>
<td>33.9903</td>
</tr>
<tr>
<td>Vapor at Minimum Liquid Surface Temperature (psia)</td>
<td>0.1297</td>
</tr>
<tr>
<td>Daily Avg Liquid/Surface Temp. (deg R)</td>
<td>595.2398</td>
</tr>
<tr>
<td>Daily Average Ambient Temp. (deg R)</td>
<td>56.0392</td>
</tr>
<tr>
<td>Ideal Gas Constant (R)</td>
<td></td>
</tr>
<tr>
<td>Liquid Density (deg R)</td>
<td>15.731</td>
</tr>
<tr>
<td>Liquid Density (deg R)</td>
<td>511.7722</td>
</tr>
<tr>
<td>Vapor Point Saturation (Solid)</td>
<td>0.6569</td>
</tr>
<tr>
<td>Vapor Point Saturation (Solid)</td>
<td>0.6569</td>
</tr>
<tr>
<td>Daily Total Saturation Factor (Solid)</td>
<td>1.380.373</td>
</tr>
<tr>
<td>Vapor Space Expansion Factor</td>
<td>0.0719</td>
</tr>
<tr>
<td>Daily Vapor Temperature Range (deg R)</td>
<td>152.2419</td>
</tr>
<tr>
<td>Daily Vapor Pressure Range (psig)</td>
<td>0.0394</td>
</tr>
<tr>
<td>Weather Wind Pressure (psig)</td>
<td>0.0300</td>
</tr>
<tr>
<td>Vapor Pressure at Daily Average Liquid Surface Temperature (psig)</td>
<td>0.0300</td>
</tr>
<tr>
<td>Vapor Pressure at Daily Minimum Liquid Surface Temperature (psig)</td>
<td>0.0300</td>
</tr>
<tr>
<td>Vapor Pressure at Daily Maximum Liquid Surface Temperature (psig)</td>
<td>0.0300</td>
</tr>
<tr>
<td>Daily Avg Liquid/Surface Temp. (deg R)</td>
<td>595.2398</td>
</tr>
<tr>
<td>Daily Max Liquid/Surface Temp. (deg R)</td>
<td>595.9314</td>
</tr>
<tr>
<td>Daily Min Liquid/Surface Temp. (deg R)</td>
<td>593.2451</td>
</tr>
<tr>
<td>Daily Ambient Temp. Range (deg R)</td>
<td>19.3917</td>
</tr>
<tr>
<td>Ventilated Vapor Saturation Factor</td>
<td></td>
</tr>
<tr>
<td>Ventilated Vapor Saturation Factor</td>
<td>0.0993</td>
</tr>
<tr>
<td>Vapor Pressure at Daily Average Liquid Surface Temperature (psig)</td>
<td>0.0300</td>
</tr>
<tr>
<td>Vapor Pressure at Daily Max Liquid Surface Temperature (psig)</td>
<td>0.0300</td>
</tr>
<tr>
<td>Vapor Space Diameter (ft)</td>
<td>1.7451</td>
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### Table A-2 (Contd)

#### TANKS 4.0

**Emissions Report - Detail Format**

**Detail Calculations (AP-42)- (Continued)**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
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</thead>
<tbody>
<tr>
<td>Working Losses (lb)</td>
<td>16.4196</td>
</tr>
<tr>
<td>Vapor Molecular Weight (lb/mole)</td>
<td>28.0300</td>
</tr>
<tr>
<td>Vapor Pressure at Daily Average Liquid</td>
<td>0.009</td>
</tr>
<tr>
<td>Surface Temperature (°F)</td>
<td>70.0095</td>
</tr>
<tr>
<td>Annual Net Throughput (gpm)</td>
<td>29.4474</td>
</tr>
<tr>
<td>Annual Turnover (g)</td>
<td>1.0000</td>
</tr>
<tr>
<td>Terminal Pressure (psia)</td>
<td>1.0000</td>
</tr>
<tr>
<td>Maximum Liquid Volume (gal)</td>
<td>24,626.0000</td>
</tr>
<tr>
<td>Maximum Liquid Height (ft)</td>
<td>34.0000</td>
</tr>
<tr>
<td>Tank Diameter (ft)</td>
<td>11.0000</td>
</tr>
<tr>
<td>Working/Less Product Factor</td>
<td>1.0000</td>
</tr>
<tr>
<td>Total Losses (lb)</td>
<td>17.1720</td>
</tr>
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</table>
### Table A-2 (Contd)

**TANKS 4.0**

**Emissions Report - Detail Format**

**Individual Tank Emission Totals**

**Annual Emissions Report**

<table>
<thead>
<tr>
<th>Components</th>
<th>Working Loss</th>
<th>Breathing Loss</th>
<th>Total Emissions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Distillate fuel oil no. 2</td>
<td>16.42</td>
<td>0.75</td>
<td>17.17</td>
</tr>
</tbody>
</table>
### Table A-3—Hydrochloric Acid Tank

**Vertical Fixed Roof Tank**
Richmond, Kentucky

#### Tank Identification and Physical Characteristics

<table>
<thead>
<tr>
<th>Identification</th>
<th>User Identification:</th>
<th>BGCAPP 1</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>City:</td>
<td>Richmond</td>
</tr>
<tr>
<td></td>
<td>State:</td>
<td>Kentucky</td>
</tr>
<tr>
<td></td>
<td>Company:</td>
<td>BGCAPP</td>
</tr>
<tr>
<td></td>
<td>Type of Tank:</td>
<td>Vertical Fixed Roof Tank</td>
</tr>
<tr>
<td></td>
<td>Description:</td>
<td>8500 GAL TANK</td>
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</table>

#### Tank Dimensions

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shell Height (ft)</td>
<td>15.00</td>
</tr>
<tr>
<td>Diameter (ft)</td>
<td>10.00</td>
</tr>
<tr>
<td>Liquid Height (ft)</td>
<td>14.47</td>
</tr>
<tr>
<td>Avg. Liquid Height (ft)</td>
<td>14.47</td>
</tr>
<tr>
<td>Volume (gallons)</td>
<td>8,500.00</td>
</tr>
<tr>
<td>Turnovers</td>
<td>25.98</td>
</tr>
<tr>
<td>Net Throughput (gph/yr)</td>
<td>220,704.00</td>
</tr>
<tr>
<td>Is Tank Heated (y/n)</td>
<td>N</td>
</tr>
</tbody>
</table>

#### Paint Characteristics

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shell Color/Shade</td>
<td>Gray/Medium</td>
</tr>
<tr>
<td>Shell Condition</td>
<td>Good</td>
</tr>
<tr>
<td>Roof Color/Shade</td>
<td>Gray/Medium</td>
</tr>
<tr>
<td>Roof Condition</td>
<td>Good</td>
</tr>
</tbody>
</table>

#### Roof Characteristics

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type:</td>
<td>Cone</td>
</tr>
<tr>
<td>Height (ft)</td>
<td>0.00</td>
</tr>
<tr>
<td>Slope (ft/ft) (Cone Roof)</td>
<td>0.06</td>
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#### Breather Vent Settings

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
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</thead>
<tbody>
<tr>
<td>Vacuum Settings (psig)</td>
<td>-0.03</td>
</tr>
<tr>
<td>Pressure Settings (psig)</td>
<td>0.03</td>
</tr>
</tbody>
</table>

Meteorological Data used in Emissions Calculations: Louisville, Kentucky (Avg Atmospheric Pressure = 14.6 psia)
### Table A-3 (Contd)

#### TANKS 4.0

**Emissions Report - Detail Format**

**Liquid Contents of Storage Tank**

<table>
<thead>
<tr>
<th>Material/Component</th>
<th>Month</th>
<th>Daily Liquid Sat. Temperatures (Deg. F)</th>
<th>Liquid Bulk Temp. (Deg. F)</th>
<th>Vapor Pressures (psia)</th>
<th>VaporLiquid Mass Frac</th>
<th>VaporLiquid Mass Frac</th>
<th>VaporLiquid Mass Frac</th>
<th>Vapor Liquid Weight</th>
<th>Vapor Liquid Weight</th>
<th>Base for Vapor Pressure Calculations</th>
</tr>
</thead>
<tbody>
<tr>
<td>HCL AND WATER</td>
<td>All</td>
<td>64.76 54.95 74.58 59.11</td>
<td>0.8608 0.6417 1.1891</td>
<td>31.4770</td>
<td>0.3700 0.6054 0.2218</td>
<td>22.18</td>
<td>36.45</td>
<td>Option 1: VR60 = 2.306 VR70 = 3.287</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HPhosphoric Acid</td>
<td>All</td>
<td>64.76 54.95 74.58 59.11</td>
<td>2.5325 2.1175 3.8219</td>
<td>30.4000</td>
<td>0.3700 0.6054 0.2218</td>
<td>22.18</td>
<td>36.45</td>
<td>Option 2: Avd.:10765, Dvd:1750206, Cvd:235</td>
<td></td>
<td></td>
</tr>
<tr>
<td>WATER</td>
<td>All</td>
<td>64.76 54.95 74.58 59.11</td>
<td>6.5630 6.2135 8.4327</td>
<td>10.0100</td>
<td>0.3700 0.6054 0.2218</td>
<td>22.18</td>
<td>36.45</td>
<td>Option 3: Avd.:10765, Dvd:1750206, Cvd:235</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Table A-3 (Contd)

TANKS 4.0
Emissions Report - Detail Format
Detail Calculations (AP-42)

<table>
<thead>
<tr>
<th>Annual Emission Calculations</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Standoff Losses (Lb)</td>
<td>6,958</td>
</tr>
<tr>
<td>Vapor Space Volume (cu ft)</td>
<td>49,9975</td>
</tr>
<tr>
<td>Vapor Density (lbs/ft^3)</td>
<td>0.0069</td>
</tr>
<tr>
<td>Vapor Space Expansion Factor</td>
<td>0.1105</td>
</tr>
<tr>
<td>Vented Vapor Saturation Factor</td>
<td>0.0115</td>
</tr>
<tr>
<td>Tank Vapor Space Volume</td>
<td>49,9975</td>
</tr>
<tr>
<td>Tank Diameter (ft)</td>
<td>10.0000</td>
</tr>
<tr>
<td>Vapor Space-Outage (ft)</td>
<td>0.4388</td>
</tr>
<tr>
<td>Tank Shell Height (ft)</td>
<td>15.0000</td>
</tr>
<tr>
<td>Average Liquid Weight (ft)</td>
<td>14.4875</td>
</tr>
<tr>
<td>Roof Outage (ft)</td>
<td>0.1643</td>
</tr>
<tr>
<td>Roof Outage (Cone Roof)</td>
<td>0.1642</td>
</tr>
<tr>
<td>Roof Weight (lbs)</td>
<td>0.0030</td>
</tr>
<tr>
<td>Roof Slope (Rad)</td>
<td>0.0035</td>
</tr>
<tr>
<td>Shell Radius (ft)</td>
<td>0.0035</td>
</tr>
<tr>
<td>Vapor Density</td>
<td></td>
</tr>
<tr>
<td>Vapor Density (lbs/ft^3)</td>
<td>0.0069</td>
</tr>
<tr>
<td>Vapor Molecular Weight (lbs/ft^3)</td>
<td>31.4770</td>
</tr>
<tr>
<td>Vapor Pressure at Daily Average Liquid Surface Temperature (psia)</td>
<td>0.8690</td>
</tr>
<tr>
<td>Daily Avg Liquid Surface Temp (deg F)</td>
<td>71.4248</td>
</tr>
<tr>
<td>Daily Average Ambient Temp (deg F)</td>
<td>70.0292</td>
</tr>
<tr>
<td>Ideal Gas Constant (ft^3/psia)</td>
<td>19.7211</td>
</tr>
<tr>
<td>Liquid Basis Temperature (deg C)</td>
<td>510.7372</td>
</tr>
<tr>
<td>Tank Plant Solar Absorbance (Fat):</td>
<td>0.6600</td>
</tr>
<tr>
<td>Tank Plant Solar Absorbance (Roof):</td>
<td>0.6600</td>
</tr>
<tr>
<td>Daily Total Solar Insulation Factor (Btu/ft^2 day)</td>
<td>1,306.0273</td>
</tr>
<tr>
<td>Vapor Space Expansion Factor</td>
<td></td>
</tr>
<tr>
<td>Vapor Space Expansion Factor</td>
<td>0.1105</td>
</tr>
<tr>
<td>Vapor Space Expansion Factor</td>
<td>30.2119</td>
</tr>
<tr>
<td>Daily Vapor Pressure Range (psia)</td>
<td>0.5483</td>
</tr>
<tr>
<td>Steam Vent Pressure Setting Range (psia)</td>
<td>0.0000</td>
</tr>
<tr>
<td>Vapor Pressure at Daily Average Liquid Surface Temperature (psia)</td>
<td>0.8690</td>
</tr>
<tr>
<td>Vapor Pressure at Daily Minimum Liquid Surface Temperature (psia)</td>
<td>0.6417</td>
</tr>
<tr>
<td>Vapor Pressure at Daily Maximum Liquid Surface Temperature (psia)</td>
<td>1.1991</td>
</tr>
<tr>
<td>Daily Avg Liquid Surface Temp (deg F)</td>
<td>526.4346</td>
</tr>
<tr>
<td>Daily Min Liquid Surface Temp (deg F)</td>
<td>515.8261</td>
</tr>
<tr>
<td>Daily Max Liquid Surface Temp (deg F)</td>
<td>536.2411</td>
</tr>
<tr>
<td>Daily Ambient Temp Range (deg F)</td>
<td>19.9177</td>
</tr>
<tr>
<td>Vented Vapor Saturation Factor</td>
<td></td>
</tr>
<tr>
<td>Vented Vapor Saturation Factor</td>
<td>0.9715</td>
</tr>
<tr>
<td>Vapor Pressure at Daily Average Liquid Surface Temperature (psia)</td>
<td>0.8693</td>
</tr>
<tr>
<td>Vapor Space Outage (ft)</td>
<td>0.0066</td>
</tr>
<tr>
<td>Working Losses (Lb)</td>
<td>145.3813</td>
</tr>
<tr>
<td>Vapor Molecular Weight (lbs/ft^3)</td>
<td>35.4770</td>
</tr>
<tr>
<td>Vapor Pressure at Daily Average Liquid Surface Temperature (psia)</td>
<td>0.8693</td>
</tr>
<tr>
<td>Annual Net Throughput (gallons)</td>
<td>320,784,0000</td>
</tr>
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### Table A-3 (Contd)

**TANKS 4.0**  
Emissions Report - Detail Format  
Detail Calculations (AP-42) - (Continued)

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Annual Turnover:</td>
<td>25,9750</td>
</tr>
<tr>
<td>Turnover Factor:</td>
<td>1.0000</td>
</tr>
<tr>
<td>Minimum Liquid Volume (gal)</td>
<td>8,560.0000</td>
</tr>
<tr>
<td>Maximum Liquid Height (ft)</td>
<td>14.4576</td>
</tr>
<tr>
<td>Total Diameter (ft)</td>
<td>10.0000</td>
</tr>
<tr>
<td>Working Level Product Factor</td>
<td>1.0000</td>
</tr>
<tr>
<td>Total Losses (BBL)</td>
<td>153.3060</td>
</tr>
</tbody>
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### Table A-3 (Contd)

#### TANKS 4.0
Emissions Report - Detail Format
Individual Tank Emission Totals

**Annual Emissions Report**

<table>
<thead>
<tr>
<th>Components</th>
<th>Working Loss (lbs)</th>
<th>Breathing Loss (lbs)</th>
<th>Total Emissions (lbs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>HCL AND WATER</td>
<td>142.84</td>
<td>0.08</td>
<td>153.97</td>
</tr>
<tr>
<td>Hydrochloric Acid</td>
<td>121.80</td>
<td>0.05</td>
<td>122.85</td>
</tr>
<tr>
<td>WATER</td>
<td>22.24</td>
<td>1.47</td>
<td>23.72</td>
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Section 9

Process Flow Diagrams
<table>
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<th>PFD/SDN</th>
<th>TITLE</th>
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</thead>
<tbody>
<tr>
<td>24915-00-M5-00-00002</td>
<td>Legend and Symbols for PFD</td>
</tr>
<tr>
<td>24915-00-HK-00-00003</td>
<td>Block Flow Diagram</td>
</tr>
<tr>
<td>24915-07-M5-RHS-00001</td>
<td>MDB Rocket Shear Machine PFD</td>
</tr>
<tr>
<td>24915-07-M5-PHS-00001</td>
<td>MDB Projectile Demilitarization PFD</td>
</tr>
<tr>
<td>24915-07-M5-NCR-00001</td>
<td>MDB Nose Closure Removal System PFD</td>
</tr>
<tr>
<td>24915-07-M5-MWS-00001</td>
<td>MDB Munitions Washout System PFD</td>
</tr>
<tr>
<td>24915-07-M5-ACS-00001</td>
<td>MDB Agent Collection/Toxic Storage PFD</td>
</tr>
<tr>
<td>24915-07-M5-ANS-00001</td>
<td>MDB Agent Neutralization PFD</td>
</tr>
<tr>
<td>24915-07-M5-SDS-00001</td>
<td>MDB Spent Decontamination System PFD</td>
</tr>
<tr>
<td>24915-07-M5-MPT-00001</td>
<td>MDB Metal Parts Treatment PFD</td>
</tr>
<tr>
<td>24915-07-M5-MPTC-00001</td>
<td>MDB MPT Condensate System PFD</td>
</tr>
<tr>
<td>24915-07-M5-OTM-00001</td>
<td>MDB Offgas Treatment MPT PFD</td>
</tr>
<tr>
<td>24915-07-M5-EBH-00001</td>
<td>MDB Energetics Batch Hydrolyzer PFD</td>
</tr>
<tr>
<td>24915-07-M5-ENS-00001</td>
<td>MDB Energetics Neutralization PFD</td>
</tr>
<tr>
<td>24915-07-M5-OTE-00001</td>
<td>MDB Offgas Treatment EBH/ENR PFD</td>
</tr>
<tr>
<td>24915-08-M5-HVAC-00001</td>
<td>Filter Area Cascade System Filter Units HVAC Air Flow Diagram</td>
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<tr>
<td>24915-21-M5-APS-00001</td>
<td>AFB Aluminum Precipitation PFD</td>
</tr>
<tr>
<td>24915-21-M5-AFS-00001</td>
<td>AFB Aluminum Filtration PFD</td>
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<tr>
<td>24915-10-M5-SCWO-00001</td>
<td>SPB SCWO PFD</td>
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<tr>
<td>24915-10-M5-SCWO-00001</td>
<td>SPB SCWO PFD</td>
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<td>24915-10-HK-TWR-00001</td>
<td>SPB Water Recovery – R.O. Unit PFD</td>
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<td>24915-10-HK-TNBE-00001</td>
<td>SPB BRP Evaporator/Crystallizer PFD</td>
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<td>24915-10-HK-TNBC-00001</td>
<td>SPB BRP Brine Concentrator PFD</td>
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<td>24915-07-M5-DWS-00001</td>
<td>MDB DSH Wood Processing Train PFD, Fig 1</td>
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<td>MDB DSH Carbon Processing Train PFD, Fig 2</td>
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<td>24915-11-M5-HSS-00001</td>
<td>HSA Agent Hydrolysate PFD</td>
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<td>24915-11-M5-HSS-00002</td>
<td>HSA Energetics Hydrolysate PFD</td>
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<td>24915-13-M5-BCS-00001</td>
<td>UB Bulk Chemical Storage PFD</td>
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<tr>
<td>24915-10-M6-IPA-00001</td>
<td>IPA Unloading &amp; Distribution</td>
</tr>
</tbody>
</table>
Section 10

Material Safety Data Sheets
List of Material Safety Data Sheets

1. Blister Agent H/HD (Mustard)
2. Lethal Nerve Agent VX
3. Lethal Nerve Agent GB
4. RDX (Cyclonitrite)
5. trinitrotoluene (TNT)
6. tetryl
7. nitroglycerin
8. nitrocellulose
9. diethylphthlate
10. Glycerine Triacetate - triacetin
11. lead azide
12. lead stearate
13. 2-nitrodiphenylamine
14. Sulfuric Acid
15. Hydrochloric Acid
16. Isopropyl Alcohol
17. Sodium Hypochlorite
18. Sodium Hydroxide
Material Safety Data Sheet

Distilled Mustard (HD)

Date: 22 September 1988
Revised: 01 October 2003

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

Section I - General Information

Manufacturer's Address:
U.S. Army Research Development Engineering Command (RDECOM)
Edgewood Chemical Biological Center (ECBC)
ATTN: AMSRD-ECB-GB-CR
Aberdeen Proving Ground, MD 21010-5424

Chemical Name: Bis- (2-chloroethyl) sulfide

Trade name and synonyms:
H; HD; H5
Mustard Gas
Sulfur mustard; Sulphur mustard gas
Sulfide, bis (2-chloroethyl)
Bis (beta-chloroethyl) sulfide
1,1'-thiodithio(2-chloroethane)
1-chloro-2 (beta-chloroethylthio) ethane
Beta, beta'-dichlorodiethyl sulfide
2,2'-dichlorodiethyl sulfide
Di-2-chloroethyl sulfide-beta, beta'-dichloroethyl sulfide
2,2'-dichloroethyl sulfide
EA 1033
Ignot
Kampstoff "Lost", Lost
S-Lost; S-yperite; Schewefel-lost
Senfgas
Yellow Cross Liquid
Yperite; Y

Chemical Family: Chlorinated sulfur compound

Formula/Chemical Structure:
C₄H₄C₁₂S

C₁CH₂CH₂SCH₂CH₂Cl
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): 5.4
Solubility (g/100g solvent): Negligible in water (0.92 @ 22 °C). Soluble in fats and oils, gasoline, kerosene, acetone, carbon tetrachloride, alcohol, tetrachlorothane, ethylbenzoate, and ether. Miscible with the organophosphorus nerve agents.
Specific Gravity (H₂O=1): 1.27 @ 25 °C
Freezing/Melting Point (°C): 13.88
Liquid Density (g/mL): 1.274 g/mL @ 20 °C
1.268 g/mL @ 25 °C
Vapor Pressures (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, and foam. CO₂. Avoid use of extinguishing methods that will cause splashing or
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, fire-fighting personnel should wear full firefighting protective clothing (flame resistant) during chemical agent fire-fighting 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 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 assure 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/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". To date, the Occupational Safety and Health Administration (OSHA) have 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 is a human carcinogen as cited by the International Agency for Research on Cancer (IARC).

Median doses of HD in man are:
LD₅₀ (skin, liquid) = 100 mg/kg
LC₅₀ (skin, vapor) = 2000 mg-min/m³ at 70 - 80 °F (humid environment)
= 1000 mg-min/m³ at 90 °F (dry environment)
LC₅₀ (eyes, vapor) = 200 mg-min/m³
LC₅₀ (inhalation) = 1500 mg-min/m³
LC₅₀ (skin, vapor) = 10,000 mg-min/m³
LD₅₀ (oral) = 0.7 mg/kg

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

Local Actions: HD affects both the eyes and the skin. Eye absorption results in injuries ranging from mild conjunctivitis to corneal necrosis and opacification (blindness). Infection of the ocular lesions is common. Skin absorption results initially in capillary hyperemia and dermal edema, usually followed by vesication. 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 the degree of exposure and individual sensitivity. Tender skin, mucous membrane and perspiration-covered skin is more sensitive to the effects of HD. The skin healing process is very slow. The skin effects of mustard agent are dependent on the concentration of the agent and the environmental conditions: a hot, humid atmosphere promotes the most severe skin reaction.

Systemic Actions: Effects can occur after any exposure with much individual variation. Like other alkylating agents, systemic absorption results in injury to the bone marrow, lymph nodes, and spleen producing leukopenia and thrombocytopenia. Other systemic effects include: fever; CNS depression; bradycardia or cardiac irregularities; hemocoagulation; and shock.

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. HD has also been shown to be mutagenic and
carcinogenic in animals. Prolonged human exposure has been associated with cancer of the tongue, paranasal sinus, larynx, bronchus, lung, and mediastinum (cavity between the right and left lung). Tumors observed have been of squamous (scale-like) or undifferentiated (altered) cell types. Consider the possibility of skin cancer because of the frequency of this lesion in animal studies. Since sulfur mustard (HD) agent is similar in its effects to nitrogen mustard, which has been associated with human leukemia, this disease might also be expected to occur in humans chronically exposed to mustard.

Emergency And First Aid Procedures:

Inhalation: Hold breath until respiratory protective mask is donned. Immediately remove from the HD source. Seek medical attention 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.

Eye Contact: Speed in decontaminating the eyes is absolutely essential. Remove the person from the liquid source immediately; flush the eyes immediately with sterile saline or 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.

Skin Contact: Don respiratory protective mask. Remove the victim from agent sources immediately. Seek medical attention immediately. Immediately remove all contaminated clothing in a clean air environment as quickly as possible. Flush contaminated skin area with warm or hot water, using liquid soap, and copious amounts of the water, apply mild to moderate friction with a single-use sponge or washcloth in the first and second wash (do not use a brush, it may enhance absorption into the skin). Shampoo can be used to wash the hair to prevent vapor off gassing. The final decontamination should be rinses with copious amounts of warm or hot water.

Ingestion: If ingested, directly or from liquid contaminated food or drink, necrosis, diarrhea, GI hemorrhage, nausea and vomiting will be present. 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 390-351 °F (149 -177 °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 at 65 °C. Will corrode steel at a rate of .0001 in. of steel per month at 65 °C.

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

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, Decontamination Agent (DS2), and Super Tropical Bleach Slurry (STB).

**Warning: DO NOT USE PURE SOLID, UNDILUTED CALCIUM HYPOCHLORITE (HTH); it will BURN UPON CONTACT to liquid mustard.

**Recommended Laboratory Procedures:** Use a minimum of 65 grams of 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. Test 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 iodide 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 decontaminated solution, wait two hours and test again for active chlorine. This works for either 5.5% sodium hypochlorite or 10% calcium hypochlorite decontamination solutions. 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 contents according to 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 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 berying 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 wastes according to RCRA regulations and must be disposed of according to those regulations.

**Section VIII - Special Protection Information**

**Respiratory Protection:**

<table>
<thead>
<tr>
<th>Concentration</th>
<th>Respiratory Protective Equipment</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 0.003 mg/m³</td>
<td>M40 protective mask and other air purifying respirator approved by ODAS for chemical agent operations.</td>
</tr>
</tbody>
</table>

| >= 0.003 mg/m³ At an 8-hr TWA | NIOSH/MSHA approved self-contained breathing apparatus or combination airline respirator with an auxiliary self-contained |
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) +/- 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 lpm +/- 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. Decontamination 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, feet, neck, and hands using plenty of soap and water before leaving at the end of the workday.

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 with in a laboratory hood or in double containment system.

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 acrylate acid butyl ester
2-Propenoic acid
Butyl ester
Polymer with ethylen/ benzene
Styrene -butyl acrylate polymer
Acronal 4D
Acronal 290D
Acronal 295D
Acronal 320D
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. Thickener is a 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, and 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.
Material Safety Data Sheet

Lethal Nerve Agent (VX)

Date: 14 September 1988
Revised: 13 August 2003

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

Section 1 - General Information

Manufacturer's Address:
U.S. Army Research Development Engineering Command (RDECOM)
Edgewood Chemical Biological Center (ECBC)
ATTN: AMSRD-ECB-CB-CR
Abbevile Proving Ground, MD 21010-5424

CAS Registry Numbers:
58782-69-9, 51848-47-6, 53800-40-1, 70938-84-0

Chemical Name:
O-ethyl S- [2-(diisopropylamino)ethyl] methylphosphonothiolate

Trade Name And Synonyms:
Phosphonothioic acid, methyl-, S- (2-hexylamino) ethyl 0-ethyl ester
O-ethyl S- (2-diisopropylamino)ethyl methylphosphonothiolate
S-2-Diisopropylaminomethyl O-ethyl methylphosphonothioate
S-2-(2-Diisopropylamino)ethyl O-ethyl methylphosphonothioate
O-ethyl S- (2-diisopropylamino)ethyl methylphosphonothioate
O-ethyl S- (2-diisopropylamino)ethyl methylphosphonothioate
S- (2-diisopropylamino)ethyl O-ethyl methyl phosphonothioate
Ethyl 2-diisopropylaminoethyl methylphosphonothioate
VX
EA 1701
TX69

Chemical Family: Sulfonated organophosphorous compound

Formula/Chemical Structure:
C_{32}H_{54}N_{10}O_{9}P_{5}S
Section II - Ingredients

Ingredients/Name: VX
Percentage by Weight: 100%
Threshold Limit Value (TLV): 0.00001mg/m³

Section III - Physical Data

Boiling Point @ 760 mm Hg: 568 °F (298 °C)
Vapor Pressure: 0.00063 mm Hg @ 25 °C
Vapor Density (Air = 1 STP): 9.2 @ 25 °C
Solubility (g/100g solvent): 5.0 @ 21.5°C and 3.0 @ 25°C in water. Soluble in organic solvents.
Specific Gravity (H₂O=1g/mL): 1.0113 @ 25°C
Freezing/Melting Point (°C): -50°C
Liquid Density (g/mL): 1.0083 @ 25°C
Vapour (mg/m³): 8.9 @ 25°C
Viscosity (CENTISTOKES): 9.98 @ 25°C
Appearance and Odor: Colorless to straw colored liquid and odorless, similar in appearance to motor oil.

Section IV - Fire and Explosion Data

Flashpoint: 159 °C (McCuehan - Young)
Flammability Limits (% By Volume): Not Available

Lower Explosive Limit: Not Applicable

Upper Explosive Limit: Not Applicable

Extinguishing Media: Water mist, fog, 5% NaOH, CO2. Avoid using extinguishing methods that will cause splashing or spreading of the VX.

Special Fire Fighting Procedures: All persons not engaged in extinguishing the fire should be immediately evacuated from the area. Fires involving VX should be contained to prevent contamination to uncontrolled areas. When responding to a fire alarm in buildings or areas containing VX, fire fighting personnel should wear fire retardant protective clothing during chemical agent fire-fighting and rescue operations. Respiratory protection is required. Positive pressure, full-face piece, 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 nerve agents must be avoided at all times. Although the fire may destroy most of the agent, care must still be taken to assure the agent or contaminated liquids do not further contaminate other areas or sewers. Contact with liquid VX or vapors can be fatal.

Unusual Fire And Explosion Hazards: None known.

Section V - Health Hazard Data

Airborne Exposure Limits (AEL): The permissible airborne exposure concentrations for VX for an 8-hour workday and a 40-hour workweek is an 8-hour time weighted average (TWA) of 0.0001 mg/m³. This value can be found in "DA Pam 40-8, Occupational Health Guidelines for the Evaluation and Control of Occupational Exposure to Nerve Agents GA, GB, GD, and VX." To date, however, the Occupational Safety and Health Administration (OSHA) have not promulgated a permissible exposure concentration for VX.

VX is not listed by the International Agency for Research on Cancer (IARC), American Conference of Governmental Industrial Hygienists (ACGIH), Occupational Safety and Health Administration (OSHA), or National Toxicology Program (NTP) as a carcinogen.

Effects Of Overexposure: VX is a lethal cholinesterase inhibitor. Doses which are potentially life-threatening may be only slightly larger than those producing least effects. Death usually occurs within 15 minutes after absorption of a fatal dosage.

<table>
<thead>
<tr>
<th>Route</th>
<th>Form</th>
<th>Effect</th>
<th>Type</th>
<th>Dose</th>
</tr>
</thead>
<tbody>
<tr>
<td>ocular</td>
<td>vapor</td>
<td>nausea</td>
<td>EC50</td>
<td>0.09 mg/min/m³</td>
</tr>
<tr>
<td>inhalation</td>
<td>vapor</td>
<td>severe</td>
<td>IC50</td>
<td>25 mg/min/m³</td>
</tr>
<tr>
<td>(15 min)</td>
<td></td>
<td>incapacitation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>inhalation</td>
<td>vapor</td>
<td>death</td>
<td>LC50</td>
<td>30 mg/min/m³</td>
</tr>
<tr>
<td>(15 min)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>parenteral</td>
<td>liquid</td>
<td>death</td>
<td>LD50</td>
<td>10 mg/70 kg</td>
</tr>
</tbody>
</table>
*Effective dosages for vapor are estimated for exposure durations of 2-10 minutes.

Symptoms of overexposure may occur within minutes or hours, depending upon the dose. Early, mild signs and symptoms of vapor exposure might include: miosis (constriction of pupils) and visual effects (pain behind the eyes, dimness of vision, and/or blurred vision), runny nose and nasal congestion, excessive salivation, and tightness in the chest, with minimal bronchospasm. Moderate nerve agent intoxication may include signs and symptoms of mild exposure, plus an increase in shortness of breath, with coughing, wheezing, or voluminous bronchitis, nausea, vomiting, or diarrhea. Severe nerve agent intoxication may include the central nervous system and multiple organ systems. Severe nerve agent intoxication includes the signs and symptoms of moderate exposure, plus generalized weakness or fasciculations in twitching, loss of consciousness (within seconds), convulsions (within minutes), severe respiratory distress, flaccid paralysis and apnea.

Exposures to liquid permeable nerve agents, such as VX, are slower to develop and slower to reach their peak, compared to vapor exposures of the eyes or respiratory tract. This is because nerve agent uptake across the skin is slower than via inhalation, and continued absorption of agent through the various skin layers can occur, even hours after the skin surface has been decontaminated. Mild signs or symptoms of liquid nerve agent, such as VX, may include localized sweating at the site of exposure, along with fine muscle fasciculations. (Note: Pinpoint pupils [miosis] are not an early sign of liquid skin exposure and may not be present at all in a mild or moderate liquid permeable exposure.) Moderate signs and symptoms may include those of mild vapor exposure, plus nausea, vomiting, and diarrhea; headache; and a feeling of generalized weakness, but no respiratory signs or symptoms. Severe signs and symptoms of liquid nerve agent may include miosis, generalized fasciculation's and twitching, respiratory arrest, unconsciousness, convulsions, flaccid muscle paralysis and apnea.

Emergency and First Aid Procedures:

Inhalation: Leave area of contamination as quickly as possible. Hold breath until respiratory protective mask is donned. Remove clothing in a clean air environment and shampoo or rinse hair to prevent vapor off gassing. If severe signs of agent exposure appear (signs and symptoms of moderate exposure, plus generalized weakness or fasciculations in twitching, loss of consciousness (within seconds), convulsions (within minutes), severe respiratory distress, flaccid paralysis and apnea), immediately administer, in rapid succession, all three sets of the Nerve Agent Antidote Kit (Mark 1) kit contains 2mg atropine and 600mg pralidoxime chloride (2 PAM C) auto-injectors. If experiencing rust or all of the MILD symptoms of nerve agent poisoning, administer one set of the Nerve Agent Antidote Kit (Mark 1), if signs and symptoms are progressing, up to three sets of injections may be administered at 5 to 20 minute intervals. No more than three (3) injector sets will be given unless directed by medical personnel. In addition, a record will be maintained of all injections given. If breathing has stopped, give artificial respiration. Mouth-to-mouth resuscitation should be used when mask or oxygen delivery systems are not available. Do not use mouth-to-mouth resuscitation when facial contamination exists. If breathing is difficult, administer oxygen. Seek medical attention immediately.

Eye Contact: Immediately leave area of contamination and begin flushing eyes with sterile saline or water for 10-15 minutes, then don respiratory protective mask. Although miosis (pinpointing of the pupils) may be an early sign of agent exposure, an injection will not be administered when miosis is the only sign present. Instead, the individual will be taken immediately to a medical treatment facility for observation.

Skin Contact: Don respiratory protective mask and remove contaminated clothing. Immediately wash contaminated skin with copious amounts of liquid soap and warm to hot water. The last wash should be a rinse with copious amounts of warm or hot water. Shampoo can be used to wash the hair. Administer nerve agent antidote kit, Mark I, only if local swelling and muscular twitching symptoms are observed. Seek medical attention immediately.

Ingestion: Do not induce vomiting. First symptoms are likely to be gastrointestinal. Immediately administer Nerve Agent Antidote Kit, Mark I. Seek medical attention immediately. Do not handle vomited material to avoid further contamination.
Section VI - Reactivity Data

Stability: Relatively stable at room temperature. Unstabilized VX of 95% purity decomposes at a rate of 3% a month at 71°C.

Incompatibility: Negligible on brass, steel, and aluminum.

Hazardous Decomposition Products: During a basic hydrolysis of VX up to 10% of the agent is converted to disopropylammonium methylphosphonic acid (EA2192). Based on the concentration of EA2192 expected to be formed during hydrolysis and its toxicity (1.4 mg/kg dermal in rabbit at 24 hours in a 10/90 w/w% ethanol/water solution), a Class B poison would result. The large-scale decontamination procedure, which uses both HTH and NaOH, destroys VX by oxidation and hydrolysis. Typically the large-scale product contains 0.2 - 0.4 w/w% EA2192 at 24 hours. At pH 12, the EA2192 in the large-scale product has a half-life of about 14 days. Thus, the 90-day holding period at pH 12 results in about a 64-fold reduction of EA2192 (six half-lives). This holding period is sufficient to reduce the toxicity of the product below that of a Class B poison. Other less toxic products are ethyl methylphosphonic acid, methylphosphonic acid, disopropylmethylcarbamate, diethyl methylphosphonate, and ethanol. The small-scale decontamination procedure uses sufficient HTH to oxidize all VX thus no EA2192 is formed.

Hazardous Polymerization: Does not occur.

Section VII - Spill, Leak, And Disposal Procedures

Steps To Be Taken In Case Material Is Released Or Spilled: If leaks or spills of VX occur, only personnel in full protective clothing will remain in the area (See Section VIII). In case of personnel contamination see Section V for emergency and first aid instructions.

Recommended Field Procedures (For Quantities Greater Than 50 Grams):

NOTE: These procedures can only be used with the approval of the Risk Manager or qualified safety professionals.

Spills must be contained and covered with vermiculite, diatomaceous earth, clay or fine sand. An alcoholic HTH mixture is prepared by adding 100 milliliters of denatured ethanol to a 900 milliliter volume of 10% HTH in water. This mixture should be made just before use since the HTH can react with the ethanol. Forty grams of alcoholic HTH solution are used for each gram of VX. Agitate the decontamination mixture as the VX is added. Continue the agitation for a minimum of one hour. This reaction is exothermic and evolves substantial off-gassing. The evolved reaction gases should be routed through a decontaminant filled scrubber before release through filtration systems. After completion of the one-hour minimum agitation, 10% sodium hypochlorite is added in a quantity equal to that necessary to assure that a pH of 12.5 is maintained for a period not less than 24 hours. Hold the material at a pH between 10 and 12 for a period not less than 90 days to ensure that a hazardous intermediate material is not formed (See Section VI). Scrape up all material and place in a DOT approved container. Cover the contents with decontaminant solution consisting of an alcoholic HTH mixture of 100 milliliters of denatured ethanol to a 900 milliliter volume of 10% HTH in water. After sealing, decontaminate the exterior container and labeled according to EPA and DOT regulations. All leaking containers will be overpacked with sorbent (e.g. vermiculite) placed between the interior and exterior containers and labeled according to EPA and DOT regulations. Dispose of decontaminant according to Federal, state, and local laws. Conduct general area monitoring to confirm that the atmospheric concentrations do not exceed the airborne exposure limits (See Sections II and VIII).

If the alcoholic HTH mixture is not available then the following decontaminants may be used instead and are listed in the order of preference: Decontaminating Agent (D52), Supertropical Bleach Slurry (STB), and Sodium Hypochlorite.

Recommended Laboratory Procedures (For Quantities Less Than 50 Grams): If the active chlorine of the Calcium Hypochlorite (HTH) at least 55%, then 80 grams of a 10% slurry are required for each gram of VX. Proportionally more HTH is required if the chlorine activity of the HTH is lower than 55% The mixture is agitated as the VX is added and the agitation is maintained for a minimum of one hour. If fuming of the VX occurs solution contains after 5 minutes an amount of denatured ethanol equal to a 10 w/w% of the total agent/decon will be added to help miscibility. Place all material in a DOT approved container and cover the contents with additional
decontaminating solution. After sealing, decontaminate the exterior of the container and label according to EPA and DOT regulations. All leaking containers will be over packed with sorbent placed between the interior and exterior containers and label according to EPA and DOT regulations. Dispose of according to Federal, State, and local laws. Conduct general area monitoring to confirm that the atmospheric concentrations do not exceed the airborne exposure limits (See Sections II and VIII).

**Note:** Ethanold Should Be Reduced To Prevent The Formation Of A Hazardous Waste.
Upon completion of the one hour agitation the decon mixture will be adjusted to a pH between 10 and 11. Conduct general area monitoring to confirm that the atmospheric concentrations do not exceed the airborne exposure limits (See Sections II and VIII).

**Waste Disposal Method:** Open pit burning or burying of VX or items containing or contaminated with VX in any quantity is prohibited. The detoxified VX (using procedures above) can be thermally destroyed by in an EPA approved incinerator according to appropriate provisions of Federal, State and/or local Resource Conservation and Recovery Act (RCRA) regulations.

**Notes:** Some decontamination solutions are hazardous waste according to RCRA regulations and must be disposed of according to those regulations.

### Section VIII - Special Protection Information

<table>
<thead>
<tr>
<th>Concentration</th>
<th>Respiratory Protective Equipment</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;0.00001 mg/m³</td>
<td>A full face piece, chemical canister air-purifying protective mask will be in hand for escape. M40-series masks are acceptable for this purpose. Other masks certified as equivalent may be used.</td>
</tr>
<tr>
<td>&gt;0.00001 or = 0.001 mg/m³</td>
<td>A NIOSH/MSHA approved pressure demand full face piece SCBA or supplied air respirator with escape air cylinder may be used. Alternatively, a full-face piece, chemical canister air-purifying protective mask is acceptable for this purpose. (See DA Pam 358-61 for determination of appropriate level)</td>
</tr>
<tr>
<td>&gt;0.01 mg/m³</td>
<td>NIOSH/MSHA approved pressure demand full face piece SCBA or supplied air respirator with escape air cylinder suitable for use in high agent concentrations with protective ensemble. (See DA Pam 385-61 for examples)</td>
</tr>
</tbody>
</table>

**Ventilation:**

Local exhaust: Mandatory. Must be filtered or exhausted to limit exit concentrations to <0.00001 mg/m³. Air emissions will meet local, state and federal regulations.

Specialties: Chemical laboratory hoods will have an average inward face velocity of 100 linear feet per minute (lfpm) +/- 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 lpfm +/- 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 methods will be used to verify hoods meet the average face velocity requirement.
devices will be performed in assessing the ability of the hood to contain agent VX.

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

Protective Gloves: Butyl Rubber Glove 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, worn 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 VX is the M8/M9 detector paper, detector ticket, M325/M26A1 kit, bubbler, Deput Area Air Monitoring System (DAAMS), Automated Continuous Air Monitoring System (ACAMS), Real-Time Monitor (RTM), Decontamination Chemical Agent Concentrator (DCAC), M3/M43, M5A/M52A1, CAM-M1, Hydrogen Flame Photometric Emission Detector (HYPED), the, Miniature Chemical Agent Monitor (MINICAM), and the Real Time Analytical Platform (RTAP).

Real-time, low-level monitors (with alarm) are required for VX 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 Storage: When handling agents, the buddy system will be incorporated. Smoking, eating, or drinking in areas containing agents is prohibited. Containers should be periodically inspected for leaks, (either visually or using a detector kit). Stringent control over all personnel practice 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 before leaving at the end of the workday with special attention given to hair, face, neck, and hands using plenty of soap and water.

Other Precautions: Agent containers will be stored in a double containment system within a laboratory hood.

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 40-4, Occupational Health Guidelines for the Evaluation and Control of Occupational Exposure to Nerve Agents GA, GB, GD, and VX."

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, organic, n.o.s.

Dot Hazard Class: 6.1, Packing Group I, Hazard Zone A

Dot Label: Poison

Dot Marking: Toxic liquids, organic, n.o.s. (2-ethyl-5-(2-dimethylaminoethyl) methyl phosphonothiolate) 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 is not to be taken as a warranty or representation for which the Department of the Army or ECBC assumes legal responsibility. This information is 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.
Material Safety Data Sheet

Lethal Nerve Agent (GB)

Date: 14 September 1988
Revised: 13 August 2003

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

Section 1 - General Information

Manufacturer's Address:
U.S. Army Research Development Engineering Command (RDECOM)
Edgewood Chemical Biological Center (ECBC)
ATTN: AMSRD-ECB-CB-CR
Aberdeen Proving Ground, MD 21010-5424

CAS Registry Numbers:
107-44-8, 50642-23-4

Chemical Name:
Isopropyl methylphosphonofluoridate

Alternate Chemical Names:
O-Isopropyl Methylphosphonofluoridate
Phosphonofluoridic acid, methyl-, isopropyl ester
Phosphonohtmloridic acid, methyl-, 1-methylethyl ester

Trade Name and Synonyms:
Isopropyl ester of methylphosphonofluoridic acid
Methylisopropoxylfluorophosphine oxide
Isopropyl Methylfluorophosphonate
O-Isopropyl Methylisopropoxyfluorophosphine oxide
Methylfluorophosphonic acid, isopropyl ester
Isopropoxymethylphosphonyl fluoride
Isopropyl methylfluorophosphite
Isopropoxymethylphosphonic fluoride
GB
Sarin
Sarin

Chemical Family: Fluorinated organophosphorous compound

Formula/Chemical Structure:
\[ C_4H_9F\text{O}_2\text{P} \]
Section II - Ingredients

Ingredients/Name: GB
Percentage by Weight: 100%
Threshold Limit Value (TLV): 0.0001 mg/m³

Section III - Physical Data

Boiling Point @ 760 mm Hg: 316 °F (158 °C)
Vapor Pressure (mm Hg): 2.9 @ 25 °C
Vapor Density (Air = 1 STP): 4.83 @ 25 °C
Solubility: Miscible with water. Soluble in all organic solvents.
Specific Gravity (H₂O=1g/mL): 1.0919 @ 25°C
Freezing/Melting Point (°C): -56 °C
Liquid Density (g/cc): 1.0887 @ 25 °C
1.102 @ 20 °C
Vapor Density (mg/m³): 22,000 @ 25 °C
Viscosity (CENTISTOKES): 1.283 @ 25 °C
Appearance and Odor: Colorless liquid. Odorless in pure form.

Section IV - Fire and Explosion Data

Flashpoint: Did not flash to 280 °F (McCutchan - Young)
Flammability Limits (% By Volume): Not Applicable
Lower Explosive Limit: Not Applicable
Upper Explosive Limit: Not Applicable
Extinguishing Media: Water mist, fog, foam, CO₂. Avoid using extinguishing methods that will cause splashing or
spreading of the GB.

**Special Fire Fighting Procedures:** All persons not engaged in extinguishing the fire should be immediately evacuated from the area. Fires involving GB should be contained to prevent contamination to uncontrolled areas. GB will react with steam or water to produce toxic and corrosive vapors. When responding to a fire alarm in buildings or areas containing GB, fire-fighting personnel should wear full firefighting protective clothing during chemical agent firefighting and fire rescue operations. Respiratory protection is required. Positive pressure, full-face piece, 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 flames. Skin contact with nerve agents must be avoided at all times. Although the fire may destroy most of the agent, care must still be taken to assure the agent or contaminated liquids do not further contaminate other areas or sewers. Contact with liquid GB or vapors can be fatal.

**Unusual Fire and Explosion Hazards:** Hydrogen may be present.

### Section V - Health Hazard Data

**Airborne Exposure Limits (AEL):** The permissible airborne exposure concentration for GB for an 8-hour workday of a 40-hour workweek is an 8-hour time weighted average (TWA) of 0.0001 mg/m$^3$. This value can be found in "DA Pam 40-8, Occupational Health Guidelines for the Evaluation and Control of Occupational Exposure to Nerve Agents GA, GB, GD, and VX." To date, however, the Occupational Safety and Health Administration (OSHA) have not promulgated a permissible exposure concentration for GB.

GB is not listed by the International Agency for Research on Cancer (IARC), American Conference of Governmental Industrial Hygienists (ACGIH), Occupational Safety and Health Administration (OSHA), or National Toxicology Program (NTP) as a carcinogen.

**Effects of Overexposure:** GB is a lethal cholinesterase inhibitor. Doses which are potentially life threatening may be only slightly larger than those producing least effects.

<table>
<thead>
<tr>
<th>GB Route</th>
<th>Form</th>
<th>Effect</th>
<th>Type</th>
<th>*Dosage</th>
</tr>
</thead>
<tbody>
<tr>
<td>ocular</td>
<td>vapor</td>
<td>miosis</td>
<td>EC50</td>
<td>≤2 mg-min/m³</td>
</tr>
<tr>
<td>inhalation (15 l/min)</td>
<td>vapor</td>
<td>severe incapacitation</td>
<td>IC50</td>
<td>35 mg-min/m³</td>
</tr>
<tr>
<td>inhalation (15 l/min)</td>
<td>vapor</td>
<td>death</td>
<td>LC50</td>
<td>70 mg-min/m³</td>
</tr>
<tr>
<td>percutaneous</td>
<td>liquid</td>
<td>death</td>
<td>LD50</td>
<td>1700 mg/70 kg man</td>
</tr>
</tbody>
</table>

*Effective dosages for vapor are estimated for exposure durations of 2-10 minutes.

Symptoms of overexposure may occur within minutes to hours, depending upon the dose. Early, mild signs and symptoms of vapor exposure might include: miosis (constriction of pupils) and visual effects (pain behind the eyes, dimness of vision, and/or blurred vision), runny nose and nasal congestion, excessive salivation, and tightness in the chest, with minimal bronchorrhea. Moderate nerve agent intoxication may include signs and symptoms of mild exposure, plus an increase in shortness of breath, with coughing, wheezing, or voluminous bronchorrhea, nausea, vomiting or diarrhea. Severe nerve agent intoxication may include the signs and symptoms of moderate exposure,
plus generalized weakness or fasciculation/switching, loss of consciousness (within seconds), convulsions (within minutes), severe respiratory distress, flaccid paralysis and apnea.

Exposures to liquid percutaneous nerve agents, such as with VX, are slower to develop and slower to reach their peak, compared to vapor exposures of the eyes or respiratory tract. This is because nerve agent uptake across the skin is slower than via inhalation, and continued absorption of agent through the various skin layers can occur, even hours after the skin surface has been decontaminated. Mild signs or symptoms of liquid nerve agent, such as VX, may include localized sweating at the site of exposure, along with fine muscle fasciculation’s. (NOTE: Pinpoint pupils (miosis) are not an early sign of liquid skin exposure and may not be present at all in a mild or moderate liquid percutaneous exposure.) Moderate signs and symptoms may include those of mild vapor exposure, plus nausea, vomiting and/or diarrhea; headache; and a feeling of generalized weakness, but no respiratory signs or symptoms. Severe signs and symptoms of liquid nerve agent may include miosis, generalized fasciculation’s and twitching, respiratory secretions, unconsciousness, convulsions, flaccid muscle paralysis and apnea.

Emergency and First Aid Procedures:

Inhalation:
Leave area of contamination as quickly as possible. Hold breath until respiratory protective mask is donned.

Remove clothing in a clean air environment and shampoo or rinse hair to prevent vapor off passing. If severe signs of agent exposure appear (signs and symptoms of moderate exposure, plus generalized weakness or fasciculation/switching, loss of consciousness (within seconds), convulsions (within minutes), severe respiratory distress, flaccid paralysis and apnea), immediately administer, in rapid succession, all three sets of the Nerve Agent Antidote Kit (Mark I) (Kit contains 2mg atropine and 600mg pralidoxime chloride (2-PAM) auto-injectors). If experiencing most or all of the MILD symptoms of nerve agent poisoning, administer one set of the Nerve Agent Antidote Kit (Mark II); if signs and symptoms are progressing, up to three sets of injections may be administered at 5 to 20 minute intervals; no more than three (3) injector sets will be given unless directed by medical personnel. In addition, a record will be maintained of all injections given. If breathing has stopped, give artificial respiration. Mouth-to-mouth resuscitation should be used when mask-bag or oxygen delivery systems are not available. Do not use mouth-to-mouth resuscitation when facial contamination exists. If breathing is difficult, administer oxygen. Seek medical attention immediately.

Eye Contact: Immediately leave area of contamination and begin flushing eyes with sterile saline or water for 10 minutes, then don respiratory protective mask. Although miosis (pinpointing of the pupils) may be an early sign of agent exposure, an injection will not be administered when miosis is the only sign present. Instead, the individual will be taken immediately to a medical treatment facility for observation.

Skin Contact: Don respiratory protective mask and remove contaminated clothing. Immediately wash contaminated skin with copious amounts of liquid soap and warm to hot water. The last wash should be a rinse with copious amounts of warm or hot water. Shampoo can be used to wash the hair. Administer nerve agent antidote kit, Mark I, only if local sweating and muscular twitching symptoms are observed. Seek medical attention immediately.

Ingestion: Do not induce vomiting. First symptoms are likely to be gastrointestinal. Immediately administer Nerve Agent Antidote Kit, Mark I. Seek medical attention immediately. Do not handle vomited material to avoid further contamination.

Section VI - Reactivity Data

Stability: Stable when pure. Plant grade material stabilized with tri-n-butylamine can be stored in steel containers for long periods of time at temperatures up to 70 °C, but unstabilized material tends to build-up pressure within a few weeks.

Incompatibility: Attacks tin, magnesium, cadmium-plated steel, and some aluminum. Slightly attacks copper, brass, and lead; practically no attack on 1020 steels, Inconel & K-monet.
Hazardous Decomposition Products: Hydrolyzes to form HF under acid conditions and isopropyl alcohol and polymers under basic conditions.

Hazardous Polymerization: Does not occur.

Section VII - Spill, Leak, And Disposal Procedures

Steps To Be Taken In Case Material Is Released Or Spilled: If leaks or spills of GB occur, only personnel in full protective clothing will remain in the area (See Section VIII). In case of personnel contamination see Section V for emergency and first aid instructions.

Recommended Field Procedures: NOTE: These procedures can only be used with the approval of the Risk Manager or qualified safety professionals. Spills must be contained by covering with vermiculite, diatomaceous earth, clay, fine sand, sponges, and paper or cloth towels. Decontaminate with copious amounts of aqueous sodium hydroxide solution (a minimum 10 wt.%). Scoop up all material and place in a DOT approved container. Cover the contents with decontaminating solution consisting of aqueous sodium hydroxide solution (a minimum 10 wt.%).

After sealing, decontaminate the exterior container 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 decontaminate according to Federal, state, and local laws. Conduct general area monitoring to confirm that the atmospheric concentrations do not exceed the airborne exposure limits (See Sections II and VIII).

If 10 wt.% aqueous sodium hydroxide is not available then the following decontaminants may be used instead and are listed in the order of preference: Decontaminating Agent (DS2), Sodium Carbonate, and Super tropical Bleach Sherry (STB)

Recommended Laboratory Procedures: A minimum of 56 grams of decon solution is required for each gram of GB. Decontaminant and agent solution is allowed to agitate for a minimum of one hour. Agitation is not necessary following the first hour. At the end of one hour, the resulting solution should be adjusted to a pH greater than 11.5. If the pH is below 11.5 NaOH should be added until the pH above 11.5 can be maintained for 30 minutes. An alternate solution for the decontamination of GB is 10 wt.% sodium carbonate in place of the 10% sodium hydroxide solution above. Continue with 56 grams of decon for each gram of agent. Agitate for one hour but allow three hours for the reaction. The final pH should be adjusted to above zero. It is also permitted to substitute 5.25% sodium hypochlorite or 25 wt.% Monoethylamine (MEA) for the 10% sodium hydroxide solution. MEA must be completely dissolved in water before addition of the agent. Continue with 56 grams of decon for each gram of GB and provide agitation for one hour. Continue with same rates and time stipulations. Scoop up all material and clothing. Place all material in a DOT approved container. Cover the contents with decontaminating solution as above. After sealing, decontaminate the exterior of the container and label according to EPA and DOT regulations.

All leaking containers will be over packed with sorbent placed between the interior and exterior containers. Decontaminate and label according to EPA and DOT regulations. Dispose of decontaminate according to Federal, State, and local laws. Conduct general area monitoring to confirm that the atmospheric concentrations do not exceed the airborne exposure limits (See Sections II and VIII).

Waste Disposal Method: Open pit burning or burying of GB or items containing or contaminated with GB in any quantity is prohibited. The detoxified GB (using procedures above) can be thermally destroyed by incineration in EPA approved incinerators according to appropriate provisions of Federal, state and local Resource Conservation and Recovery Act (RCRA) Regulations.

Note: Some decontaminant solutions are hazardous wastes according to RCRA regulations and must be disposed of according to those regulations.
Section VIII - Special Protection Information

<table>
<thead>
<tr>
<th>Concentration</th>
<th>Respiratory Protective Equipment</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;0.0001 mg/m³</td>
<td>A full face piece, chemical canister air-purifying protective mask will be on hand for escape. M40-series masks are acceptable for this purpose. Other masks certified as equivalent may be used.</td>
</tr>
<tr>
<td>&gt;0.0001 or = 0.2 mg/m³</td>
<td>A NIOSH/MSHA approved pressure demand full face piece SCBA or supplied air respirators with escape air cylinder may be used. Alternatively, a full-face piece, chemical canister air-purifying protective mask is acceptable for this purpose. (See DA Pam 385-61 for determination of appropriate level.)</td>
</tr>
<tr>
<td>&gt;0.2 mg/m³</td>
<td>NIOSH/MSHA approved pressure demand full face piece SCBA or supplied air respirators with escape air cylinder suitable for use in high agent concentrations. (See DA Pam 385-61 for examples)</td>
</tr>
</tbody>
</table>

Ventilation:

Local exhaust: Mandatory. Must be filtered or scrubbed to limit exit concentrations to < 0.0001 mg/m³. Air emissions will meet local, state and federal regulations.

Special: Chemical laboratory hoods will have an average inward face velocity of 100 linear feet per minute (lfpm) +/- 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 +/- 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 GB.

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

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

Eye Protection: At 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 GB is the M8/M9 detector paper, detector ticket, M256/M256A1 kits, bubbler, Depot Area Air Monitoring System (DAAMS), Automated Continuous Air Monitoring System (ACAMS), Real-Time Monitor (RTM), Demilitarization Chemical Agent Concentrator (DCAC), M8/M43, M8A1/M43A1, CAM-M1, Hydrogen Flame Photometric Emission Detector (HYFED), the Miniature Chemical Agent Monitor (MINICAM), and the Real Time Analytical Platform (RTAP).
Real-time, low-level monitors (with alarm) are required for GB 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 workday.

Other Precautions: Agent containers will be stored in a single containment system within a laboratory hood or in a double containment system.


**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, organic, n.o.s.

Dot Hazard Class: 6.1, Packing Group I, Hazard Zone A

Dot Label: Poison

Dot Marking:
Toxic liquids, organic, n.o.s. (Isopropyl methylphosphonofluoridate) 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.

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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.
Material Safety Data Sheets

Division of Facilities Services

DOD Hazardous Material Information (ANSI Format)
For Cornell University Convenience Only

RDX(CYCLONITE)

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Section 1 - Product and Company Identification
RDX(CYCLONITE)

Product Identification: RDX(CYCLONITE)
Date of MSDS: 01/01/1985 Technical Review Date: 01/05/1982
FSC: 6850 NIIN: LIIN: 00D000069
Submitter: D DG
Status Code: C
MFN: 01
Article: N
Kit Part: N

file://E:\Environmental\MSDSs\MSDS%20Text%20&%20HTML%20Files\RDX(CYCLONITE) 12/19/2003
Manufacturer's Information

Manufacturer's Name: CONSOLIDATED CONTROLS CORP.
Manufacturer's Address1:
Manufacturer's Address2: N/P, NK 00000
Manufacturer's Country: NK
General Information Telephone:
Emergency Telephone: 213-772-5301
Emergency Telephone: 213-772-5301
MSDS Preparer's Name: N/P
Proprietary: N
Reviewed: Y
Published: Y
CAGE: 09790
Special Project Code: N

Contractor Information

Contractor's Name: CONSOLIDATED CONTROLS CORPORATION
Contractor's Address1: UNKNOWN
Contractor's Address2: UNKNOWN, NK 00000
Contractor's Telephone: UNKNOWN
Contractor's CAGE: 09790

Section 2 - Composition/Information on Ingredients

Ingredient Name: CYCLONITE
Ingredient CAS Number: 121-82-4 Ingredient CAS Code: M
RTECS Number: XY9450000 RTECS Code: M
=WT: =WT Code:
>WT: >WT Code:
>Volume: >Volume Code:
<WT: <WT Code:
<Volume: <Volume Code:
% Low WT: % Low WT Code:
% High WT: % High WT Code:
% Low Volume: % Low Volume Code:
% High Volume: % High Volume Code:
% Text: 100.
% Environmental Weight:
Other REC Limits: N/P
OSHA PEL: S, 1.5 MG/M3 OSHA PEL Code: M
OSHA STEL: OSHA STEL Code:
ACGIH TLV: S, 1.5MG/M3; 9192 ACGIH TLV Code: M
ACGIH STEL: N/P ACGIH STEL Code:
EPA Reporting Quantity:
DOT Reporting Quantity:
Ozone Depleting Chemical: N

file://E:\Environmental\MSDSs\MSDS%20Text%20&%20HTML%20Files\RDX(CYCLONITE)  12/19/2003
Section 3 - Hazards Identification, Including Emergency Overview

RDX(CYCLONITE)

Health Hazards Acute & Chronic: N/P

Signs & Symptoms of Overexposure:
N/A

Medical Conditions Aggravated by Exposure:
N/P

LD50 LC50 Mixture: N/P

Route of Entry Indicators:
- Inhalation: N/P
- Skin: N/P
- Ingestion: N/P

Carcinogenicity Indicators
- NTP: N/P
- IARC: N/P
- OSHA: N/P

Carcinogenicity Explanation: N/P

Section 4 - First Aid Measures

RDX(CYCLONITE)

First Aid:
N/A

Section 5 - Fire Fighting Measures

RDX(CYCLONITE)

Fire Fighting Procedures:
- ISOLATION

Unusual Fire or Explosion Hazard:
N/A

Extinguishing Media:
N/A

Flash Point: Flash Point Text: N/A

Autoignition Temperature:
- Autoignition Temperature Text: N/A
- Lower Limit(s): 400°F
- Upper Limit(s): N/A

Section 6 - Accidental Release Measures

RDX(CYCLONITE)
Spill Release Procedures:
NO

Section 7 - Handling and Storage
RDX(CYCLONITE)

Handling and Storage Precautions:

Other Precautions:

Section 8 - Exposure Controls & Personal Protection
RDX(CYCLONITE)

Respiratory Protection:
N/A
Ventilation:
N/P
Protective Gloves:
N/P
Eye Protection: N/P
Other Protective Equipment: N/P
Work Hygienic Practices: N/P
Supplemental Health & Safety Information: ITEM IS A 1.5 GRAM EXPLOSIVE IS CONTAINED IN AN ASSEMBLY P/N 200WSS-6

Section 9 - Physical & Chemical Properties
RDX(CYCLONITE)

HCC: E2
NRC/State License Number:
Net Property Weight for Ammo:
Boiling Point: Boiling Point Text: N/A
Melting/Freezing Point: Melting/Freezing Text: N/A
Decomposition Point: Decomposition Text: N/A
Vapor Pressure: N Vapor Density: N/A
Percent Volatile Organic Content:
Specific Gravity: N/A
Volatile Organic Content Pounds per Gallon:
pH: N/P
Volatile Organic Content Grams per Liter:
Viscosity: N/P
Evaporation Weight and Reference: N/A
Solubility in Water: N/A
Appearance and Odor: SOLID 1.5 GM EXPLOSIVE
Percent Volatiles by Volume: N/A
Corrosion Rate: N/P

Section 10 - Stability & Reactivity Data
RDX(CYCLONITE)
Stability Indicator: YES
Materials to Avoid:
N/A
Stability Condition to Avoid:
UNIT CAN ONLY BE IGNITED BY APPLICATION OF 4 AMPS DC TO CIRS
Hazardous Decomposition Products:
N/A
Hazardous Polymerization Indicator: NO
Conditions to Avoid Polymerization:
NONE

Section 11 - Toxicological Information
RDX(CYCLONITE)

Toxicological Information:
N/P

Section 12 - Ecological Information
RDX(CYCLONITE)

Ecological Information:
N/P

Section 13 - Disposal Considerations
RDX(CYCLONITE)

Waste Disposal Methods:
N/A

Section 14 - MSDS Transport Information
RDX(CYCLONITE)

Transport Information:
N/P

Section 15 - Regulatory Information
RDX(CYCLONITE)

SARA Title III Information:
N/P
Federal Regulatory Information:
N/P
State Regulatory Information:
N/P

Section 16 - Other Information
RDX(CYCLONITE)

Other Information:
N/P

HMIS Transportation Information

Product Identification: RDX(CYCLONITE)
Transporation ID Number: 435
Responsible Party CAGE: 09790
Date MSDS Prepared: 01/01/1985
Date MSDS Reviewed: 01/05/1982
MFN: 01/05/1982
Submitter: D DG
Status Code: C

Container Information
   Unit of Issue: NK
   Container Quantity: NK
   Type of Container:
   Net Unit Weight:

Article without MSDS: N
Technical Entry NOS Shipping Number: NOT ACCEPTABLE FOR SHIPMENT
Radioactivity:
Form:
Net Explosive Weight:
Coast Guard Ammunition Code:
Magnetism: N/P
AF MMAC Code:
DOD Exemption Number:
Limited Quantity Indicator:
Multiple Kit Number: 0
Kit Indicator: N
Kit Part Indicator: N
Review Indicator: Y
Additional Data:

Department of Transportation Information
DOT Proper Shipping Name: CYCLOTRIMETHYLENENITRAMINE, WETTED OR CYCLONITE, WETTED OR HEXOGEN, WETTED OR RDX, WETTED
DOT PSN Code: EET
Symbols:
DOT PSN Modifier: WITH NOT LESS THAN 15 PER CENT WATER BY MASS.
Hazard Class: 1.1D
UN ID Number: UN0072
DOT Packaging Group: II
Label: EXPLOSIVE 1.1D
Special Provision(s):
Packaging Exception:
Non Bulk Packaging: 62
Bulk Packaging: NONE
Maximum Quantity in Passenger Area: FORBIDDEN
Maximum Quantity in Cargo Area: FORBIDDEN
Stow in Vessel Requirements: B
Requirements Water/Sp/Other: 1E,5E
IMO Detail Information
IMO Proper Shipping Name: CYCLONITE, WETTED
IMO PSN Code: EYX
IMO PSN Modifier: WITH NOT LESS THAN 15% WATER, BY MASS
IMDG Page Number: 1106
UN Number: 0072
UN Hazard Class: 1.1 D
IMO Packaging Group: 
Subsidiary Risk Label: 
EMS Number: 1-01
Medical First Aid Guide Number: 235

IATA Detail Information
IATA Proper Shipping Name: FORBIDDEN BY THIS MODE OF TRANSPORTATION
IATA PSN Code: ZZY
IATA PSN Modifier: 
IATA UN Id Number: N/R
IATA UN Class: N/R
Subsidiary Risk Class: N/R
UN Packaging Group: N/R
IATA Label: N/R
Packaging Note for Passengers: N/R
Maximum Quantity for Passengers: N/R
Packaging Note for Cargo: N/R
Maximum Quantity for Cargo: N/R
Exceptions: N/R

AFI Detail Information
AFI Proper Shipping Name: CYCLOTRIMETHYLENETRINITRAMINE, CYCLONITE, HEXOGEN, RDX, WETTED
AFI Symbols:
AFI PSN Code: IBK
AFI PSN Modifier: WITH NOT LESS THAN 15% WATER, BY MASS
AFI UN Id Number: UN0072
AFI Hazard Class: 1.1D
AFI Packing Group: II
AFI Label:
Special Provisions: P4
Back Pack Reference: A5.37

HAZCOM Label Information
Product Identification: RDX(CYCLONITE)
CAGE: 09790
Assigned Individual: N
Company Name: CONSOLIDATED CONTROLS CORPORATION
Company PO Box:
Company Street Address: 1
Company Street Address2: UNKNOWN, NK 00000 NK
Health Emergency Telephone: 213-772-5301
Label Required Indicator: Y
Date Label Reviewed: 12/16/1998
Status Code: C
Manufacturer's Label Number:
Date of Label: 12/16/1998
Year Procured: N/K
Organization Code: G
Chronic Hazard Indicator: N/P
Eye Protection Indicator: N/P
Skin Protection Indicator: N/P
Respiratory Protection Indicator: N/P
Signal Word: N/P
Health Hazard:
Contact Hazard:
Fire Hazard:
Reactivity Hazard:

8/8/2002 7:16:49 AM
Chronic Hazard Indicator: N/P
Eye Protection Indicator: N/P
Skin Protection Indicator: N/P
Respiratory Protection Indicator: N/P
Signal Word: N/P
Health Hazard:
Contact Hazard:
Fire Hazard:
Reactivity Hazard:

8/8/2002 7:16:49 AM
## DOD Hazardous Material Information (ANSI Format)
For Cornell University Convenience Only

### TRINITROTOLUENE (TNT) TYPE 1 FLAKE FORM

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**Section 1 - Product and Company Identification**

**TRINITROTOLUENE (TNT) TYPE 1 FLAKE FORM**

*Product Identification: TRINITROTOLUENE (TNT) TYPE 1 FLAKE FORM*

*Date of MSDS: 07/02/1991 Technical Review Date: 09/10/1991*

*FSC: 1376 NIIN: LII: 00N018210*

*Submitter: N EN*

*Status Code: C*

*MFN: 01*

*Article: N*

*Kit Part: N*

12/19/2003
Manufacturer's Information

Manufacturer's Name: HERCULES INCORPORATED
Manufacturer's Address1: RADFORD ARMY AMMUNITION PLANT
Manufacturer's Address2: RADFORD, VA 24141
Manufacturer's Country: US
General Information Telephone: 703-639-7294
Emergency Telephone: 703-639-7294
Emergency Telephone: 703-639-7294
MSDS Preparer's Name: N/P
Proprietary: N
Reviewed: N
Published: Y
CAGE: 2D295
Special Project Code: N

Contractor Information

Contractor's Name: HERCULES INC
Contractor's Address1: RADFORD ARMY AMMUNITION PLANT
Contractor's Address2: RADFORD, VA 24141
Contractor's Telephone: 703-639-7294
Contractor's CAGE: 2D881

Contractor Information

Contractor's Name: HERCULES INCORPORATED
Post Office Box: N/K
Contractor's Address1: 84 5TH AVE
Contractor's Address2: NEW YORK, NY 10011-7603
Contractor's Telephone: UNKNOWN
Contractor's CAGE: 2D295

Section 2 - Composition/Information on Ingredients

TRINITROTOLUENE (TNT) TYPE 1 FLAKE FORM

Ingredient Name: 2,4,6-TRINITROTOLUENE (TNT)
Ingredient CAS Number: 118-96-7 Ingredient CAS Code: M
RTECS Number: XU0175000 RTECS Code: M
=WT: =WT Code:
=Volume: =Volume Code:
>WT: >WT Code:
>Volume: >Volume Code:
<WT: <WT Code:
<Volume: <Volume Code:
% Low WT: % Low WT Code:
% High WT: % High WT Code:
% Low Volume: % Low Volume Code:
% High Volume: % High Volume Code:
% Text: 99
% Environmental Weight:
Other REC Limits: N/K
OSHA PEL: S, 1.5 MG/M3 OSHA PEL Code: M
OSHA STEL: OSHA STEL Code:
ACGIH TLV: S, 0.5 MG/M3; 9293 ACGIH TLV Code: M
ACGIH STEL: N/P ACGIH STEL Code:
EPA Reporting Quantity:
DOT Reporting Quantity:
Ozone Depleting Chemical: N

Section 3 - Hazards Identification, Including Emergency Overview
TRINITROTOLUENE (TNT) TYPE 1 FLAKE FORM

Health Hazards Acute & Chronic: ALLERGENIC, CAN CAUSE DERMATITIS. DISCOLOR SKIN
AND HAIR PALE YELLOW. CAUSES NAUSEA, VOMITING AND ANOREXIA ALSO LIVER
AND BLOOD DAMAGE, AND APLASTIC ANEMIA.

Signs & Symptoms of Overexposure:
SEE HEALTH HAZARDS.

Medical Conditions Aggravated by Exposure:
NONE SPECIFIED BY MANUFACTURER.

LD50 LC50 Mixture: NONE SPECIFIED BY MANUFACTURER.

Route of Entry Indicators:
Inhalation: YES
Skin: NO
Ingestion: NO

Carcinogenicity Indicators
NTP: NO
IARC: NO
OSHA: NO

Carcinogenicity Explanation: NOT RELEVANT.

Section 4 - First Aid Measures
TRINITROTOLUENE (TNT) TYPE 1 FLAKE FORM

First Aid:
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 RUN NING WATER.
INHAL.: REMOVE TO FRESH AIR. TREAT ANY IRRITATION SYMPTOMATICALLY. CALL
MD. INGEST.:CALL MD IMMEDIATELY (FP N).

Section 5 - Fire Fighting Measures
TRINITROTOLUENE (TNT) TYPE 1 FLAKE FORM

Fire Fighting Procedures:
WEAR NIOSH/MSHA APPROVED SCBA AND FULL PROTECTIVE EQUIPMENT (FP N). EVACUATE THE AREA.

Unusual Fire or Explosion Hazard:
HIGHLY DANGEROUS-SHOCK WILL EXPLODE IT. WILL DETONATE IF CONFINED AND EXPOSED TO EXTREME HEAT.

Extinguishing Media:
DELUGE WITH WATER-USE LARGE QUANTITIES.

Flash Point: Flash Point Text: EXPLODES

Autoignition Temperature:
Autoignition Temperature Text: N/A
Lower Limit(s): N/A
Upper Limit(s): N/A

Section 6 - Accidental Release Measures
TRINITROTOLUENE (TNT) TYPE 1 FLAKE FORM

Spill Release Procedures:
CLEAN UP SPILL IMMEDIATELY USING A SOFT BRISTLE BRUSH AND A CONDUCTIVE RUBBER OR PLASTIC SHOVEL.

Section 7 - Handling and Storage
TRINITROTOLUENE (TNT) TYPE 1 FLAKE FORM

Handling and Storage Precautions:

Other Precautions:

Section 8 - Exposure Controls & Personal Protection
TRINITROTOLUENE (TNT) TYPE 1 FLAKE FORM

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.

Supplemental Health & Safety Information: NONE SPECIFIED BY MANUFACTURER.

Section 9 - Physical & Chemical Properties
TRINITROTOLUENE (TNT) TYPE 1 FLAKE FORM

HCC: E1
NRC/State License Number:
Net Property Weight for Ammo:
Boiling Point: Boiling Point Text: 464F, 240C
Melting/Freezing Point: Melting/Freezing Text: N/K
Decomposition Point: Decomposition Text: N/K
Vapor Pressure: N/K Vapor Density: N/A
Percent Volatile Organic Content:
Specific Gravity: 1.5-1.6
Volatile Organic Content Pounds per Gallon:
pH: N/K
Volatile Organic Content Grams per Liter:
Viscosity: N/P
Evaporation Weight and Reference: NOT APPLICABLE
Solubility in Water: 0.01% @ 25C
Appearance and Odor: FLAKES, PALE YELLOW IN COLOR.
Percent Volatiles by Volume: <0.1
Corrosion Rate: N/K

Section 10 - Stability & Reactivity Data
TRINITROTOLUENE (TNT) TYPE 1 FLAKE FORM

Stability Indicator: YES
Materials to Avoid:
SODIUM HYDROXIDE, POTASSIUM HYDROXIDE AND OTHER HIGHLY ALKALINE
MATERIALS.
Stability Condition to Avoid:
AVOID CONTACT WITH ALKALINE MATERIALS. WILL DETONATE IF CONTAINED AND
EXPOSED TO EXTREME HEAT.
Hazardous Decomposition Products:
NOX.
Hazardous Polymerization Indicator: NO
Conditions to Avoid Polymerization:
NOT RELEVANT.

Section 11 - Toxicological Information
TRINITROTOLUENE (TNT) TYPE 1 FLAKE FORM

Toxicological Information:
N/P

Section 12 - Ecological Information
TRINITROTOLUENE (TNT) TYPE 1 FLAKE FORM

Ecological Information:
N/P

Section 13 - Disposal Considerations
TRINITROTOLUENE (TNT) TYPE 1 FLAKE FORM

Waste Disposal Methods:
BURN ON OPEN BURNING GROUND IN ACCORDANCE WITH STATE AND LOCAL
REGULATIONS. MAY ALSO BE BURNT IN AN INCINERATOR APPROVED FOR
EXPLOSIVES. DISPOSE OF IN ACCORDANCE WITH FEDERAL, STATE AND LOCAL
REGULATIONS (FP N).

Section 14 - MSDS Transport Information

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TRINITROTOLUENE (TNT) TYPE 1 FLAKE FORM

Section 15 - Regulatory Information

SARA Title III Information:
N/P
Federal Regulatory Information:
N/P
State Regulatory Information:
N/P

Section 16 - Other Information

Other Information:
N/P

HMIS Transportation Information
Product Identification: TRINITROTOLUENE (TNT) TYPE 1 FLAKE FORM
Transportation ID Number: 22878
Responsible Party CAGE: 2D295
Date MSDS Prepared: 07/02/1991
Date MSDS Reviewed: 10/21/1991
MFN: 10/21/1991
Submitter: N TN
Status Code: C

Container Information
Unit of Issue: NK
Container Quantity: NK
Type of Container:
Net Unit Weight:

Article without MSDS: N
Technical Entry NOS Shipping Number:
Radioactivity:
Form:
Net Explosive Weight:
Coast Guard Ammunition Code:
Magnetism: N/P
AF MMAC Code:
DOD Exemption Number:
Limited Quantity Indicator:
Multiple Kit Number: 0
Kit Indicator: N
Kit Part Indicator: N
Review Indicator: Y
Additional Data:
Department of Transportation Information

DOT Proper Shipping Name: CYCLOTETRAMETHYLENETETRANITRAMINE, WETTED OR HMX, WETTED OR OCTOGEN, WETTED
DOT PSN Code: EEL
Symbols:
DOT PSN Modifier: WITH NOT LESS THAN 15 PER CENT WATER, BY MASS
Hazard Class: 1.1D
UN ID Number: UN0226
DOT Packaging Group: II
Label: EXPLOSIVE 1.1D
Special Provision(s):
Packaging Exception:
Non Bulk Packaging: 62
Bulk Packaging: NONE
Maximum Quantity in Passenger Area: FORBIDDEN
Maximum Quantity in Cargo Area: FORBIDDEN
Stow in Vessel Requirements: B
Requirements Water/Sp/Other: 1E,5E

IMO Detail Information

IMO Proper Shipping Name: TRINITROTOLUENE
IMO PSN Code: PBV
IMO PSN Modifier: DRY OR WETTET WITH LESS THAN 30% WATER, BY MASS
IMDG Page Number: 1144
UN Number: 0209
UN Hazard Class: 1.1 D
IMO Packaging Group: -
Subsidiary Risk Label: -
EMS Number: 1-01
Medical First Aid Guide Number: *

IATA Detail Information

IATA Proper Shipping Name: N/A
IATA PSN Code: YYG
IATA PSN Modifier: TRINITROTOLUENE, DRY OR WETTED WITH LESS THAN 30% WATER, BY WEIGHT
IATA UN Id Number: 0209
IATA UN Class: 1.1D
Subsidiary Risk Class: -
UN Packaging Group: -
IATA Label:
Packaging Note for Passengers: FORB
Maximum Quantity for Passengers: FORB
Packaging Note for Cargo: FORB
Maximum Quantity for Cargo: FORB
Exceptions:

AFI Detail Information

AFI Proper Shipping Name: TETRAHYDROFURAN
AFI Symbols:
AFI PSN Code: XSI
AFI PSN Modifier:
AFI UN Id Number: UN2056
AFI Hazard Class: 3
AFI Packing Group: II
AFI Label: 
Special Provisions: P5
Back Pack Reference: A7.3

**HAZCOM Label Information**

**Product Identification:** TRINITROTOLUENE (TNT) TYPE 1 FLAKE FORM

**CAGE:** 2I295

**Assigned Individual:** N

**Company Name:** HERCULES INCORPORATED

**Company PO Box:** N/K

**Company Street Address1:** 84 5TH AVE

**Company Street Address2:** NEW YORK, NY 10011-7603 US

**Health Emergency Telephone:** 703-639-7294

**Label Required Indicator:** Y

**Date Label Reviewed:** 09/10/1991

**Status Code:** C

**Manufacturer's Label Number:**

**Date of Label:** 09/10/1991

**Year Procured:** N/K

**Organization Code:** G

**Chronic Hazard Indicator:** Y

**Eye Protection Indicator:** YES

**Skin Protection Indicator:** YES

**Respiratory Protection Indicator:** YES

**Signal Word:** DANGER

**Health Hazard:** Slight

**Contact Hazard:** Slight

**Fire Hazard:** Severe

**Reactivity Hazard:** Severe

8/8/2002 6:10:22 PM
DOD Hazardous Material Information (ANSI Format)
For Cornell University Convenience Only

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Section 1 - Product and Company Identification

Product Identification: TETRYL
Date of MSDS: 04/30/1991 Technical Review Date: 02/14/1992
FSC: 1375 NIIN: LIIN: 00N026374
Submitter: N EN
Status Code: C
MFN: 01
Article: N
Kit Part: N

http://msds.pdc.cornell.edu/msds/msdsdod/a359/m179255.htm
12/19/2003
Manufacturer's Information

Manufacturer's Name: ENSIGN-BICKFORD CO
Manufacturer's Address1: 660 HOPMEADOW ST
Manufacturer's Address2: SIMSBURY, CT 06070
Manufacturer's Country: US
General Information Telephone: 203-658-4411; 203-843-2276
Emergency Telephone: 203-658-4411; 203-843-2276
Emergency Telephone: 203-658-4411; 203-843-2276
MSDS Preparer's Name: T.A. SHREVE
Proprietary: N
Reviewed: N
Published: Y
CAGE: 0B1W4
Special Project Code: N

Contractor Information

Contractor's Name: ENSIGN-BICKFORD CO
Contractor's Address1: 660 HOPMEADOW ST
Contractor's Address2: SIMSBURY, CT 06070
Contractor's Telephone: (203) 658-4411 OR (203) 843-22
Contractor's CAGE: 0B1W4

Contractor Information

Contractor's Name: THE ENSIGN-BICKFORD CO
Contractor's Address1: 660 HOPMEADOW ST
Contractor's Address2: SIMSBURY, CT 06070
Contractor's Telephone: (203) 658-4411
Contractor's CAGE: 0B2N1

Section 2 - Compositin/Information on Ingredients

TETRYL

Ingredient Name: ANILINE, N-METHYL-N,2,4,6-TETRANITRO-; (TRINITRO-2,4,6-PHENYL METHYL MITRAMINE)
Ingredient CAS Number: 479-45-8 Ingredient CAS Code: M
RTECS Number: BY6300000 RTECS Code: M
=WT: =WT Code:
=Volume: =Volume Code:
>WT: >WT Code:
>Volume: >Volume Code:
<WT: <WT Code:
<Volume: <Volume Code:
% Low WT: % Low WT Code:
% High WT: % High WT Code:
% Low Volume: % Low Volume Code:
% High Volume: % High Volume Code:
% Text: 100
% Environmental Weight:

http://msds.pdc.cornell.edu/msds/msdsdod/a359/m179255.htm 12/19/2003
Other REC Limits: N/K
OSHA PEL: S; 1.5 MG/M3 OSHA PEL Code: M
OSHA STEL: OSHA STEL Code:
ACGIH TLV: 1.5 MG/M3; 9293 ACGIH TLV Code: M
ACGIH STEL: N/P ACGIH STEL Code:
EPA Reporting Quantity:
DOT Reporting Quantity:
Ozone Depleting Chemical: N

Ingredient Name: ING 3: SENSITIVE TO DETONATION. IF POSS, SEPARATE ANY MATERIAL THAT APPEARS TO BE UNCONTAMMED FROM MATL THAT APPEARS TO (ING 5)
Ingredient CAS Number: Ingredient CAS Code: X
RTECS Number: 999999ZZ RTECS Code: M
=WT: =WT Code:
=Volume: =Volume Code:
>WT: >WT Code:
>Volume: >Volume Code:
<WT: <WT Code:
<Volume: <Volume Code:
% Low WT: % Low WT Code:
% High WT: % High WT Code:
% Low Volume: % Low Volume Code:
% High Volume: % High Volume Code:
% Text: N/K
% Enviormental Weight:
Other REC Limits: N/K
OSHA PEL: NOT APPLICABLE OSHA PEL Code: M
OSHA STEL: OSHA STEL Code:
ACGIH TLV: NOT APPLICABLE ACGIH TLV Code: M
ACGIH STEL: N/P ACGIH STEL Code:
EPA Reporting Quantity:
DOT Reporting Quantity:
Ozone Depleting Chemical:

Ingredient Name: ING 4: BE GRIT CONTAM. STORE COLLECTED MATL FOR PROPER DISP.
Ingredient CAS Number: Ingredient CAS Code: X
RTECS Number: 999999ZZ RTECS Code: M
=WT: =WT Code:
=Volume: =Volume Code:
>WT: >WT Code:
>Volume: >Volume Code:
<WT: <WT Code:
<Volume: <Volume Code:
% Low WT: % Low WT Code:
% High WT: % High WT Code:
% Low Volume: % Low Volume Code:
% High Volume: % High Volume Code:
% Text: N/K
% Environmental Weight:
Other REC Limits: N/K
OSHA PEL: NOT APPLICABLE OSHA PEL Code: M

http://msds.pdc.cornell.edu/msds/msdssod/a359/m179255.htm 12/19/2003
OSHA STEL: OSHA STEL Code:
ACGIH TLV: NOT APPLICABLE ACGIH TLV Code: M
ACGIH STEL: N/P ACGIH STEL Code:
EPA Reporting Quantity:
DOT Reporting Quantity:
Ozone Depleting Chemical:

Ingredient Name: ING 6: RECOM MET OF DISP OF WASTE EXPLO IS BY OPEN BURN/OPEN DETONATION. TETRYL MAY BE DESTROYED BY BOIL IN SOLN (ING 8)
Ingredient CAS Number: Ingredient CAS Code: X
RTECS Number: 9999999ZZ RTECS Code: M
=WT: =WT Code:
=Volume: =Volume Code:
>WT: >WT Code:
>Volume: >Volume Code:
<WT: <WT Code:
<Volume: <Volume Code:
% Low WT: % Low WT Code:
% High WT: % High WT Code:
% Low Volume: % Low Volume Code:
% High Volume: % High Volume Code:
% Text: N/K
% Environmental Weight:
Other REC Limits: N/K
OSHA PEL: NOT APPLICABLE OSHA PEL Code: M
OSHA STEL: OSHA STEL Code:
ACGIH TLV: NOT APPLICABLE ACGIH TLV Code: M
ACGIH STEL: N/P ACGIH STEL Code:
EPA Reporting Quantity:
DOT Reporting Quantity:
Ozone Depleting Chemical:

Ingredient Name: ING 7: OF SODIUM CARBONATE. BY-PROD & SPECIFICS OF RXN ARE NOT AVAILABLE.
Ingredient CAS Number: Ingredient CAS Code: X
RTECS Number: 9999999ZZ RTECS Code: M
=WT: =WT Code:
=Volume: =Volume Code:
>WT: >WT Code:
>Volume: >Volume Code:
<WT: <WT Code:
<Volume: <Volume Code:
% Low WT: % Low WT Code:
% High WT: % High WT Code:
% Low Volume: % Low Volume Code:
% High Volume: % High Volume Code:
% Text: N/K
% Environmental Weight:
Other REC Limits: N/K
OSHA PEL: NOT APPLICABLE OSHA PEL Code: M
OSHA STEL: OSHA STEL Code:

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12/19/2003
ACGIH TLV: NOT APPLICABLE  ACGIH TLV Code: M
ACGIH STEL: N/P  ACGIH STEL Code: M
EPA Reporting Quantity: 
DOT Reporting Quantity: 
Ozone Depleting Chemical: 

Ingredient Name: SPILL PROC: FRICTION/IMPACT. PLACE MATL IN VELOSTAT BAG.
CONTAM OF MATL W/SAND/DIRT/OTHER GRIT WILL RENDER IT MORE (ING 4)
Ingredient CAS Number: Ingredient CAS Code: X
RTECS Number: 9999999ZZ RTECS Code: M

=WT: =WT Code: 
>Volume: >Volume Code: 
<Volume: <Volume Code: 
% Low WT: % Low WT Code: 
% High WT: % High WT Code: 
% Low Volume: % Low Volume Code: 
% High Volume: % High Volume Code: 
% Text: N/K 
% Environmental Weight: 
Other REC Limits: N/K
OSHA PEL: NOT APPLICABLE OSHA PEL Code: M
OSHA STEL: OSHA STEL Code: 
ACGIH TLV: NOT APPLICABLE ACGIH TLV Code: M
ACGIH STEL: N/P ACGIH STEL Code: 
EPA Reporting Quantity: 
DOT Reporting Quantity: 
Ozone Depleting Chemical: 

Ingredient Name: SUPP DATA: IT DOES NOT DETONATE, IT WILL BURN
VIGOROUSLY. DEFLAGRATION TEMPERATURE IS 185C (365F).
Ingredient CAS Number: Ingredient CAS Code: X
RTECS Number: 9999999ZZ RTECS Code: M

=WT: =WT Code: 
>Volume: >Volume Code: 
<Volume: <Volume Code: 
% Low WT: % Low WT Code: 
% High WT: % High WT Code: 
% Low Volume: % Low Volume Code: 
% High Volume: % High Volume Code: 
% Text: N/K 
% Environmental Weight: 
Other REC Limits: N/K
OSHA PEL: NOT APPLICABLE OSHA PEL Code: M
OSHA STEL: OSHA STEL Code: 
ACGIH TLV: NOT APPLICABLE ACGIH TLV Code: M
ACGIH STEL: N/P ACGIH STEL Code:
EPA Reporting Quantity:
DOT Reporting Quantity:
Ozone Depleting Chemical:

Ingredient Name: VENT:STRONGLY RECOMMENDED TO MINIMIZE EMPLOYEE EXPOSURE.
Ingredient CAS Number: Ingredient CAS Code: X
RTECS Number: 9999999ZZ RTECS Code: M
=WT: =WT Code:
=Volume: =Volume Code:
>WT: >WT Code:
>Volume: >Volume Code:
<WT: <WT Code:
<Volume: <Volume Code:
% Low WT: % Low WT Code:
% High WT: % High WT Code:
% Low Volume: % Low Volume Code:
% High Volume: % High Volume Code:
% Text: N/K
% Environmental Weight:
Other REC Limits: N/K
OSHA PEL: NOT APPLICABLE OSHA PEL Code: M
OSHA STEL: OSHA STEL Code:
ACGIH TLV: NOT APPLICABLE ACGIH TLV Code: M
ACGIH STEL: N/P ACGIH STEL Code:
EPA Reporting Quantity:
DOT Reporting Quantity:
Ozone Depleting Chemical:

Ingredient Name: WASTE DISP METH:LABLG/PACKAGING/STOR & TRANSPORTATION) MUST BE PERFORMED I/A/W ALL APPLIC LOC/ST/FED LAWS & REGS. (ING 7)
Ingredient CAS Number: Ingredient CAS Code: X
RTECS Number: 9999999ZZ RTECS Code: M
=WT: =WT Code:
=Volume: =Volume Code:
>WT: >WT Code:
>Volume: >Volume Code:
<WT: <WT Code:
<Volume: <Volume Code:
% Low WT: % Low WT Code:
% High WT: % High WT Code:
% Low Volume: % Low Volume Code:
% High Volume: % High Volume Code:
% Text: N/K
% Environmental Weight:
Other REC Limits: N/K
OSHA PEL: NOT APPLICABLE OSHA PEL Code: M
OSHA STEL: OSHA STEL Code:
ACGIH TLV: NOT APPLICABLE ACGIH TLV Code: M
ACGIH STEL: N/P ACGIH STEL Code:
Section 3 - Hazards Identification, Including Emergency Overview

TETRYL

Health Hazards Acute & Chronic: EYE: MAY CAUSE IRRITATION, POSSIBLE EYE DAMAGE. SKIN: SKIN MAY TURN YELLOW & DERMATITIS MAY DEVELOP. INHAL: IRRITATION TO UPPER RESPIRATORY TRACT & POSSIBLE DEATH. INGEST: POISONING IS ACCOMPANIED BY FOLL OWING SYMPTOMS: LACK OF APPETITE, INSOMNIA, & GIDDINESS. SYMPTOMS USUALLY BEGIN AFTER 2-3 WEEKS OF BEING EXPOS TO TETRYL.

Signs & Symptoms of Overexposure:
SEE HEALTH HAZARDS.

Medical Conditions Aggravated by Exposure:
NONE SPECIFIED BY MANUFACTURER.

LD50 LC50 Mixture: NONE SPECIFIED BY MANUFACTURER.

Route of Entry Indicators:
Inhalation: YES
Skin: NO
Ingestion: YES

Carcinogenicity Indicators
NTP: NO
IARC: NO
OSHA: NO

Carcinogenicity Explanation: NOT RELEVANT.

Section 4 - First Aid Measures

TETRYL

First Aid:
EYE: FLUSH IMMEDIATELY UNDER RUNNING WATER FOR AT LEAST 15 MIN, SEEK MEDICAL ATTENTION IMMEDIATELY. SKIN: FLUSH IMMEDIATELY UNDER RUNNING WATER FOR AT LEAST 15 MIN, SEEK MEDICAL ATTENTION IMMEDIATELY. INHAL: GET VICTIM TO FRESH AIR. GIVE ARTIFICIAL RESPIRATION IF BREATHING HAS STOPPED. SEEK MEDICAL ATTENTION IMMEDIATELY. INGEST: INDUCE VOMIT IMMEDIATELY BY STICKING FINGER DOWN THROAT. SEEK MEDICAL ATTENTION IMMEDIATELY.

Section 5 - Fire Fighting Measures

TETRYL

Fire Fighting Procedures:
NIOSH/MSHA APPROVED SCBA & FULL PROTECTIVE EQUIPMENT (PPE). DO NOT FIGHT FIRES INVOLVING TETRYL. PROD IS PRIMARY (INITIATING) EXPLOSION & MAY DETONATE WHEN EXPOSED TO (SUPP DATA)

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12/19/2003
Unusual Fire or Explosion Hazard:
TETRYL IS PRIMARY(INITIATING) EXPLO. PROD IS LIKELY TO DETONATE WHEN EXPOS TO SHOCK/HEAT/IMPACT/SPARKS/FRICITION. PROD SHOULD BE HNDL DL ONLY BY (SUPP DATA)

Extinguishing Media:
MEDIA SUITABLE FOR SURROUNDING FIRE (FP N).
Flash Point: Flash Point Text: N/K

Autoignition Temperature:
Autoignition Temperature Text: N/A
Lower Limit(s): N/K
Upper Limit(s): N/K

---

Section 6 - Accidental Release Measures
TETRYL

Spill Release Procedures:
ISOLATE SPILL AREA, KEEP ALL SOURCES OF IGNIT AWAY FROM SPILL & EVACUATE ALL NONESSENTIAL PERS TO SAFE DISTANT LOCATION, REMOVE ALL EXPLO THAT WERE NOT INVOLVED IN SPILL FROM SPILL AREA, CAREFULLLY COLLECT SPILLED MATL, AVOID ANY EXCESS (ING 3)

---

Section 7 - Handling and Storage
TETRYL

Handling and Storage Precautions:

Other Precautions:

---

Section 8 - Exposure Controls & Personal Protection
TETRYL

Respiratory Protection:
NIOSH/MSHA APPROVED DUST RESPIRATOR SHOULD BE WORN WHEN HANDLING TETRYL.

Ventilation:
LOC EXHAUST: STRONGLY RECOM TO MINIMIZE EMPLOYEE EXPOS. SPECIAL TETRYL DUST IS POISONOUS. MECH: EXHAUST VENT (ING 9)

Protective Gloves:
BUTYL RUBBER GLOVES.

Eye Protection: CHEMICAL WORKERS GOGGLES (FP N).

Other Protective Equipment: COTTON COVERALLS (ANTISTATIC) WHICH WILL PROTECT AGAINST POWDER SPLASHES; SHOULD BE REPLACED WHEN CONTAMINATED.

Work Hygienic Practices: NONE SPECIFIED BY MANUFACTURER.

Supplemental Health & Safety Information: FIRE FIGHT PROC.HEAT/FLAMES, DO NOT ATTEMPT TO FIGHT TETRYL FIRES! ISOLATE AFFECTED AREA & EVACUATE ALL PERS TO DISTANT SAFE AREA.EXPLO HAZ: QUALIFIED INDIVIDS WHO ARE THORO FAMILIAR W/ PROPER EXPLO HDL PROC.HAZ. GASES (NITROGEN OXIDES, NO* X'S) MAY BE REL WHEN TETRYL BURNS/DETONATES. IF TETRYL IS EXPOS TO FIRE & (ING 2)

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12/19/2003
Section 9 - Physical & Chemical Properties

TETRYL

HCC: E2
NRC/State License Number:
Net Property Weight for Ammo:
Boiling Point: Boiling Point Text: N/A
Melting/Freezing Point: Melting/Freezing Text: 265F, 129C
Decomposition Point: Decomposition Text: N/K
Vapor Pressure: N/A Vapor Density: N/A
Percent Volatile Organic Content:
Specific Gravity: N/K
Volatile Organic Content Pounds per Gallon:
pH: N/K
Volatile Organic Content Grams per Liter:
Viscosity: N/P
Evaporation Weight and Reference: NOT APPLICABLE
Solubility in Water: INSOLUBLE
Appearance and Odor: LIGHT YELLOW CRYSTALS.
Percent Volatiles by Volume: 100%
Corrosion Rate: N/K

Section 10 - Stability & Reactivity Data

TETRYL

Stability Indicator: YES
Materials to Avoid:
CARBON STEEL IS EASILY CORRODE BY TETRYL. A SLIGHT CORROSION IS FOUND WITH ZINC AND ZINC PLATED STEEL.
Stability Condition to Avoid:
EXPOSURE TO SHOCK, SPARKS, PRESSURE, OR IMPACT MAY RESULT IN DETONATION.
Hazardous Decomposition Products:
THERMAL DECOMPOSITION MAY PRODUCE OXIDES OF CARBON & NITROGEN.
Hazardous Polymerization Indicator: NO
Conditions to Avoid Polymerization:
NOT RELEVANT.

Section 11 - Toxicological Information

TETRYL

Toxicological Information:
N/P

Section 12 - Ecological Information

TETRYL

Ecological Information:
N/P

Section 13 - Disposal Considerations

TETRYL

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12/19/2003
Waste Disposal Methods:
WASTE TETRYL IS HAZ WASTE AS DEFINED UNDER RESOURCE CONSERVATION &
RECOVERY ACT (RCRA) REGS, & MUST BE DISP OF @ PROPERLY PERMITTED
TRTMT/STOR/DISP FACILITY (TSD). WASTE TETRYL DISP & ALL RELATED, REGULATED
ACTIVITIES (INCL BUT NOT LIM TO ING 6)

Section 14 - MSDS Transport Information
TETRYL

Transport Information:
N/P

Section 15 - Regulatory Information
TETRYL

SARA Title III Information:
N/P
Federal Regulatory Information:
N/P
State Regulatory Information:
N/P

Section 16 - Other Information
TETRYL

Other Information:
N/P

HMIS Transportation Information

Product Identification: TETRYL
Transportation ID Number: 31002
Responsible Party CAGE: 0B1W4
Date MSDS Prepared: 04/30/1991
Date MSDS Reviewed: 05/13/1992
MFN: 05/13/1992
Submitter: N TN
Status Code: C

Container Information
Unit of Issue: NK
Container Quantity: NK
Type of Container:
Net Unit Weight:

Article without MSDS: N
Technical Entry NOS Shipping Number:
Radioactivity:
Form:
Net Explosive Weight:
Coast Guard Ammunition Code:
Magnetism: N/P

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AF MMAC Code: 
DOD Exemption Number: 
Limited Quantity Indicator: 
Multiple Kit Number: 0 
Kit Indicator: N 
Kit Part Indicator: N 
Review Indicator: Y 
Additional Data: 

Department of Transportation Information 
DOT Proper Shipping Name: CYCLOTETRAMETHYLENETETRANITRAMINE, WETTED OR HMX, WETTED OR OCTOGEN, WETTED 
DOT PSN Code: EEL 
Symbols: 
DOT PSN Modifier: WITH NOT LESS THAN 15 PER CENT WATER, BY MASS 
Hazard Class: 1.1D 
UN ID Number: UN0226 
DOT Packaging Group: II 
Label: EXPLOSIVE 1.1D 
Special Provision(s): 
Packaging Exception: 
Non Bulk Packaging: 62 
Bulk Packaging: NONE 
Maximum Quantity in Passenger Area: FORBIDDEN 
Maximum Quantity in Cargo Area: FORBIDDEN 
Stow in Vessel Requirements: B 
Requirements Water/Sp/Other: 1E, 5E 

IMO Detail Information 
IMO Proper Shipping Name: TETRYL 
IMO PSN Code: ONJ 
IMO PSN Modifier: 
IMDG Page Number: 1112 
UN Number: 0208 
UN Hazard Class: 1.1 D 
IMO Packaging Group: - 
Subsidiary Risk Label: - 
EMS Number: 1-01 
Medical First Aid Guide Number: T 

IATA Detail Information 
IATA Proper Shipping Name: N/A 
IATA PSN Code: YXR 
IATA PSN Modifier: TRINITROPHENYLMETHYLNITRAMINE 
IATA UN Id Number: 0208 
IATA UN Class: 1.1D 
Subsidiary Risk Class: 
UN Packaging Group: 
IATA Label: 
Packaging Note for Passengers: FORB 
Maximum Quantity for Passengers: FORB 
Packaging Note for Cargo: FORB 

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12/19/2003
Maximum Quantity for Cargo: FORB
Exceptions:

**AFI Detail Information**
AFI Proper Shipping Name: TRINITROPHENYLMETHYLNITRAMINE OR TETRYL
AFI Symbols:
AFI PSN Code: YXR
AFI PSN Modifier:
AFI UN Id Number: UN0208
AFI Hazard Class: 1.1D
AFI Packing Group: II
AFI Label:
Special Provisions: P4
Back Pack Reference: A5.47

**HAZCOM Label Information**
Product Identification: TETRYL
CAGE: 0B1W4
Assigned Individual: N
Company Name: ENSIGN-BICKFORD CO
Company PO Box:
Company Street Address1: 660 HOPMEADOW ST
Company Street Address2: SIMSBURY, CT 06070 US
Health Emergency Telephone: 203-658-4411;203-843-2276
Label Required Indicator: Y
Date Label Reviewed: 02/14/1992
Status Code: C
Manufacturer's Label Number:
Date of Label: 02/14/1992
Year Procured: N/K
Organization Code: G
Chronic Hazard Indicator: N
Eye Protection Indicator: YES
Skin Protection Indicator: YES
Respiratory Protection Indicator: YES
Signal Word: DANGER
Health Hazard: Moderate
Contact Hazard: Moderate
Fire Hazard: None
Reactivity Hazard: Severe

8/8/2002 6:37:56 PM
# Material Safety Data Sheet (MSDS)

**Identity (As Used on Label)**

Nitroglycerin

**Other Names**

NG, nitrate ester

**Section I. General**

<table>
<thead>
<tr>
<th>Manufacturer</th>
<th>Emergency Telephone Number</th>
<th>Telephone Number for Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Indian Head Division</td>
<td>301-744-4438</td>
<td>301-744-4924</td>
</tr>
<tr>
<td>Naval Surface Warfare Center</td>
<td></td>
<td></td>
</tr>
<tr>
<td>101 Straus Avenue</td>
<td></td>
<td>29 July 03</td>
</tr>
<tr>
<td>Indian Head, MD 20640-5035</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Data Prepared**: 29 July 03

**Section II. Summary of Hazards**

The first symptoms of exposure to nitroglycerin are usually a headache, nausea or vomiting. Nitroglycerin is an irritant through inhalation, skin contact and eye contact. Exposure to nitroglycerin affects central nervous system depressant and methemoglobin formation. Persons at greatest risk when exposed include those with hypotension, anemia, hyperthyroidism and cardiovascular disease.

This document is the MSDS for **Nitroglycerin**.

**Section III. Emergency and First Aid**

- **Inhalation**: Remove to fresh air immediately. If breathing has stopped, give artificial respiration. Seek medical attention.
- **Eye Contact**: Wash eyes immediately with large amounts of water or saline solution, occasionally lifting upper and lower lids, for at least 15 minutes. Seek medical attention.
- **Skin Contact**: Remove contaminated clothing immediately. Wash affected area with soap and water for at least 15 minutes. Seek medical attention if irritation persists.
- **Ingestion**: DO NOT INDUCE VOMITING. Qualified medical personnel should remove chemical by gastric lavage or catharsis. Activated charcoal is useful. Seek medical attention.
- **Emergency Medical Treatment**: Move victim to fresh air and call emergency medical care. If not breathing, give artificial respiration; if breathing is difficult, give oxygen. Keep victim quiet and maintain normal body temperature. Effects may be delayed; keep victim under observation.
### Section IV. Health Hazards & Symptoms of Exposure

**Nitroglycerin**

**Summary of Acute Hazards**
Symptoms include headache, nausea, vomiting and skin irritation.

<table>
<thead>
<tr>
<th>ROUTE OF EXPOSURE</th>
<th>SIGNS AND SYMPTOMS</th>
<th>PRIMARY ROUTE OF ENTRY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inhalation: Headache, conjunctivitis, nausea, vomiting, visual disturbances and mental confusion.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Eye Contact: Local irritation, decreased visual acuity, systematic effects of headache, nausea, vomiting and other symptoms of narcosis.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Skin Contact: Local irritation and systematic effects of headache, nausea, vomiting and other symptoms of narcosis.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ingestion: Ingestion may cause numbness of extremities, tingling sensation, excitement, headache, hypotension, nausea, vomiting, abdominal cramps, gastrointestinal irritation and respiratory difficulty.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Chronic Hazards**
Symptoms include headache, nausea, vomiting, hallucinations, hypotension, mental confusion, skin rashes, conjunctivitis and numbness. Long term exposure may result in acclimatization to discomforts produced by acute effects. Exposure also targets the skin, blood and cardiovascular system. NG is not a suspected carcinogen.

### Section V. Protective Equipment and Control Measures

**Organic vapor respirator/supplied air respirator is required if exposed to levels above OSHA limits.**

**Eye:** Chemical splash goggles and face shield are recommended when handling.

**Skin:** Nitrile Buna-rubber gloves and flame-resistant powder uniform are recommended when handling.

**Engineering:** Use general or local exhaust ventilation to satisfy exposure limits. Ventilation Controls: equipment must be explosion-proof.

**Other Hygienic and Work Practices:** Wear flame-resistant powder uniform, flame-resistant soft cap, and conductive-soled shoes. Have an eyewash and safety shower nearby. There should be no smoking or eating in the workplace.
## Section VI. Fire and Explosion

<table>
<thead>
<tr>
<th>Identity</th>
<th>Nitroglycerin</th>
</tr>
</thead>
</table>

### Flash Point (method): **Explodes**
- **Autoignition Temp (method):** 518 °F (270 °C)
- **Flammable Limits (% vol in air):** Lower Unknown, Upper Unknown

### Fire And Explosion Hazards:
- Dangerously explosive. Moderate fire hazard when exposed to heat or flame.

### Extinguishing Media:
- Water sprinkler/deluge system recommended.
- Do not attempt to manually extinguish fires. Burning explosives may accelerate to a detonation at any time when subjected to confinement, shock or other sufficient initiation source. Positive pressure self-contained breathing apparatus (SCBA) and structural firefighter's protective clothing will provide limited protection. Withdraw from area and let fire burn. Promptly isolate the scene by removing all persons from the vicinity of the scene and away from windows.

### Section VII. Spill and Disposal

#### Large Spill:
- Shut off all sources of ignition. Do not touch spilled material. Smoking and open flames are strictly prohibited in the area. Evacuate area to a distance of 2500 feet in all directions.
- Control access to area and remove sources of friction, impact, heat, low level electrical current, electrostatic or RF energy. Review FIRE AND EXPLOSION HAZARDS and SAFETY PRECAUTIONS before proceeding with clean up. Keep unnecessary people away.

#### Small Spill:
- Wipe up spill with an acetone-dampened sponge. Use conductive containers and ground all containers before transferring explosives between containers. Avoid metal-to-metal contact, impact, friction or other situations, which may initiate the explosive. Avoid sand, glass, grit and metal fragments which may sensitize the material to impact or friction.

### Waste Disposal Methods:
- Store and handle waste as a Class A explosive. Transport in accordance with Department of Transportation regulations for Class A explosives. Obtain approval from appropriate agencies prior to disposal. Consult manufacturer for recommended methods of destroying explosive materials. Comply with all Federal, State and local regulations. NG solutions must be disposed of as a hazardous waste per 40 CFR 262.

## Section VIII. Handling and Storage

### General Handling Procedures:
- Avoid contact with heat, sparks, flame or other sources of ignition. Avoid friction, shock and impact. Use all required personal protective equipment. Explosives must be tested for compatibility with any materials which they contact. Wash thoroughly after handling. Wash contaminated clothing before use. Avoid pinching material, metal-to-metal contact, impact, friction, shock or other mechanical stimuli.

### Storage Requirements:
- Storage must be performed in accordance with appropriate safety regulations concerning quantity distance, barricading, personnel exposure and handling equipment. Storage containers should be grounded. Observe all federal, state and local regulations.
### Section IX. Stability and Reactivity

<table>
<thead>
<tr>
<th>Identity</th>
<th>Nitroglycerin</th>
</tr>
</thead>
</table>

#### Stable Conditions
- **Yes**: □
- **No**: X

**Conditions To Avoid:**
- Avoid heat, sparks, open flame and other sources of ignition. Avoid impact, shock, friction and electrostatic discharge. High explosives will detonate when exposed to sufficient mechanical and thermal stimuli.

**Incompatibility:** Acids, oxidizers and ozone.

#### Decomposition
- Carbon monoxide, carbon dioxide, oxides of nitrogen

#### By-Products:
- **Yes**: □
- **No**: X

**Conditions To Avoid:**
- Not applicable

#### Hazardous Polymerization
- **Yes**: □
- **No**: X

#### Impact Sensitivity (mm)
- 8.4 mm for 50% height (NOS)
- Other

#### Friction Sensitivity (pelg)
- Unknown
- Other

#### ESD Sensitivity (joules)
- ≥12.5
- Other

### Section X. Hazardous Ingredients/Identity Information

<table>
<thead>
<tr>
<th>Hazardous Components</th>
<th>OSHA PEL</th>
<th>ACGIH TLV</th>
<th>Other Limits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nitroglycerin (CAS# 55-63-0)</td>
<td>2.0 mg/m³</td>
<td>0.5 mg/m³</td>
<td></td>
</tr>
</tbody>
</table>
Identity: Nitroglycerin

Section XI. Physical and Chemical Data

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boiling Point</td>
<td>424 °F (218 °C)</td>
</tr>
<tr>
<td>(indicate °F or °C)</td>
<td></td>
</tr>
<tr>
<td>Specific Gravity</td>
<td>1.6</td>
</tr>
<tr>
<td>(water = 1)</td>
<td></td>
</tr>
<tr>
<td>Vapor Pressure</td>
<td>0.0015 @ 20 °C</td>
</tr>
<tr>
<td>(mm Hg)</td>
<td></td>
</tr>
<tr>
<td>Melting Point</td>
<td>55 °F (13 °C)</td>
</tr>
<tr>
<td>(indicate °F or °C)</td>
<td></td>
</tr>
<tr>
<td>Vapor Density</td>
<td>7.8</td>
</tr>
<tr>
<td>(Air = 1)</td>
<td></td>
</tr>
<tr>
<td>Evaporation Rate</td>
<td></td>
</tr>
<tr>
<td>(Butyl Acetate = 1)</td>
<td></td>
</tr>
<tr>
<td>Solubility in Water</td>
<td>0.125%</td>
</tr>
<tr>
<td>Appearance and Odor</td>
<td>Colorless to pale yellow slightly viscous liquid with a sweet burning taste.</td>
</tr>
</tbody>
</table>

Section XII. Other Information

<table>
<thead>
<tr>
<th>Health (blue)</th>
<th>2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contact (white)</td>
<td>2</td>
</tr>
<tr>
<td>Fire (red)</td>
<td>3</td>
</tr>
<tr>
<td>Reactivity (yellow)</td>
<td>1.1</td>
</tr>
<tr>
<td>Hazardous Material Warning Label</td>
<td>(for Naval Surface Warfare Center, Indian Head Division use only)</td>
</tr>
<tr>
<td>0 = no significant hazard</td>
<td></td>
</tr>
<tr>
<td>1 = slight hazard</td>
<td></td>
</tr>
<tr>
<td>2 = moderate hazard</td>
<td></td>
</tr>
<tr>
<td>3 = severe hazard</td>
<td></td>
</tr>
<tr>
<td>1.1 = mass detonating explosive</td>
<td></td>
</tr>
<tr>
<td>1.3 = mass fire explosive</td>
<td></td>
</tr>
<tr>
<td>ND = hazard has not yet been determined</td>
<td></td>
</tr>
</tbody>
</table>

Shipping Name: Explosive A

UN or North American Identification Number: Explosive A

Hazard Class and Packing Group: Class 1 Division 1.1 Explosives

TSCA Status: All components are listed in the TSCA chemical inventory.


RCRA: Discarded Nitroglycerin solution is a D003 (reactive) RCRA hazardous waste. Dispose of according to federal, state and local regulations.

State Regulatory Information: This material contains nitroglycerin and is thus a P081 (reactive) COMAR hazardous waste.
1. Identification of the substance and of the company/undertaking

Product name: Nitrocellulose
Chemical name: Nitrocellulose, NSC 830
Company/Manufacturer: NEXPLO BOFORS AB
Company address: S-691 86 KARLSKOGEN, SWEDEN
Telephone number: 46-586-830 50
Telex number: 46-586-853 10
Emergency telephone number: 46-586-832 00, SRC + m. 46-0(8)-33 70 45
Contact person: Birgitta Peterson
Dangerous Goods, documentation: Birgitta Peterson

2. Composition/Information on ingredients

Identification of product: Nitrocellulose, N-content <12.6 %
Substances: NC, wetted
CAS-number: 9004-70-0
% Risk phrases: 100 11

3. Hazard Identification

Health hazard:
Inhalation: May irritate respiratory organs and lungs. May cause headache.
Skin contact: May irritate.
Eye contact: May irritate.
Ingestion: May irritate and cause headache.
Fire and explosion hazards: HIGHLY FLAMMABLE.

NOTE: Risk that fire continues into explosion. Nitrocellulose is in dry or slightly wetted condition a heavy explosive. It can easily be ignited or explode by shock, friction, sparks or contact with hot surfaces. In disadvantageous cases dust or dry NC can be ignited by sweeping with a hard brush, for example. Dry NC may self-ignite, for example exposed in sunshine. NC develops toxic smoke at heating/combustion.
Environmental hazards

Waste of wetted nitrocellulose must immediately be taken care of. Dry product must be wetted before it can be taken care of. Product in the nature may cause overdosing through Nitrogen addition.

4. First-aid measures

After inhalation:

Inhalation of gases from fire: Fresh air, warmth and rest, in half sitting position. Avoid strain - increased risk for affections on the lungs. Use oxygen, go to hospital even by small troubles.

After skin contact:

Take off contaminated clothes/shoes. Wash with soap and water.

After eye contact:

Rinse with water.

After ingestion:

No harmful effects known.

5. Fire-fighting measures

Extinguishing media

- Suitable extinguishing media: Use copious volumes of water, sprinkler.
- Extinguishing media not to be used: Not fire - extinction powder.
- Special exposure causing hazard: Nitrous gases.

Special protective equipment for firefighters:

Full protection including compressed air mask.

6. Accidental release measures

Personal precautions:

Flame-protection treated clothes, protecting against direct contact, and gloves.

Environmental precautions:

Production as far as possible in closed systems. Containers must be kept well closed. Working place and methods must be planned in such a way that direct contact with NC is prevented and potential wastage from leaking production kestles can be taken care of before product is getting dry and contaminating the sewage system. Special explosive vapors must exist in resp. room. Rooms and equipment must regularly be rinsed with water for removal of wastage.
Methods for cleaning up: Product, wetted with water, shall be collected and put into special and marked containers. Waste shall be burned in open air and set to fire from a protected place. Destruction shall be carried out with explosives. Contact fire-brigade.

7 Handling and storage

Handling: Product must be kept wet. Containers kept wetted and must continuously be lined with a wetting moisture content. Explosive classified electric equipment must be used. Equipment well earthed.

Storage: Must always be stored wetted with water in tight closing containers, only in places approved for explosives. Keep protected from warmth. By intermediate sorting, for example in production stores, the water-content must be checked every week, especially by sunshine and hot weather.

8 Personal protection/Exposure controls

Engineering measures: Must only be handled in rooms where water pouring is possible. Keep containers well closed. Working place and methods must be planned in such a way that direct contact with NC is avoided. No smoking, fire, sparks or welding. Prevent sparks caused by static electricity. Use explosion-protected equipment.

Personal protection equipment

Respiratory protection: Inhaling protection with dust-filter P2 is recommended at cleaning of rooms, machine equipment, transporters etc., which are swept by brushes, before pouring with water.

Hand protection: Tightly lined gloves, of plastic or plastic gloves with cotton inside glove.

Eye protection: Face screen or glasses with side-protection is recommended by cleaning.

Skin protection: Flame-protection treated clothes, as close-fitted as possible, when direct contact is risked.

Specific hygiene measures

Further information: Because of the explosion risk must the product be kept wetted.
# Physical and chemical properties

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Appearance</td>
<td>Fibres</td>
</tr>
<tr>
<td>Colour</td>
<td>White</td>
</tr>
<tr>
<td>Odour</td>
<td></td>
</tr>
<tr>
<td>Decomposition point (°C)</td>
<td>Heated NC during a longer period of time decomposition can happen with a temperature &gt; 100 °C.</td>
</tr>
<tr>
<td>Melting point/range (°C)</td>
<td></td>
</tr>
<tr>
<td>Flash point (°C)</td>
<td></td>
</tr>
<tr>
<td>Autolignition temperature (°C)</td>
<td>185 - 190 (Explosive temp.)</td>
</tr>
<tr>
<td>Explosion properties</td>
<td>Explosive</td>
</tr>
<tr>
<td>Boiling point/range (°C)</td>
<td></td>
</tr>
<tr>
<td>Relative density (g/m³)</td>
<td>~1160</td>
</tr>
<tr>
<td>Solubility in water</td>
<td>Insoluble</td>
</tr>
<tr>
<td>Solubility in other solvents</td>
<td>Ketones and esters.</td>
</tr>
<tr>
<td>Partition coefficient acetone/water</td>
<td></td>
</tr>
</tbody>
</table>

## Stability and reactivity

### Conditions to avoid
- Risk for fire. Shock, friction, sparks, electrostatic electricity must be avoided. Must not be stored in temperatures higher than normal room temperature. Must be protected against getting dry.

### Materials to avoid
- Alkaline substances and strong acids.

### Hazardous decomposition products
- Nitrous gases.

### Other information

## Toxicological information

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>LD₅₀ oral rat</td>
<td>&gt; 2000 mg/kg</td>
</tr>
<tr>
<td>Hazardous ingredients</td>
<td>No harmful effects known from available literature.</td>
</tr>
</tbody>
</table>
Immediate health effects
Delayed health effects Not known
Acute toxicity Not known
Chronic toxicity (long-term) Not known
Carcinogenicity -
Mutagenicity -
Reproductive toxicity -
Inhalation Irritates the respiratory organs.
Skin Irritates
Eye Irritates
Ingestion May cause headache.

Hypoxic standards and recommendations Swedish limit value not existing.

12 Ecological information
Microtox (mg/l) LC50/LC90 > 10000 mg/l
Mobility -
Persistence & degradability 28 days = 10 % at 10 mg/l, COD 0.463 g/g
Biocaccumulative potential -
Aquatic toxicity and other data -
Marine pollutant (IMDG Code) -

13 Disposal considerations
Disposal of waste materials Wasteage, washed with water, shall be collected and put in special container. At destruction experts shall be called upon. Contact fire-brigade.
Contaminated packaging Must be disposed of in a safe way.
Symbols

P, Extremely flammable.

Risk phrases

R11, Highly flammable.

Safety phrases

S16, Keep away from sources of ignition - No smoking.

S33, Take precautionary measures against static electricity.

S37, Wear suitable gloves.

S39, Wear eye/face protection.

Other information

16

References

SAX'S DANGEROUS PROPERTIES OF INDUSTRIAL MATERIALS.

Arbetskyddsavvisen för dermedstyret 1993:9
# Material Safety Data Sheets

## Division of Facilities Services

**DOD Hazardous Material Information (ANSI Format)**  
**For Cornell University Convenience Only**

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</thead>
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<td>Section 14 - MSDS Transport Information</td>
</tr>
<tr>
<td>Section 7 - Handling and Storage</td>
<td>Section 15 - Regulatory Information</td>
</tr>
<tr>
<td>Section 8 - Exposure Controls &amp; Personal Protection</td>
<td>Section 16 - Other Information</td>
</tr>
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The information in this document is compiled from information maintained by the United States Department of Defense (DOD). Anyone using this information is solely responsible for the accuracy and applicability of this information to a particular use or situation. Cornell University does not in any way warrant or imply the applicability, viability or use of this information to any person or for use in any situation.

### Section 1 - Product and Company Identification

**DIETHYL PHTHALATE, H944**

- **Product Identification:** DIETHYL PHTHALATE, H944  
- **Date of MSDS:** 08/15/1996  
- **Technical Review Date:** 12/22/1997  
- **FSC:** 6810  
- **NIIN:** L111: 00N062225  
- **Submitter:** N EN  
- **Status Code:** C  
- **MFN:** 02  
- **Article:** N  
- **Kit Part:** N

[http://msds.pdc.cornell.edu/msds/msdsdod/a428/m213612.htm](http://msds.pdc.cornell.edu/msds/msdsdod/a428/m213612.htm)  
12/19/2003
Manufacturer’s Information

Manufacturer’s Name: J.T. BAKER INC
Manufacturer's Address1: 222 RED SCHOOL LANE
Manufacturer's Address2: PHILLIPSBURG, NJ 08885-2219
Manufacturer's Country: US
General Information Telephone: 908-859-2151
Emergency Telephone: 800-424-6802; 800-424-9300 (CHEMTREC)
Emergency Telephone: 800-424-6802; 800-424-9300 (CHEMTREC)
MSDS Preparer’s Name: N/P
Proprietary: N
Reviewed: N
Published: Y
CAGE: JO091
Special Project Code: N

Contractor Information

Contractor’s Name: J.T. BAKER INC
Contractor's Address1: 222 RED SCHOOL LANE
Contractor's Address2: PHILLIPSBURG, NJ 08885-2219
Contractor’s Telephone: 908-859-2151
Contractor’s CAGE: JO091

Contractor Information

Contractor’s Name: MALLINCKRODT BAKER, INC. (FORMERLY J.T. BAKER INC)
Contractor's Address1: 222 RED SCHOOL LANE
Contractor's Address2: PHILLIPSBURG, NJ 08885-2219
Contractor’s Telephone: 800-582-2537
Contractor’s CAGE: 70829

Section 2 - Composition/Information on Ingredients

DIETHYL PHTHALATE, H944

Ingredient Name: PHTHALIC ACID, DIETHYL ESTER; (DIETHYL PHTHALATE) (SARA 315)
>CERCLA), LDS50 (ORAL, RAT) 8600 MG/KG.
Ingredient CAS Number: 84-66-2 Ingredient CAS Code: M
RTECS Number: T11050000 RTECS Code: M
=WT: =WT Code:
>Volume: >Volume Code:
>% Low WT: % Low WT Code:
>% High WT: % High WT Code:
>% Low Volume: % Low Volume Code:
>% High Volume: % High Volume Code:
>% Text: 99-100
% Enviromental Weight:

http://msds.pdc.cornell.edu/msds/msdsdod/a428/m213612.htm 12/19/2003
Other REC Limits: N/K
OSHA PEL: 5 MG/M3 OSHA PEL Code: M
OSHA STEL: OSHA STEL Code: 
ACGIH TLV: 5 MG/M3 ACGIH TLV Code: M
ACGIH STEL: N-P ACGIH STEL Code: 
EPA Reporting Quantity: 1000 LBS
DOT Reporting Quantity: 1000 LBS
Ozone Depleting Chemical: N

Section 3 - Hazards Identification, Including Emergency Overview
DIETHYL PHTHALATE, H944

Health Hazards Acute & Chronic: ACUTE: INHALATION: IRRITATION OF MUCOUS MEMBRANES, COUGHING, DIFFICULT BREATHING, MAY CAUSE NARCOSIS. SKIN/EYE CONTACT: IRRITATION. SKIN ABSORPTION: NONE IDENTIFIED. INGESTION: IRRITATION OF MUCOUS MEMBRANES, HEADACHE, NAUSEA, VOMITING, DIZZINESS, GASTROINTESTINAL IRRITATION, CENTRAL NERVOUS SYSTEM DEPRESSION. (EFTS OF OVEREXP)

Signs & Symptoms of Overexposure: 
HLTH HAZ: CHRONIC: SOME REPORTS HAVE INDICATED THAT THIS SUBSTANCE MAY BE TERATOGENIC.

Medical Conditions Aggravated by Exposure: NONE IDENTIFIED.

LD50 LC50 Mixture: SEE INGREDIENT 1.

Route of Entry Indicators:
Inhalation: YES 
Skin: YES
Ingestion: YES

Carcinogenicity Indicators
NTP: NO
IARC: NO
OSHA: NO

Carcinogenicity Explanation: NOT RELEVANT

Section 4 - First Aid Measures
DIETHYL PHTHALATE, H944

First Aid:
INGEST: IF CONSCIOUS, IMMEDIATELY INDUCE VOMITING. INHAL: IF PERSON BREATHES IN LARGE AMOUNTS, MOVE EXPOSED PERSON TO FRESH AIR. SKIN: IMMEDIATELY WASH WITH ABUNDANT AMOUNTS OF SOAP & WATER FOR AT LEAST 15 MINUTES. EYES: IMMEDIATELY FLUSH WITH ABUNDANT AMOUNTS OF WATER FOR AT LEAST 15 MINUTES.

Section 5 - Fire Fighting Measures
DIETHYL PHTHALATE, H944

Fire Fighting Procedures:
USE NIOSH APPROVED SCBA & FULL PROTECTIVE EQUIPMENT (FP N). MOVE CNTNRS FROM FIRE AREA IF IT CAN BE DONE W/OUT RISK. USE WATER TO KEEP FIRE-EXPOS CNTNRS COOL.

Unusual Fire or Explosion Hazard:
CLOSED CONTAINERS EXPOSED TO HEAT MAY EXPLODE.

Extinguishing Media:
USE EXTINGUISHING MEDIA APPROPRIATE FOR SURROUNDING FIRE.

Flash Point: Flash Point Text: 322F,160C

Autoignition Temperature:
  Autoignition Temperature Text: N/A
  Lower Limit(s): 0.07%
  Upper Limit(s): N/A

Section 6 - Accidental Release Measures
DIETHYL PHTHALATE, H944

Spill Release Procedures:
WEAR SUITABLE PROTECTIVE CLOTHING. TAKE UP W/SAND OR OTHER NON-COMBUSTIBLE ABSORBENT MATERIAL & PLACE INTO CONTAINER FOR LATER DISPOSAL. FLUSH SPILL AREA W/WATER. REPORTABLE QUANTITY:1000 LBS.

Section 7 - Handling and Storage
DIETHYL PHTHALATE, H944

Handling and Storage Precautions:

Other Precautions:

Section 8 - Exposure Controls & Personal Protection
DIETHYL PHTHALATE, H944

Respiratory Protection:
NIOSH APPROVED RESPIRATORY PROTECTION REQUIRED IF AIRBORNE CONCENTRATION EXCEEDS TLV. AT CONCENTRATIONS UP TO 25 PPM, A NIOSH APPROVED HIGH-EFFICIENCY PARTICULATE RESPIRATOR IS REC. ABOVE THIS LEVEL, A NIOSH APPROVED SCBA IS ADVISED.

Ventilation:
USE GENERAL OR LOCAL EXHAUST VENTILATION TO MEET TLV REQUIREMENTS.

Protective Gloves:
NEOPRENE GLOVES.

Eye Protection:
ANSI APPROVED CHEM WORKERS GOGGS (FP N).

Other Protective Equipment:
ANSI APPRVD EYE WASH FOUNTAIN & DELUGE SHOWER (FP N). UNIFORM & APRON ARE REC. LAB COAT. NOTE:WHEN HNDLG LIQ (SUPP DATA)

Work Hygienic Practices:
WASH THOROUGHLY AFTER HANDLING.

Supplemental Health & Safety Information:
OTHER PROT EQUIP:PRODUCTS, SECONDARY

http://msds.pdc.cornell.edu/msds/msdsdod/a428/m213612.htm 12/19/2003
PROTECTIVE CONTAINERS MUST BE USED FOR CARRYING.

Section 9 - Physical & Chemical Properties
DIETHYL PHTHALATE, H944

HCC:
NRC/State License Number:
Net Property Weight for Ammo:
Boiling Point: Boiling Point Text: 568F, 298C
Melting/Freezing Point: Melting/Freezing Text: -40F, -40C
Decomposition Point: Decomposition Text: N/K
Vapor Pressure: <1 @ 20C Vapor Density: 7.6
Percent Volatile Organic Content:
Specific Gravity: 1.12 (H2O=1)
Volatile Organic Content Pounds per Gallon:
pH: N/A
Volatile Organic Content Grams per Liter:
Viscosity: N/P
Evaporation Weight and Reference: NOT APPLICABLE
Solubility in Water: NEGLIGIBLE (<0.1%)
Appearance and Odor: COLORLESS VISCOS LIQUID; ODORLESS.
Percent Volatiles by Volume: 100
Corrosion Rate: N/K

Section 10 - Stability & Reactivity Data
DIETHYL PHTHALATE, H944

Stability Indicator: YES
Materials to Avoid:
STRONG OXIDIZING AGENTS, STRONG ACIDS, NITRIC ACID, STRONG BASES.
Stability Condition to Avoid:
HEAT, FLAME, OTHER SOURCES OF IGNITION.
Hazardous Decomposition Products:
CARBON MONOXIDE, CARBON DIOXIDE.
Hazardous Polymerization Indicator: NO
Conditions to Avoid Polymerization:
NOT RELEVANT

Section 11 - Toxicological Information
DIETHYL PHTHALATE, H944

Toxicological Information:
N/P

Section 12 - Ecological Information
DIETHYL PHTHALATE, H944

Ecological Information:
N/P

Section 13 - Disposal Considerations
DIETHYL PHTHALATE, H944

http://msds.pdc.cornell.edu/msds/msdsdod/a428/m213612.htm
12/19/2003
Waste Disposal Methods:
DISPOSE I/A/W ALL APPLICABLE FEDERAL, STATE & LOCAL ENVIRONMENTAL REGULATIONS. EPA HAZARDOUS WASTE NUMBER:U088 (TOXIC WASTE).

Section 14 - MSDS Transport Information
DIETHYL PHTHALATE, H944

Transport Information:
N/P

Section 15 - Regulatory Information
DIETHYL PHTHALATE, H944

SARA Title III Information:
N/P
Federal Regulatory Information:
N/P
State Regulatory Information:
N/P

Section 16 - Other Information
DIETHYL PHTHALATE, H944

Other Information:
N/P

HAZCOM Label Information
Product Identification: DIETHYL PHTHALATE, H944
CAGE: JO091
Assigned Individual: Y
Company Name: J.T. BAKER INC
Company PO Box:
Company Street Address1: 222 RED SCHOOL LANE
Company Street Address2: PHILLIPSBURG, NJ 08865-2219 US
Health Emergency Telephone: 800-424-6802, 800-424-9300 (CHEMTREC)
Label Required Indicator: Y
Date Label Reviewed: 12/22/1997
Status Code: C
Manufacturer’s Label Number:
Date of Label: 12/22/1997
Year Proced: N/K
Organization Code: G
Chronic Hazard Indicator: Y
Eye Protection Indicator: YES
Skin Protection Indicator: YES
Respiratory Protection Indicator: YES
Signal Word: WARNING
Health Hazard: Moderate
Contact Hazard: Moderate
Fire Hazard: Slight
Reactivity Hazard: None

http://msds.pdc.cornell.edu/msds/msdsdod/a428/m213612.htm 12/19/2003
Division of Facilities Services

DOD Hazardous Material Information (ANSI Format)
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Section 1 - Product and Company Identification

**104 0724 TRIACETIN**

**Product Identification:** 104 0724 TRIACETIN

**Date of MSDS:** 05/14/1986 **Technical Review Date:** 08/11/1998

**FSC:** 6810 **NIIN:** LIIN: 00F014969

**Submitter:** F BT

**Status Code:** C

**MFN:** 01

**Article:** N

**Kit Part:** N

---

file://E:\Environmental\MSDSs\MSDS%20Text%20&%20htm%20Files\104%200724%20%200724%2... 12/19/2003
Manufacturer's Information

Manufacturer's Name: EASTMAN KODAK CO
Post Office Box: N/K
Manufacturer's Address1: 343 STATE ST
Manufacturer's Address2: ROCHESTER, NY 14650-1115
Manufacturer's Country: US
General Information Telephone: 716-724-6481/716-722-5151
Emergency Telephone: 716-722-5151/716-724-4501
Emergency Telephone: 716-722-5151/716-724-4501
MSDS Preparer's Name: N/P
Proprietary: Y
Reviewed: Y
Published: Y
CAGE: 19139
Special Project Code: N

Preparer Information

Preparer's Name: EASTMAN KODAK CO GOVERNMENT MARKETS CONTRACTS
Preparer's Address1: 343 STATE ST
Preparer's Address2: ROCHESTER, NY 14650-1115
Preparer's CAGE: 19139
Assigned Individual: N

Contractor Information

Contractor's Name: EASTMAN KODAK CO GOVERNMENT MARKETS CONTRACTS
Contractor's Address1: 343 STATE ST
Contractor's Address2: ROCHESTER, NY 14650-1115
Contractor's Telephone: 716-722-5151/(800) 242-2424
Contractor's CAGE: 19139

Section 2 - Composition/Information on Ingredients

Ingredient Name: TRIACETIN *98-2*
Ingredient CAS Number: 102-76-1 Ingredient CAS Code: M
RTECS Number: AK3675000 RTECS Code: M
=WT: =WT Code:
=Volume: =Volume Code:
>WT: >WT Code:
>Volume: >Volume Code:
<WT: <WT Code:
<Volume: <Volume Code:
% Low WT: % Low WT Code:
% High WT: % High WT Code:
% Low Volume: % Low Volume Code:
% High Volume: % High Volume Code:
% Text: 100
% Enviromental Weight:

12/19/2003
Section 3 - Hazards Identification, Including Emergency Overview

104 0724 TRIACETIN

Health Hazards Acute & Chronic: EYES: TRANSIENT IRRITATION. INHALATION/INGESTION/SKIN: LOW HAZARD.

Signs & Symptoms of Overexposure:
IRRITATION

Medical Conditions Aggravated by Exposure:
N/K

LD50 LC50 Mixture: N/K

Route of Entry Indicators:
Inhalation: NO
Skin: NO
Ingestion: NO

Carcinogenicity Indicators
NTP: NO
IARC: NO
OSHA: NO

Carcinogenicity Explanation: NONE

Section 4 - First Aid Measures

104 0724 TRIACETIN

First Aid:
EYES: FLUSH W/PLENTY OF WATER. OBTAIN MEDICAL ATTENTION IN ALL CASES.

Section 5 Fire Fighting Measures

104 0724 TRIACETIN

Fire Fighting Procedures:
N/K

Unusual Fire or Explosion Hazard:
N/K

Extinguishing Media:
WATER SPRAY, DRY CHEMICAL, CO2, & ALCOHOL FOAM.
Flash Point: Flash Point Text: 308F

Autoignition Temperature:
- Autoignition Temperature Text: N/A
- Lower Limit(s): N/K
- Upper Limit(s): N/K

Section 6 - Accidental Release Measures
104 0724 TRIACETIN

Spill Release Procedures:
ABSORB MATERIAL IN VERMICULITE/OTHER SUITABLE ABSORBENT & PLACE IN IMPERVIOUS CONTAINER.

Section 7 - Handling and Storage
104 0724 TRIACETIN

Handling and Storage Precautions:

Other Precautions:

Section 8 - Exposure Controls & Personal Protection
104 0724 TRIACETIN

Respiratory Protection:
N/K
Ventilation:
GOOD VENTILATION SHOULD BE SUFFICIENT.
Protective Gloves:
N/K
Eye Protection: SAFETY GLASSES
Other Protective Equipment: N/K
Work Hygienic Practices: N/K
Supplemental Health & Safety Information: N/K

Section 9 - Physical & Chemical Properties
104 0724 TRIACETIN

HCC:
NRC/State License Number:
Net Property Weight for Ammoe:
Boiling Point: Boiling Point Text: 496F
Melting/Freezing Point: Melting/Freezing Text: N/K
Decomposition Point: Decomposition Text: N/K
Vapor Pressure: 1 Vapor Density: N/K
Percent Volatile Organic Content:
Specific Gravity: 1.16
Volatile Organic Content Pounds per Gallon:
pH: N/K
Volatile Organic Content Grams per Liter:

file://E:\Environmental\MSDS\%20Text\%20&\%20html\%20Files\104%200724%... 12/19/2003
Viscosity: N/P
Evaporation Weight and Reference: (N-BU AC = 1): <0.1
Solubility in Water: 1-10%
Appearance and Odor: COLORLESS LIQUID
Percent Volatiles by Volume: N/K
Corrosion Rate: N/K

Section 10 - Stability & Reactivity Data
104 0724 TRIACETIN

Stability Indicator: YES
Materials to Avoid:
STRONG OXIDIZERS
Stability Condition to Avoid:
N/K
Hazardous Decomposition Products:
CO2 & CO
Hazardous Polymerization Indicator: NO
Conditions to Avoid Polymerization:
N/K

Section 11 - Toxicological Information
104 0724 TRIACETIN

Toxicological Information:
N/P

Section 12 - Ecological Information
104 0724 TRIACETIN

Ecological Information:
N/P

Section 13 - Disposal Considerations
104 0724 TRIACETIN

Waste Disposal Methods:
DISPOSE BY INCINERATION/CONTRACT W/LICENSED CHEMICAL WASTE DISPOSAL AGENCY. DISCHARGE, TREATMENT/DISPOSAL SHOULD BE IAW/LOCAL, STATE & FEDERAL REGULATIONS.

Section 14 - MSDS Transport Information
104 0724 TRIACETIN

Transport Information:
N/P

Section 15 - Regulatory Information
104 0724 TRIACETIN

SARA Title III Information:
N/P

12/19/2003
Federal Regulatory Information:
N/P
State Regulatory Information:
N/P

Section 16 - Other Information
104 0724 TRIACETIN

Other Information:
N/P

HAZCOM Label Information
Product Identification: 104 0724 TRIACETIN
CAGE: 19139
Assigned Individual: N
Company Name: EASTMAN KODAK CO GOVERNMENT MARKETS CONTRACTS
Company PO Box:
Company Street Address1: 343 STATE ST
Company Street Address2: ROCHESTER, NY 14650-1115 US
Health Emergency Telephone: (716) 722-5151
Label Required Indicator: Y
Date Label Reviewed: 12/16/1998
Status Code: C
Manufacturer's Label Number:
Date of Label: 12/16/1998
Year Procured: N/K
Organization Code: G
Chronic Hazard Indicator: N/P
Eye Protection Indicator: N/P
Skin Protection Indicator: N/P
Respiratory Protection Indicator: N/P
Signal Word: N/P
Health Hazard:
Contact Hazard:
Fire Hazard:
Reactivity Hazard:

8/8/2002 8:21:45 AM
ENSLIGN-BICKFORD CO  -- LEAD DIAZIDE

MSDS Safety Information

MSDS Date: 03/12/1993
MSDS Num: CKLHH
Product ID: LEAD DIAZIDE
MFN: 01
Responsible Party
Cage: 96336
Name: ENSIGN-BICKFORD CO
Address: 660 HOPMEADOW STREET
Box: 483
City: SIMSBURY CT 06070-0483
Info Phone Number: 203-843-2276
Emergency Phone Number: 203-658-441
Preparer's Name: T A SHREVE
Review Ind: Y
Published: Y

Contractor Summary

Cage: 96336
Name: ENSIGN-BICKFORD CO
Address: 660 HOPMEADOW STREET
Box: 483
City: SIMSBURY CT 06070-0483
Phone: 1-801-798-8613

Ingredients

Cas: 13424-46-9
RTECS #: OF8650000
Name: LEAD AZIDE (PB)(N32)
Percent by Wt: 91.5
OSHA PEL: 50 MG/M3 (PB)
ACGIH TLV: 0.15 MG/M3 (PB)

Health Hazards Data

Route Of Entry Inds - Inhalation: YES
Skin: YES
Ingestion: YES
Carcinogenicity Inds - NTP: NO
IARC: NO
OSHA: NO
Effects of Exposure: EYE CONTACT: MAY CAUSE IRRITATION, POSSIBLE CORNEAL INJURY. SKIN CONTACT: EXPOSURE MAY CAUSE IRRITATION & DERMATITIS. INHALATION: MAY CAUSE NASAL & RESPIRATORY IRRITATION. INGESTION: MAY BE FATAL OR CAUSE POISONING IF INGESTED. TOXICITY OF LEAD AZIDE HAS BEEN LINKED TO AZOMIDE RADICAL AS WELL AS PRESENCE OF LEAD. MAJOR SYMPTOMS OF AZIDE POISONING ARE SEVERE HYPOTENSION & PARALYSIS. SYMPTOMS OF LEAD POISONING INCLUDE LOSS OF APPETITE, ANEMIA, SLEEP DISORDERS, & FATIGUE. CHRONIC: LEAD AZIDE APPEARS ON NAVY LISTING OF OCCUPATIONAL CHEMICAL REPRODUCTIVE HAZARDS. SEEK CONSULTATION FROM APPROPRIATE HEALTH (EFTS OF OVEREXP)

Explanation Of Carcinogenicity: LEAD AZIDE IS NOT LISTED AS A POTENTIAL CARCINOGEN BY (NTP) (IARC) (OSHA).

Signs And Symptoms Of Overexposure: HLTH HAZ: PROFESSIONALS CONCERNING LATEST HAZARD LIST INFORMATION AND SAFE HANDLING AND EXPOSURE INFORMATION (FP N). THRESHOLD LIMIT VALUE: 0.15 MG/M3 AS LEAD (PB) (ACGIH).

First Aid: EYE CONTACT: FLUSH IMMEDIATELY UNDER RUNNING WATER FOR AT LEAST FIFTEEN MINUTES, SEEK MEDICAL ATTENTION. SKIN CONTACT: FLUSH IMMEDIATELY UNDER RUNNING WATER FOR AT LEAST FIFTEEN MINUTES. IF SKIN IRRITATION OCCURS, SEEK MEDICAL ATTENTION. INHALATION: MOVE VICTIM TO FRESH AIR. GIVE ARTIFICIAL RESPIRATION IF BREATHING HAS STOPPED. SEEK MEDICAL ATTENTION IMMEDIATELY. INGESTION: IF INGESTED, INDUCE VOMITING IMMEDIATELY BY STICKING FINGER DOWN VICTIM'S THROAT! SEEK MEDICAL ATTENTION IMMEDIATELY.

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Handling and Disposal

Spill Release Procedures: ISOLATE SPILL AREA, KEEP ALL SOURCES OF IGNITION AWAY FROM SPILL, & EVACUATE ALL NON-ESSENTIAL PERS TO SAFE DISTANT LOCATION.
REMOVE ALL EXPLOSIVES THAT WERE NOT INVOLVED IN SPILL FROM SPILL AREA. LEAD AZIDE IS EXTREMELY SENSITIVE EXPLOSIVE. IT IS POSSIBLE TO STEP ON LEAD AZIDE & HAVE IT DETONATE. DO NOT MOVE UNLESS THERE IS CLEAR PATH AWAY FROM SPILL AREA. SPILLED LEAD AZIDE SHOULD BE (SUPP) WASTE DISPOSAL METHODS: WASTE LEAD AZIDE SHOULD BE CHEMICALLY DESTROYED USING 20% CERIC AMMONIUM NITRATE & H2O KILLING SOLN. THOROUGHLY POUR LIBERAL AMTS OF KILLING SOLN OVER EXCESS LEAD AZIDE. RSLTG CHEM RXN WILL LIBERATE HYDRAZOIC ACID (HN3). USE NIOSH APPROVED SCBA/USE WELL VENT AREA TO PREVENT INHAL OF FUMES. ALTHOUGH RS LTG SOLN IS NOT EXPLOSIVE IT SHOULD BE (OTHER INFO) HANDLING AND STORAGE PRECAUTIONS: HANDLE AND STORE IN ACCORDANCE WITH ALL APPLICABLE REGULATIONS AND INDUSTRY PRACTICES GOVERNING CLASS A PRIMARY (INITIATING)/HAZARD CLASS 1.1A EXPLOSIVE (SEE REACTIVITY DATA SECTION). OTHER PRECAUTIONS: LEAD AZIDE WILL ALWAYS BE SHIPPED WET WITH A MINIMUM OF 20% AQUEOUS ETHANOL (CAS 64-17-5) DENATURED WITH METHANOL (CAS 67-56-1). REFER TO THE ENCLOSED MATERIAL DATA SHEETS FOR THE PROPERTIES OF THESE MATERIALS IF APPLICABLE.

Fire and Explosion Hazard Information

Autoignition Temp: =275 C, 527.5 F Extinguishing Media: MEDIA SUITABLE FOR SURROUNDING FIRE (FP N). AUTO IGNITION TEMP: 275C (527F) MINIMUM TEMPERATURE FOR IGNITION IN 5 SECONDS FOR DEXTRINATED LEAD AZIDE, U.S. ARMY REFERENCE. 

Fire Fighting Procedures: USE NIOSH APPROVED SCBA & FULL PROTECTIVE EQUIPMENT (FP N). DO NOT FIGHT FIRES INVOLVING LEAD AZIDE!

PRODUCT IS A PRIMARY (INITIATING) EXPLOSIVE AND MAY DETONATE WHEN EXPOSED TO HEAT OR FLAMES. ISOLATE THE AFFECTED AREA AND EVACUATE ALL PERSONNEL TO A DISTANT,
SAFE AREA.
Unusual Fire/Explosion Hazard: LEAD AZIDE IS PRIMARY (INITIATING) EXPLO.
THIS
PROD IS LIKELY TO DETONATE WHEN EXPOSED TO SHOCK, HEAT,
IMPACT, ELECTROSTATIC
DISCHARGE (SPARKS)/FRICTION. PROD SHOULD BE HANDLED ONLY BY
QUALIFIED INDIV
IDUALS WHO ARE THOROUGHLY FAMILIAR W/PROPER PRIMARY
EXPLOSIVES HANDLING
PROC. HAZ GASES (LEAD VAP, HYDRAZOIC (TOX INFO)

Control Measures

Respiratory Protection: NIOSH APPROVED DUST RESPIRATOR SHOULD BE WORN
WHEN
HANDLING DRY LEAD AZIDE. NIOSH APPROVED ORGANIC VAPOR
RESPIRATOR SHOULD BE
USED WHEN HANDLING WET LEAD AZIDE.
Ventilation: LOCAL EXHAUST: NONE REC DUE TO EXPLOSION HAZ. SPECIAL:
FOR
ADDITIONAL INFO ON LEAD SEE 29 CFR 1910.1025. MECH: EXHAUST VENT
REC TO MIN
EMPLOYEE EXPOSURE.
Protective Gloves: BUTYL RUBBER GLOVES.
Eye Protection: ANSI APPROVED CHEMICAL WORKERS GOGGLES (FP N).
Other Protective Equipment: EYE WASH & DELUGE SHWR MTG ANSI DESIGN
CRITERIA (FP
N). COTTON COVERALLS TO PROTECT AGAINST EMPLOYEE CONT W/LEAD
AZIDE; SHOULD BE
REPLACED WHEN CONTAM. CONDUCTIVE FOOTWEAR & FLOORING IS
ALSO RECOMMENDED.
Supplemental Safety and Health: SPILL PROC: CAREFULLY WIPE UP
LIBERALLY USING
SOPEX & H*2O SOLN/KILLED W/KILLING SOLN OF 1 PART CERRIC
AMMONIUM NITRATE
& 6 PARTS H*2O (APPROX 20%). DISPOSE OF SOPEX/H*2O SOLN BY
ADDING ABOVE
REFERENCED KILLING SOLN. TREAT ALL MTL TREATED W/KILLING
SOLN AS LEAD (PB)
WASTE. ALWAYS KILL LEAD AZIDE IN (OTHER INFO)

Physical/Chemical Properties

Melt/Freeze Pt: >275.C, 527.F
M.P/F.P Text: EXPLODES
Spec Gravity: 4.38
Solubility in Water: SLIGHT (0.02% @ 18C (64F))
Appearance and Odor: WHITE TO LIGHT BUFF CRYSTALS, ODORLESS.

Reactivity Data

Stability Indicator: YES
Stability Condition To Avoid: DO NOT STORE AT TEMP >66C (150F). ALWAYS
SHIP &
STORE BULK LEAD AZIDE WET W/ALCOHOL TO PVNT FREEZING. EXPOS
TO SHOCK, HEAT,
SPKS, PRESS/IMPACT MAY RSLT IN (ECOLOGICAL INFO)
Materials To Avoid: COPPER AND COPPER ALLOYS, SILVER, MERCURY,
CADMIUM NICKEL,
ACIDS, AND OXIDANTS.
Hazardous Decomposition Products: IN PRESENCE OF MOISURE (H*2O), LEAD
AZIDE
REACTS W/COPPER (CU) & COPPER BEARING ALLOYS TO FORM UNSTABLE
BY-PRODUCTS.
LEAD AZIDE SHOULD NOT BE MFRD, STORED/LOADED IN COPPER/COPPER
ALLOY (TOX
INFO)
Hazardous Polymerization Indicator: NO
Conditions To Avoid Polymerization: WILL NOT OCCUR.

Toxicological Information

Toxicological Information: N/P. HAZ DECOMP PROD: CONTAINERS (I.E. BRASS OR
BRONZE). HAZARDOUS DECOMPOSITION GASES ARE LEAD VAPOR AND
HYPRAZOIC ACID
(HN*3). EXPO HAZ: ACID, & NITROGEN OXIDES (NO**X'S) MAY BE
RELEASED WHEN
LEAD AZIDE BURNS OR DETONATES. IF LEAD AZIDE IS EXPOSED TO
FIRE AND IT DOES
NOT DETONATE, IT WILL BURN VIGOROUSLY.

Ecological Information

Ecological: N/P. DETONATION. (ENERGY VALUES AS LOW AS 2X10 JOULES
HAVE BEEN
SHOWN TO INITIATE LEAD AZIDE W/METAL TO METAL CNCTCT IN LAB
EXPERIMENTS).

MSDS Transport Information

Regulatory Information

Sara Title III Information: SARA 313 NOTIFICATION: "THIS PRODUCT CONTAINS LEAD & LEAD COMPOUNDS THAT ARE SUBJECT TO THE REPORTING REQUIREMENTS OF SECTION 313 TITLE III OF THE SUPERFUND AMENDMENT AND REAUTHORIZATION ACT OF 1986 40 CR PART 372."

State Regulatory Information: CALIFORNIA PROPOSITION 65 NOTIFICATION: "LEAD & LEAD COMPOUNDS ARE LISTED ON CALIFORNIA SAFE DRINKING WATER & TOXIC ENFORCEMENT ACT OF 1986 (PROPOSITION 65) AS A CHEMICAL KNOWN TO THE STATE TO CAUSE CANCER. LEAD IS LISTED AS A CHEMICAL KNOWN TO THE STATE TO CAUSE REPRODUCTIVE TOXICITY."

Other Information

Other Information: CHEM NAME: LEAD AZIDE. CHEM FAMILY: METAL SALT OF INORG ACD. FORMULA: Pb(N3)2. SUPDAT: WELL VENT AREA/USE NIOSH APPROVED SCBA TO PREVENT INHAL OF HYDRAZOIC ACID (HN*3) FUMES. WASTE DISP METH-TREATED AS LEAD (PB) WASTE. LEAD WASTE IS HAZ. WASTE AS DEFINED UNDER RCRA REGULATIONS, MUST BE DISPOSED OF AT PROPERLY PERMITTED TREATMENT/STORAGE/DISPOSAL FACILITY (TSD). LEAD AZIDE DISPOSAL & ALL RELATED, REGULATED ACTIVITIES, (INCLUDING BUT NOT LIMITED TO HANDLING, LABELING, PACKAGING, STORAGE, AND TRANSPORTATION MUST BE PERFORMED IN ACCORDANCE WITH ALL APPLICABLE LOCAL, STATE, AND FEDERAL LAWS & REGULATIONS.

HAZCOM Label
Product ID: LEAD DIAZIDE
 Cage: 96336
 Company Name: ENSIGN-BICKFORD CO
 Street: 660 HOPMEADOW STREET
 PO Box: 483
 City: SIMSBURY CT
 Zipcode: 06070-0483
 Health Emergency Phone: 203-658-441
 Label Required IND: Y
 Date Of Label Review: 05/11/2000
 Status Code: A
 Origination Code: F
 Chronic Hazard IND: Y
 Eye Protection IND: YES
 Skin Protection IND: YES
 Signal Word: DANGER
 Respiratory Protection IND: YES
 Health Hazard: Moderate
 Contact Hazard: Moderate
 Fire Hazard: Slight
 Reactivity Hazard: Severe
 Hazard And Precautions: EXPLOSIVE! ACUTE: EYE CONTACT: MAY CAUSE IRRITATION, POSSIBLE CORNEAL INJURY. SKIN CONTACT: EXPOSURE MAY CAUSE IRRITATION & DERMATITIS. INHALATION: MAY CAUSE NASAL & RESPIRATORY IRRITATION. INGESTION: MAY BE FATAL OR CAUSE POISONING IF INGESTED.
 TOXICITY OF LEADAZIDE HAS BEEN LINKED TO AZOMIDE RADICAL AS WELL AS PRESENCE OF LEAD. MAJOR SYMPTOMS OF AZIDE POISONING ARE SEVERE HYPOTENSION & PARALYSIS. SYMPTOMS OF LEAD POISONING INCLUDE LOSS OF APPETITE, ANEMIA, SLEEP DISORDERS, & FATIGUE. CHRONIC: LEAD AZIDE APPEARS ON NAVY LISTING OF OCCUPATIONAL CHEMICAL REPRODUCTIVE HAZARDS (FP N).

Disclaimer (provided with this information by the compiling agencies): This information is formulated for use by elements of the Department of Defense. The United States of America in no manner whatsoever expressly or implied warrants, states, or intends said information to have any application, use or viability by or to any person or persons outside the Department of Defense nor any person or persons contracting with any instrumentality of the United
States of America and disclaims all liability for such use. Any person utilizing this instruction who is not a military or civilian employee of the United States of America should seek competent professional advice to verify and assume responsibility for the suitability of this information to their particular situation regardless of similarity to a corresponding Department of Defense or other government situation.
MSDS Safety Information

FSC: 8030
MSDS Date: 01/12/1993
MSDS Num: BW282
LIIN: 00N07915
Product ID: SC-1073 BLUE
MHN: 01
Responsible Party
Cage: 87354
Name: SPRAYLAT CORP
Address: 716 SOUTH COLUMBUS AVE
City: MT VERNON NY 10550
Info Phone Number: 914-699-3030
Emergency Phone Number: 800-424-9300 (CHEMTREC)
Preparer's Name: MICHAEL A SPATH
Published: Y

Contractor Summary

Cage: 87354
Name: SPRAYLAT CORPORATION
Address: 716 SOUTH COLUMBUS AVENUE
City: MT. VERNON NY 10550
Phone: 914-699-3030; 310-559-2335

Ingredients

Cas: 56189-09-4
Name: LEAD STEARATE (SARA 313) (CERCLA)
% Wt: <10
OSHA PEL: SEE 1910.1025
ACGIH TLV: 0.15 MG/(PB)/M3

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Cas: 1317-80-2
RTCS #: VM2940000
Name: RUTILE; (TITANIUM DIOXIDE)
% Wt: <10
OSHA PEL: 10 MG/M3 TDUST Z1A
ACGIH TLV: 10 MG/M3 8990

Name: HLTH HAZ: CONSULT FROM APPROP HLTH PROFESSIONALS CONCERNING LATEST HAZ
LIST INFO & SAVE HNDLG & EXPOS INFO (FP N).

Name: FIRST AID: BY A PHYSICIAN. CONTACT A PHYSICIAN IMMEDIATELY.

Name: RESP PROT: (APPRO) DURING & AFTER APPLICATN UNLESS AIR MONITORING
DEMONSTRATES VAP/MIST LEVELS ARE BELOW

Name: RESP PROT: APPLICABLE LIMITS. FOLLOW RESP MFR DIRECTIONS FOR USE.

Name: PROT GLOVES: CONT. WEAR RST RGLOVES SUCH AS NATRL RUB, NEOPRENE, BUNA
N/NITRILE.

Name: VENT: NIOSH/MSHA APPROVED RESP TO PREVENT OVEREXPOS. FOR ING 1, SEE OSHA

Name: SPILL PROC: NOTIFY LOCAL HEALTH & POLLUTION CONTROL AGENCIES. CALL
SPILL RESPONSE TEAMS IF SPILL IS LARGE.

Name: SPILL PROC: DO NOT FLUSH TO SEWER, WATERSHED OR WATERWAY.
lead stearate.txt

Name: FIRE FIGHT PROC: SAFE DISTANCE OR A PROTECTED LOCATION.

Health Hazards Data

LD50 LC50 Mixture: NONE SPECIFIED BY MANUFACTURER.
Route Of Entry Inds - Inhalation: YES
Skin: YES
Ingestion: YES
Carcinogenicity Inds - NTP: NO
IARC: NO
OSHA: NO
Effects of Exposure: ING 1: CHRONIC OVEEXP OR INGEST MAY CAUSE POSS KIDNEY
DMG, CNS DEPRESS/DISORDER, DELAYED EFTS INVOLVING BLOOD, GI, NERV & REPRO
SYS, MOOD, NUS, VOMIT, DIZZ/LOSS OF CONSCIOUSNESS, REPRO SYS DMG IN S OME
LAB ANIMALS, TESTICULAR INJURY. MAY CAUSE APPETITE LOSS. INGEST/EXCESSIVE
INHAL MAY BE FATAL.
Explanation Of Carcinogenicity: NOT RELEVANT.
Signs And Symptoms Of Overexposure: MAY RESULT IN TOXIC LEAD LEVELS IN BODY.
SEE OSHA STD 29 CFR 1910.1025. MAY CAUSE NOSE, THROAT & UPPER RESP TRACT
IRRIT. SPRAY MIST/VAP/VAPS OF SPRAY PAINTS MAY CAUSE IRRIT TO THE EYES, NOSE,
THROAT, UPPE R RESP TRACT, MUCOUS MEMBRANES & SKIN. INGEST WILL AT FIRST
ACT AS A STIMULANT, FOLLOWED BY SYMP OF MENTAL (SOP DAT)
Medical Cond Aggravated By Exposure: NONE SPECIFIED BY MANUFACTURER.
First Aid: EYES: FLUSH W/LUKE WARM WATER FOR AT LEAST 15 MIN. SEEK MD IMMEDIATELY.
SKIN: FLUSH W/COPIOUS AMOUNTS OF LUKE WARM WATER. REMOVE CONTAM CLOTH PROMPTLY.
CONT MD IMMEDIATELY. INHALE: IF EXPOSURE, PERS TO FRESH AIR. REST OR BREATHE IF
NEEDED. CONT MD IMMEDIATELY. INGEST: RINSE MOUTH IMMEDIATELY. GIVE EXPOSURE PERS 6 TO 8
OUNCE OF LIQUID. (NEVER GIVE ANYTHING BY MOUTH TO UNCONSCIOUS PERS). DO NOT
INDUCE VOMIT UNLESS ADVISED

Handling and Disposal

Spill Release Procedures: STAY UPWIND & AWAY FROM SPILL UNLESS WEARING
APPROPRIATE PROT EQUIP. STOP &/CONTAIN DISCHARGE IF IT MAY BE DONE
SAFELY. KEEP ALL IGNITION SOURCES AWAY. VENT AREA OF SPILL. KEEP OUT OF
DRAINS, SEWERS/W ATERWAYS. CONT FIRE AUTH.
Neutralizing Agent: NONE SPECIFIED BY MANUFACTURER.
Waste Disposal Methods: DISPOSE OF PRODUCT IN ACCORDANCE WITH APPLICABLE LOCAL,
COUNTY, STATE AND FEDERAL REGULATIONS.
Handling And Storage Precautions: KEEP PROD CONTRS COOL & DRY. USE &
STORE THIS PROD W/ADEQUATE VENT. DO NOT SMOKE IN STORAGE AREAS. KEEP CONTRS
TEMPERATURES-CLOSED. DO NOT STORE IN UNVENTED AREA. WHEN NOT IN USE. CONTINUOUSLY
OTHER PRECAUTIONS: PERS SHOULD AVOID INHAL OF VAP/MIST. PERS CONT W/PROT
SHOULD BE AVOIDED. PROTEFACTORS OF THIS MAT MAY BE HAZ WHEN EMPTIED. EMPTIED
CONTAS RETAIN PROT RESIDES (VAP, LIQUID, &/SOLID), OBSERVE ALL HAZARD PR
ECUATIONS.

Fire and Explosion Hazard Information

Extinguishing Media: CARBON DIOXIDE, DRY CHEMICALS, FOAM OR WATER FOG.
Fire Fighting Procedures: WEAR NIOSH/MSHA APPRV D SCBA & FULL PROT EQUIP (FP
N). CLEAR FIRE AREA OF UNPROT PERS. DO NOT ENTER CONFINED SPACE WITHOUT
PERMISSION. FIGHT FIRE FROM A
Unusual Fire/Explosion Hazard: NONE SPECIFIED BY MANUFACTURER.

Control Measures

Respiratory Protection: USE NIOSH/MSHA APPRV DUST MASK/RESPIRATOR IF CONC IS
HIGH. BASED ON ING 1, SEE OSHA STD 29 CFR 1910.1225 FOR APPROP RESP &
OTHER PROT EQUIP. DO NOT BREATHE VAP OF ANY SPRAY PAINT. WEAR APPROP, PROPERLY FITTED RESP (NIOSH/MSHA)
Ventilation: USE AS REQUIRED TO CONTROL VAP/JUST/MIST CONC. AVOID
Physical/Chemical Properties

B.P. Text: >200°F, >93°C
Spec Gravity: 1.04 (FPM)
Solubility in Water: SOLUBLE
Appearance and Odor: BLUE LIQUID WITH MILD ODOR.

Reactivity Data

Stability Indicator: YES
Stability Condition To Avoid: AVOID EXPOSURE TO SPARKS, OPEN FLAME, HOT SURFACES, & ALL SOURCES OF HEAT & IGNITION.
Materials To Avoid: BASED ON INGREDIENT 2 THIS PRODUCT IS INCOMPATIBLE WITH STRONG OXIDIZERS. MAY CAUSE FIRE OR EXPLOSION ON CONTACT.
Hazardous Decomposition Products: IN PRESENCE OF AIR MAY YIELD CO &/OR CO2. BASED ON INGREDIENT 1 MAY FORM LEAD/CHROMIUM OXIDES.
Hazardous Polymerization Indicator: NO
Conditions To Avoid Polymerization: NOT RELEVANT.

Toxicological Information

Ecological Information

MSDS Transport Information

Regulatory Information

other Information


HAZCOM Label

Product ID: SC-1073 BLUE
Cage: 87354
Company Name: SPRAYLAT CORPORATION
Street: 716 SOUTH COLUMBUS AVENUE
City: MT. VERNON NY
Zipcode: 10550
Health Emergency Phone: 800-424-9300 (CHEMTREC)
Label Required IND: Y
Date of Label Review: 03/10/1995
Status Code: C
Label Date: 03/10/1995
Origination Code: G
Chronic Hazard IND: Y
Eye Protection IND: YES
Skin Protection IND: YES
Signal Word: WARNING
Respiratory Protection IND: YES
Health Hazard: Moderate
Contact Hazard: Slight
Fire Hazard: None
Reactivity Hazard: None
Hazard And Precautions: ACUTE: LOSS OF APPETITE, CNS DEPRESSION, LUNG INJURY,
IRRITATION OF EYES, NOSE, THROAT, UPPER RESP TRACT, MUCOUS MEMBRANES &
SKIN. INGEST: CAN BE FATAL. CHRONIC: LEAD APPEARS ON THE NAVY OCCUPATION CH
EMICAL REPRODUCTIVE HAZARDS LIST (FP N). INGEST: KIDNEY DAMAGE, CNS
DEPRESSION/DISORDER. OVEREXPOSURE MAY CAUSE BLOOD & GI EFFECTS, HEADACHE,
NAUSEA, VOMITING, DIZZINESS/LOSS OF CONSCIOUSNESS.

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Division of Facilities Services

DOD Hazardous Material Information (ANSI Format)
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Section 1 - Product and Company Identification
2-NITRODIPHENYLAMINE, 98%, 157171

Product Identification: 2-NITRODIPHENYLAMINE, 98%, 157171
Date of MSDS: 09/07/1993 Technical Review Date: 07/07/1994
FSC: 6810 NIIN: LIIN: 00N050296
Submitter: N EN
Status Code: C
MFN: 01
Article: N
Kit Part: N

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Manufacturer's Information

Manufacturer's Name: ALDRICH CHEMICAL CO INC
Post Office Box: 355
Manufacturer's Address1: MILWAUKEE, WI 53201
Manufacturer's Country: US
General Information Telephone: 414-273-3850
Emergency Telephone: 414-273-3850
Emergency Telephone: 414-273-3850
MSDS Preparer's Name: N/P
Proprietary: N
Reviewed: N
Published: Y
CAGE: 60928
Special Project Code: N

Contractor Information

Contractor's Name: ALDRICH CHEMICAL CO INC
Post Office Box: 355
Contractor's Address1: 1001 WEST ST PAUL AVE
Contractor's Address2: MILWAUKEE, WI 53233
Contractor's Telephone: 414-273-3850
Contractor's CAGE: 60928

Section 2 - Composition/Information on Ingredients
2-NITRODIPHENYLAMINE, 98%, 157171

Ingredient Name: 2-NITRODIPHENYLAMINE
Ingredient CAS Number: 119-75-5 Ingredient CAS Code: M
RTECS Number: RTECS Code: X
=WT: =WT Code:
>Volume: >Volume Code:
<WT: <WT Code:
<Volume: <Volume Code:
% Low WT: % Low WT Code:
% High WT: % High WT Code:
% Low Volume: % Low Volume Code:
% High Volume: % High Volume Code:
% Text: 98
% Environmental Weight:
Other REC Limits: N/K
OSHA PEL: N/K (FP N) OSHA PEL Code: M
OSHA STEL: OSHA STEL Code:
ACGIH TLV: N/K (FP N) ACGIH TLV Code: M
ACGIH STEL: N/P ACGIH STEL Code:
EPA Reporting Quantity:
DOT Reporting Quantity:
Ozone Depleting Chemical: N

Section 3 - Hazards Identification, Including Emergency Overview
2-NITRODIPHENYLAMINE, 98%, 157171

Health Hazards Acute & Chronic: ACUTE: MAY BE HARMFUL BY INHALATION, INGESTION OR SKIN ABSORPTION. CAUSES EYE & SKIN IRRITATION. MATERIAL IS IRRITATING TO MUCOUS MEMBRANES & UPPER RESPIRATORY TRACT. TO THE BEST OF MFR'S KNOWLEDGE, THIS CHEMICAL, PHYSICAL & TOXICOLOGICAL PROPERTIES HAVE NOT BEEN THOROUGHLY INVESTIGATED.

Signs & Symptoms of Overexposure:
SEE HEALTH HAZARDS.

Medical Conditions Aggravated by Exposure:
NONE SPECIFIED BY MANUFACTURER.

LD50 LC50 Mixture: NONE SPECIFIED BY MANUFACTURER.

Route of Entry Indicators:
Inhalation: YES
Skin: YES
Ingestion: YES

Carcinogenicity Indicators
NTP: NO
IARC: NO
OSHA: NO

Carcinogenicity Explanation: NOT RELEVANT

Section 4 - First Aid Measures
2-NITRODIPHENYLAMINE, 98%, 157171

First Aid:
EYES: IMMEDIATELY FLUSH WITH COPIOUS AMOUNTS OF WATER FOR AT LEAST 15 MINUTES. SKIN: IMMEDIATELY WASH WITH SOAP & COPIOUS AMOUNTS OF WATER. WASH CONTAMINATED CLOTHING BEFORE REUSE. INHAL.: REMOVE TO FRESH AIR. IF NOT BREATHING GIVE ARTIFICIAL RESPIRATION. IF BREATHING IS DIFFICULT, GIVE OXYGEN. INGEST: WASH OUT MOUTH WITH WATER PROVIDED PERSON IS CONSCIOUS. CALL MD.

Section 5 - Fire Fighting Measures
2-NITRODIPHENYLAMINE, 98%, 157171

Fire Fighting Procedures:
USE NIOSH/MSHA APPROVED SCBA & FULL PROTECTIVE EQUIPMENT (FPN).
Unusual Fire or Explosion Hazard:
EMITS TOXIC FUMES UNDER FIRE CONDITIONS.
Extinguishing Media:
WATER SPRAY, CARBON DIOXIDE, DRY CHEMICAL POWDER OR APPROPRIATE FOAM.
Flash Point: Flash Point Text: N/K

Autoignition Temperature:
Autoignition Temperature Text: N/A
Lower Limit(s): N/K
Upper Limit(s): N/K

Section 6 - Accidental Release Measures
2-NITRODIPHENYLAMINE, 98%, 157171

Spill Release Procedures:
WEAR NIOSH/MSHA APPROVED SCBA, RUBBER BOOTS & HEAVY RUBBER GLOVES.
Sweep up, place in a bag & hold for waste disposal. AVOID RAISING DUST.
VENTILATE AREA & WASH SPILL SITE AFTER MATERIAL PICKUP IS COMPLETE.

Section 7 - Handling and Storage
2-NITRODIPHENYLAMINE, 98%, 157171

Handling and Storage Precautions:

Other Precautions:

Section 8 - Exposure Controls & Personal Protection
2-NITRODIPHENYLAMINE, 98%, 157171

Respiratory Protection:
NIOSH/MSHA APPROVED RESPIRATOR.

Ventilation:
MECHANICAL EXHAUST REQUIRED.

Protective Gloves:
RUBBER GLOVES.

Eye Protection: ANSI APPROVED CHEM WORKER GOGGLES (FP N).

Other Protective Equipment: EMERGENCY EYE WASH AND DELUGE SHOWER WHICH
MEET ANSI DESIGN CRITERIA (FP N).

Work Hygiene Practices: WASH THOROUGHLY AFTER HANDLING.

Supplemental Health & Safety Information: NONE SPECIFIED BY MANUFACTURER.

Section 9 - Physical & Chemical Properties
2-NITRODIPHENYLAMINE, 98%, 157171

HCC:
NRC/State License Number:
Net Property Weight for Ammo:
Boiling Point: Boiling Point Text: N/K
Melting/Freezing Point: Melting/Freezing Text: >165F, >74C
Decomposition Point: Decomposition Text: N/K
Vapor Pressure: N/K Vapor Density: 10.7
Percent Volatile Organic Content:
Specific Gravity: N/K
Volatile Organic Content Pounds per Gallon:
PH: N/K
Volatile Organic Content Grams per Liter:
Viscosity: N/P
Evaporation Weight and Reference: N/K
Solubility in Water: N/K
Appearance and Odor: RED-ORANGE CRYSTALS.
Percent Volatiles by Volume: N/K
Corrosion Rate: N/K

Section 10 - Stability & Reactivity Data
2-NITRODIPHENYLAMINE, 98%, 157171
Stability Indicator: YES
Materials to Avoid:
STRONG OXIDIZING AGENTS, STRONG ACIDS, STRONG BASES.
Stability Condition to Avoid:
NONE SPECIFIED BY MANUFACTURER.
Hazardous Decomposition Products:
TOXIC FUMES OF: CARBON MONOXIDE, CARBON DIOXIDE, NITROGEN OXIDES.
Hazardous Polymerization Indicator: NO
Conditions to Avoid Polymerization:
NOT RELEVANT

Section 11 - Toxicological Information
2-NITRODIPHENYLAMINE, 98%, 157171
Toxicological Information:
N/P

Section 12 - Ecological Information
2-NITRODIPHENYLAMINE, 98%, 157171
Ecological Information:
N/P

Section 13 - Disposal Considerations
2-NITRODIPHENYLAMINE, 98%, 157171
Waste Disposal Methods:
DISSOLVE OR MIX THE MATERIAL W/COMBUSTIBLE SOLVENT & BURN IN A CHEMICAL INCINERATOR EQUIPPED W/AFTERBURNER & SCRUBBER. OBSERVE ALL FEDERAL, STATE & LOCAL ENVIRONMENTAL REGULATIONS.

Section 14 - MSDS Transport Information
2-NITRODIPHENYLAMINE, 98%, 157171
Transport Information:
N/P

Section 15 - Regulatory Information
2-NITRODIPHENYLAMINE, 98%, 157171

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SARA Title III Information:
N/P
Federal Regulatory Information:
N/P
State Regulatory Information:
N/P

Section 16 - Other Information
2-NITRODIPHENYLAMINE, 98%, 157171

Other Information:
N/P

HAZCOM Label Information
Product Identification: 2-NITRODIPHENYLAMINE, 98%, 157171
CAGE: 60928
Assigned Individual: N
Company Name: ALDRICH CHEMICAL CO INC
Company PO Box: 355
Company Street Address 1: 1001 WEST ST PAUL AVE
Company Street Address 2: MILWAUKEE, WI 53233 US
Health Emergency Telephone: RUBBER GLOVES.
Label Required Indicator: Y
Date Label Reviewed: 07/07/1994
Status Code: C
Manufacturer's Label Number:
Date of Label: 07/07/1994
Year Procured: N/K
Organization Code: G
Chronic Hazard Indicator: N
Eye Protection Indicator: N/P
Skin Protection Indicator: N/P
Respiratory Protection Indicator: N/P
Signal Word: CAUTION
Health Hazard: Slight
Contact Hazard: Slight
Fire Hazard: None
Reactivity Hazard: None

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DOD Hazardous Material Information (ANSI Format)
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H2SO4

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Section 1 - Product and Company Identification
H2SO4

Product Identification: H2SO4
Date of MSDS: 01/01/1987 Technical Review Date: 08/12/1986
FSC: 6810 NIIN: 00-551-5231
Submitter: F BT
Status Code: C
MFN: 01
Article: N
Kit Part: N

Manufacturer's Information
Manufacturer's Name: NATIONAL ZINC CO
Manufacturer's Address1: BARTLESVILLE, OK 74003
Manufacturer's Country: NK
General Information Telephone: 918-336-7100
Emergency Telephone: 918-336-7100
Emergency Telephone: 918-336-7100
MSDS Preparer's Name: N/P
Proprietary: N
Reviewed: Y
Published: Y
CAGE: 91963
Special Project Code: N

Item Description
Item Name: SULFURIC ACID, ELECTROLYTE

Item Manager: S9G

Specification Number: O-S-801

Type/Grade/Class: 1 CL

Unit of Issue: DR Quantitative Expression: 10000000065GL

Unit of Issue Quantity: 1

Type of Container: DRUM

Contractor Information

Contractor's Name: NATIONAL ZINC CO

Contractor's Address1: UNKNOWN

Contractor's Address2: BARTLESVILLE, OK 74003

Contractor's Telephone: 918-336-7100

Contractor's CAGE: 91963

Section 2 - Composition/Information on Ingredients

H2SO4

Ingredient Name: SULFURIC ACID (SARA III)

Ingredient CAS Number: 7664-93-9 Ingredient CAS Code: M

RTECS Number: WS5600000 RTECS Code: M

=WT: =WT Code:

=Volume: =Volume Code:

>WT: >WT Code:

>Volume: >Volume Code:

<WT: <WT Code:

<Volume: <Volume Code:
Section 3 - Hazards Identification, Including Emergency Overview

H2SO4

Health Hazards Acute & Chronic: N/P

Signs & Symptoms of Overexposure:
BURNS TO SKIN, EYES, NOSE, AND OTHER MEMBRANES. CHRONIC - FIBROSIS, EMPHYSEMA, CONJUNCTIVITIS.

Medical Conditions Aggravated by Exposure:
N/P
Section 4 - First Aid Measures

H2SO4

First Aid:

FLUSH EYES AND SKIN WITH WATER FOR AT LEAST 15 MINUTES. INHALATION: REMOVE TO UNCONTAMINATED AREA. INGESTION: DRINK LARGE AMOUNTS OF WATER. GET MEDICAL TREATMENT. ADMINISTRATION OF OXYGEN ADEQUATE BUT SHOULD BE CONTROLLED BY ARTERIAL BLOODGAS VERIFICATION.
Fire Fighting Procedures:

N/P

Unusual Fire or Explosion Hazard:

REACTS WITH SOME METALS TO RELEASE POTENTIALLY EXPLOSIVE HYDROGEN GAS. IGNITES ORGANIC MATERIALS.

Extinguishing Media:

USE MEDIA SUITABLE FOR SURROUNDING FIRE.

Flash Point: Flash Point Text: NONE

Autoignition Temperature:
Autoignition Temperature Text: N/A
Lower Limit(s): N/R
Upper Limit(s): N/R

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Section 6 - Accidental Release Measures

H2SO4

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Spill Release Procedures:

NEUTRALIZE THE ACID. WASH DOWN WITH COPIOUS AMOUNTS OF WATER. ZONE OFF AREA. VENTILATE THOROUGHLY. CAN BE NEUTRALIZED CAREFULLY WITH SODIUM CARBONATE (SODA ASH) WASHING SODA.

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Section 7 - Handling and Storage

H2SO4

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Handling and Storage Precautions:
Other Precautions:

Section 8 - Exposure Controls & Personal Protection
H2SO4

Respiratory Protection:
NIOSH APPROVED SUPPLIED AIR, SELF CONTAINED OR ACID MIST CARTRIDGE

Ventilation:
LOCAL EXHAUST, ENCLOSURE, SURFACE ACTIVE AGENTS OR CHIPS

Protective Gloves:
RUBBER

Eye Protection: FACE SHIELD, GOGGLES
Other Protective Equipment: IMPERVIOUS CLOTHING, SAFETY SHOWERS, EYE WASH
Work Hygenic Practices: WASH THOROUGHLY AFTER HANDLING.
Supplemental Health & Safety Information: N/P

Section 9 - Physical & Chemical Properties
H2SO4

HCC: C1
NRC/State License Number: N/R
Net Property Weight for Ammo: N/R
Boiling Point: Boiling Point Text: 538°F, 281°C
Melting/Freezing Point: Melting/Freezing Text: UNKNOWN
Decomposition Point: Decomposition Text: UNKNOWN
Vapor Pressure: UNKNOWN Vapor Density: UNKNOWN
Percent Volatile Organic Content:
Specific Gravity: 1.8354
Volatile Organic Content Pounds per Gallon:
P pH: N/K
Volatile Organic Content Grams per Liter:
Viscosity: UNKNOWN
Evaporation Weight and Reference: UNKNOWN
Solubility in Water: COMPLETE
Appearance and Odor: CLEAR, COLORLESS TO CLOUDY LIQUID. BITING ODOR.
Percent Volatiles by Volume: N/K
Corrosion Rate: UNKNOWN

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Section 10 - Stability & Reactivity Data
H2SO4

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Stability Indicator: YES
Materials to Avoid:
SEE SECTION IX
Stability Condition to Avoid:
HIGH HEAT, MOISTURE
Hazardous Decomposition Products:
OXIDES OF SULFUR, HYDROGEN SULFIDE, HYDROGEN GAS
Hazardous Polymerization Indicator: NO
Conditions to Avoid Polymerization:
N/R

Section 11 - Toxicological Information
H2SO4

Toxicological Information:
N/P

Section 12 - Ecological Information
H2SO4

Ecological Information:
N/P

Section 13 - Disposal Considerations
H2SO4

Waste Disposal Methods:
DISPOSE IN ACCORDANCE WITH LOCAL, STATE, AND FEDERAL REGULATIONS. NEUTRALIZATION TO THE REQUIRED PH IS THE MOST FREQUENT PRACTICE PRIOR
TO DISPOSAL. HYDROGEN SULFIDE GAS IS FORMED WHEN ACID CONTACTS SULFIDES IN SEWERS.

Section 14 - MSDS Transport Information

H2SO4

Transport Information:
N/P

Section 15 - Regulatory Information

H2SO4

SARA Title III Information:
N/P

Federal Regulatory Information:
N/P

State Regulatory Information:
N/P

Section 16 - Other Information

H2SO4
Other Information:

N/P

HMIS Transportation Information
Product Identification: H2SO4
Transportation ID Number: 76491
Responsible Party CAGE: 91963
Date MSDS Prepared: 01/01/1987
Date MSDS Reviewed: 10/06/1982
MFN: 10/06/1982
Submitter: F KT
Status Code: C

Container Information
Unit of Issue: DR
Container Quantity: 1
Type of Container: DRUM
Net Unit Weight: 99.71 LBS
Article without MSDS: N
Technical Entry NOS Shipping Number:
Radioactivity: N/R
Form:
Net Explosive Weight: N/R
Coast Guard Ammunition Code:
Magnetism: N/P
AF MMAC Code:
DOD Exemption Number:
Limited Quantity Indicator:
Multiple Kit Number: 0
Kit Indicator: N
Kit Part Indicator: N
Review Indicator: Y
Additional Data:
NOT ACCEPTABLE FOR AIR TRANSPORTATION DUE TO CONTAINER AND QUANTITY.

Department of Transportation Information
DOT Proper Shipping Name: SULFURIC ACID
DOT PSN Code: NUC
Symbols:
DOT PSN Modifier: WITH MORE THAN 51 PERCENT ACID
Hazard Class: 8
UN ID Number: UN1830
DOT Packaging Group: II
Label: CORROSIVE
Special Provision(s): A3,A7,B3,B83,B84,N34,T9,T27
Packaging Exception: 154
Non Bulk Packaging: 202
Bulk Packaging: 242
Maximum Quantity in Passenger Area: 1 L
Maximum Quantity in Cargo Area: 30 L
Stow in Vessel Requirements: C
Requirements Water/Sp/Other: 14

IMO Detail Information
IMO Proper Shipping Name: SULPHURIC ACID
IMO PSN Code: OFJ
IMO PSN Modifier: ,WITH MORE THAN 51% ACID
IMDG Page Number: 8230
UN Number: 1830
UN Hazard Class: 8
IMO Packaging Group: II
Subsidiary Risk Label: -
EMS Number: 8-06
Medical First Aid Guide Number: 700

IATA Detail Information
IATA Proper Shipping Name: FORBIDDEN BY THIS MODE OF TRANSPORTATION
IATA PSN Code: ZZY
IATA PSN Modifier:
IATA UN Id Number: N/R
IATA UN Class: N/R
Subsidiary Risk Class: N/R
UN Packaging Group: N/R
IATA Label: N/R
Packaging Note for Passengers: N/R
Maximum Quantity for Passengers: N/R
Packaging Note for Cargo: N/R
Maximum Quantity for Cargo: N/R
Exceptions: N/R

AFI Detail Information
AFI Proper Shipping Name: SULPHURIC ACID
AFI Symbols:
AFI PSN Code: XIX
AFI PSN Modifier: WITH MORE THAN 51% ACID
AFI UN Id Number: UN1830
AFI Hazard Class: 8
AFI Packing Group: II
AFI Label:

Special Provisions: P4, A3, A7, N34
Back Pack Reference: A12.3

HAZCOM Label Information
Product Identification: H2SO4
CAGE: 91963
Assigned Individual: N
Company Name: NATIONAL ZINC CO
Company PO Box:
Company Street Address1: UNKNOWN
Company Street Address2: BARTLESVILLE, OK 74003 NK
Health Emergency Telephone: 918-336-7100
Label Required Indicator: Y
Date Label Reviewed: 09/12/1990
Status Code: C
Manufacturer's Label Number: N/R
Date of Label: 09/12/1990
Year Procured: N/K
Organization Code: F
Chronic Hazard Indicator: N
Eye Protection Indicator: YES
Skin Protection Indicator: YES
Respiratory Protection Indicator: YES
Signal Word: DANGER
Health Hazard: Severe
Contact Hazard: Severe
Fire Hazard: Slight
Reactivity Hazard: Slight
**Division of Facilities Services**

**DOD Hazardous Material Information (ANSI Format)**
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### MURIATIC ACID, 20 BE

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### Section 1 - Product and Company Identification

- **MURIATIC ACID, 20 BE**
- **Product Identification:** MURIATIC ACID, 20 BE
- **Date of MSDS:** 01/01/1987 **Technical Review Date:** 03/06/1996
- **FSC:** 6810 **NIIN:** 00-823-8010
- **Submitter:** D DG
- **Status Code:** C
- **MFN:** 01
Manufacturer's Information

Manufacturer's Name: HOOKER CHEMICALS & PLASTICS CORP
Manufacturer's Address1: 75 RIVER RD
Manufacturer's Address2: NUTLEY, NJ 07110-3513
Manufacturer's Country: US
General Information Telephone:
Emergency Telephone: 800-424-9300(CHEMTREC)
Emergency Telephone: 800-424-9300(CHEMTREC)
MSDS Preparer's Name: UNKNOWN
Proprietary: N
Reviewed: Y
Published: Y
CAGE: 73675
Special Project Code: N

Item Description

Item Name: HYDROCHLORIC ACID, TECHNICAL
Item Manager: S9G
Specification Number: ASTM E 1146-92
Type/Grade/Class: GRADE 20 DEG BAUME
Unit of Issue: DR
Quantitative Expression: 0000000015GL
Unit of Issue Quantity: 1
Type of Container: DRUM

Contractor Information

Contractor's Name: HOOKER CHEMICALS & PLASTICS CORP., DUREZ DIVISION
Post Office Box: 728
Contractor's Address1: UNKNOWN
Contractor's Address2: UNKNOWN, NK 00000
Contractor's Telephone: UNKNOWN
Contractor's CAGE: 73675

Contractor Information

Contractor's Name: OMI INTERNATIONAL CORP
Contractor's Address1: 75 RIVER RD
Contractor's Address2: NUTLEY, NJ 07110-3513
Contractor's Telephone: UNKNOWN
Contractor's CAGE: 04767

Section 2 - Composition/Information on Ingredients
MURIATIC ACID, 20 BE

Ingredient Name: HYDROGEN CHLORIDE (HYDROCHLORIC ACID) (SARA III)
Ingredient CAS Number: 7647-01-0 Ingredient CAS Code: M
RTECS Number: MW4025000 RTECS Code: M
=WWT: =WT Code:
=Volume: =Volume Code:
>WT: >WT Code:
>Volume: >Volume Code:
Section 3 - Hazards Identification, Including Emergency Overview
MURIATIC ACID, 20 BE

Health Hazards Acute & Chronic: **CORROSIVE** EYES: MAY CAUSE SEVERE IRRITATION, BURNS AND POSSIBLE PERMANENT VISUAL IMPAIRMENT. SKIN: MAY CAUSE SEVERE IRRITATION, BURNS AND ULCERATIONS. INGEST: MAY CAUSE SEVERE GI TRACT IRRITATION. INHAL: MAY CAUSE SEVERE RESPIRATORY IRRITATION. CHRONIC: MAY DAMAGE LUNGS AND TEETH AND CAUSE DERMATITIS.

Signs & Symptoms of Overexposure:
EYES/SKIN: CAUSE BURNS, IRRITATION, DAMAGES EYE- BLINDNESS; INHAL: IRRITATION; INGEST: IRRITATION/BURNS, GI

Medical Conditions Aggravated by Exposure:
PERSONS WITH PRE-EXISTING SKIN OR RESPIRATORY AILMENTS MAY BE AT INCREASED RISK FROM EXPOSURE.

LD50 LC50 Mixture: LD50 ORAL RABBIT IS 900MG/KG

Route of Entry Indicators:
- Inhalation: YES
- Skin: YES
- Ingestion: YES

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

Carcinogenicity Explanation: HYDROCHLORIC ACID IS CLASSIFIED IARC-3 (INSUFFICIENT EVIDENCE-HUMAN).
**First Aid:**
SKIN: REMOVE CONTAMINATED CLOTHING; WASH WITH SOAP AND WATER. GET MEDICAL ATTENTION.
EYES: FLUSH WITH WATER FOR 15 MINUTES. GET MEDICAL ATTENTION.
INHAL: REMOVE TO FRESH AIR. GIVE OXYGEN OR ARTIFICIAL RESPIRATION IF NEEDED. GET MEDICAL ATTENTION.
INGEST: DO NOT INDUCE VOMITING. GET PROMPT QUALIFIED MEDICAL ATTENTION. IF CONSCIOUS, GIVE WATER OR MILK OR MAGNESIA.

**Section 5 - Fire Fighting Measures**
**MURIATIC ACID, 20 BE**

**Fire Fighting Procedures:**
USE A SELF-CONTAINED BREATHING APPARATUS AND FULL PROTECTIVE EQUIPMENT. COOL FIRE EXPOSED CONTAINERS WITH WATER FOG.

**Unusual Fire or Explosion Hazard:**
REACTS W/METALS TO EMIT H2 GAS WHICH MAY FORM EXPLOSIVE MIXTURES WITH AIR.

**Extinguishing Media:**
EXTINGUISH WITH AGENT SUITABLE FOR SURROUNDING FIRE

**Flash Point:** Flash Point Text: NONE

**Autoignition Temperature:**
- Autoignition Temperature Text: N/K
- Lower Limit(s): N/R
- Upper Limit(s): N/R

**Section 6 - Accidental Release Measures**
**MURIATIC ACID, 20 BE**

**Spill Release Procedures:**
ELIMINATE IGNITION SOURCES. STOP LEAK W/O RISK. EVACUATE AREA. SM SPILL: ABSORB WITH INERT ABSORBENT, FLUSH AREA WITH WATER. LG SPILL: NEUTRALIZE WITH SODA ASH. FLUSH NEUTRALIZED SOLUTION TO SEWER IN ACCORDANCE WITH INTERNATIONAL FED, STA, & LOCAL REGS.

**Section 7 - Handling and Storage**
**MURIATIC ACID, 20 BE**

**Handling and Storage Precautions:**

**Other Precautions:**

**Section 8 - Exposure Controls & Personal Protection**
**MURIATIC ACID, 20 BE**

**Respiratory Protection:**
WHERE ENVIRONMENTAL CONTROLS ARE LACKING OR IN ENCLOSED SPACES USE EITHER A SELF-CONTAINED BREATHING APPARATUS OR A NIOSH/MSHA APPROVED RESPIRATOR FOR ACID GAS, DEPENDING ON THE AIRBORN CONCENTRATION.

**Ventilation:**
LOCAL VENTILATION AT THE WORKSITE; MECHANICAL (GENERAL) VENTILATION TO
MAINTAIN TLV/PEL.

Protective Gloves:
RUBBER/NEOPRENE

Eye Protection: GOGGLES/FACE SHIELD

Other Protective Equipment: FULL PROTECTIVE CLOTHING, SAFETY SHOWER, EYE WASH STATION

Work Hygenic Practices: WASH HANDS. SEPERATE WORK CLOTHES FROM STREET CLOTHES. LAUNDER WORK CLOTHES BEFORE REUSE. KEEP FOOD OUT OF THE WORK AREA.

Supplemental Health & Safety Information: MSDS FM MFR DATED: 10/76; SPEC REF: O-H-765C

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Section 9 - Physical & Chemical Properties
MURIATIC ACID, 20 BE

HCC: C1
NRC/State License Number: N/R
Net Property Weight for Ammo: N/R
Boiling Point: Boiling Point Text: 230F, 110C
Melting/Freezing Point: Melting/Freezing Text: UNKNOWN
Decomposition Point: Decomposition Text: UNKNOWN
Vapor Pressure: UNKNOWN
Vapor Density: UNKNOWN
Percent Volatile Organic Content:
Specific Gravity: 1.160
Volatile Organic Content Pounds per Gallon:
PH: N/K
Volatile Organic Content Grams per Liter:
Viscosity: UNKNOWN
Evaporation Weight and Reference: UNKNOWN
Solubility in Water: COMPLETE
Appearance and Odor: CLEAR, COLORLESS TO FAINT YELLOW LIQUID WITH A PUNGENT ODOR.
Percent Volatiles by Volume: 100
Corrosion Rate: UNKNOWN

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Section 10 - Stability & Reactivity Data
MURIATIC ACID, 20 BE

Stability Indicator: YES
Materials to Avoid:
OXIDIZERS, FLAMM LIQUIDS, MOST METALS & STRONG ALKALIS, NH3
Stability Condition to Avoid:
AVOID CONTACT W/METALS & SULFIDES.
Hazardous Decomposition Products:
HCL GAS, H2 & CL2 GAS
Hazardous Polymerization Indicator: NO
Conditions to Avoid Polymerization:
N/R

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Section 11 - Toxicological Information
MURIATIC ACID, 20 BE
Toxicological Information:
N/P

Section 12 - Ecological Information
MURIATIC ACID, 20 BE

Ecological Information:
N/P

Section 13 - Disposal Considerations
MURIATIC ACID, 20 BE

Waste Disposal Methods:
KEEP IN COVERED DRUMS,PENDING DISPOSAL. HANDLE & DISPOSE IN FULL
COMPLIANCE WITH ALL APPLICABLE INTERNATIONAL,FEDERAL,STATE, & LOCAL
REGULATIONS.

Section 14 - MSDS Transport Information
MURIATIC ACID, 20 BE

Transport Information:
N/P

Section 15 - Regulatory Information
MURIATIC ACID, 20 BE

SARA Title III Information:
N/P
Federal Regulatory Information:
N/P
State Regulatory Information:
N/P

Section 16 - Other Information
MURIATIC ACID, 20 BE

Other Information:
N/P

HMIS Transportation Information

Product Identification: MURIATIC ACID, 20 BE
Transportation ID Number: 87173
Responsible Party CAGE: 73675
Date MSDS Prepared: 01/01/1987
Date MSDS Reviewed: 03/06/1996
MFN: 03/06/1996
Submitter: D DG
Status Code: C
Container Information
    Unit of Issue: DR
    Container Quantity: 1
Type of Container: DRUM
Net Unit Weight: 145.0 LBS

Article without MSDS: N
Technical Entry NOS Shipping Number:
Radioactivity: N/R
Form:
Net Explosive Weight: N/R
Coast Guard Ammunition Code: N/R
Magnetism: N/P
AF MMAC Code: NR
DOD Exemption Number: N/R
Limited Quantity Indicator:
Multiple Kit Number: 0
Kit Indicator: N
Kit Part Indicator: N
Review Indicator: Y
Additional Data:
NONE

Department of Transportation Information

DOT Proper Shipping Name: HYDROCHLORIC ACID
DOT PSN Code: HJG
Symbols:
DOT PSN Modifier:
Hazard Class: 8
UN ID Number: UN1789
DOT Packaging Group: II
Label: CORROSIVE
Special Provision(s): A3,A6,B3,B15,N41,T9,T27
Packaging Exception: 154
Non Bulk Packaging: 202
Bulk Packaging: 242
Maximum Quantity in Passenger Area: 1 L
Maximum Quantity in Cargo Area: 30 L
Stow in Vessel Requirements: C
Requirements Water/Sp/Other:

IMO Detail Information

IMO Proper Shipping Name: HYDROCHLORIC ACID
IMO PSN Code: IEX
IMO PSN Modifier:
IMDG Page Number: 8183
UN Number: 1789
UN Hazard Class: 8
IMO Packaging Group: II/III
Subsidiary Risk Label: -
EMS Number: 8-03
Medical First Aid Guide Number: 700

IATA Detail Information

IATA Proper Shipping Name: HYDROCHLORIC ACID
IATA PSN Code: NPG
IATA PSN Modifier:
IATA UN Id Number: 1789
IATA UN Class: 8
Subsidiary Risk Class:
UN Packaging Group: II
IATA Label: CORROSIVE
Packaging Note for Passengers: 809
Maximum Quantity for Passengers: 1L
Packaging Note for Cargo: 813
Maximum Quantity for Cargo: 30L
Exceptions: A3

**AFI Detail Information**
AFI Proper Shipping Name: HYDROCHLORIC ACID, SOLUTION
AFI Symbols:
AFI PSN Code: NPG
AFI PSN Modifier:
AFI UN Id Number: UN1789
AFI Hazard Class: 8
AFI Packing Group: II
AFI Label:
Special Provisions: P4, A3, A6, N41
Back Pack Reference: A12.3

**HAZCOM Label Information**
Product Identification: MURIATIC ACID, 20 BE
CAGE: 73675
Assigned Individual: N
Company Name: HOOKER CHEMICALS & PLASTICS CORP., DUREZ DIVISION
Company PO Box: 728
Company Street Address1: UNKNOWN
Company Street Address2: UNKNOWN, NK 00000 NK
Health Emergency Telephone: 800-424-9300(CHEMTREC)
Label Required Indicator: Y
Date Label Reviewed: 03/06/1996
Status Code: C
Manufacturer’s Label Number: UNKNOWN
Date of Label: 03/06/1996
Year Procured: N/K
Organization Code: F
Chronic Hazard Indicator: N/P
Eye Protection Indicator: YES
Skin Protection Indicator: YES
Respiratory Protection Indicator: N/P
Signal Word: WARNING
Health Hazard: Moderate
Contact Hazard: Moderate
Fire Hazard: Slight
Reactivity Hazard: None

8/8/2002 12:33:37 AM
Section 1 - Product and Company Identification

ISOPROPANOL; ISOPROPYL ALCOHOL

Product Identification: ISOPROPANOL; ISOPROPYL ALCOHOL

Date of MSDS: 01/01/1985 Technical Review Date: 05/25/1999
FSC: 6810  NIIN: 00-983-8551
Submitter: D DG
Status Code: C
MFN: 01
Article: N
Kit Part: N

Manufacturer's Information
Manufacturer's Name: UNION CARBIDE CORP, MFR - CHEM COMMOD AGY, DIST
Manufacturer's Address1: 39 OLD RIDGEBURY ROAD
Manufacturer's Address2: DANBURY, CT 06817-0001
Manufacturer's Country: US
General Information Telephone: 800-822-4357
Emergency Telephone: 800-822-4357
Emergency Telephone: 800-822-4357
MSDS Preparer's Name: N/P
Proprietary: N
Reviewed: Y
Published: Y
CAGE: 61637
Special Project Code: N

Item Description
Item Name: ISOPROPYL ALCOHOL, TECHNICAL
Item Manager: S9G
Specification Number: TT-I-735A
Type/Grade/Class: GRADE A
Unit of Issue: QT
Unit of Issue Quantity: G
Type of Container: CAN
Contractor Information
Contractor’s Name: UNION CARBIDE CORP INDUSTRIAL
Contractor’s Address1: 39 OLD RIDGE BURY ROAD CHEMICALS DIV
Contractor’s Address2: DANBURY, CT 06817-0001
Contractor’s Telephone: 800-568-4000/732-563-5522 (MSDS)
Contractor’s CAGE: 61637

Section 2 - Composition/Information on Ingredients
ISOPROPANOL; ISOPROPYL ALCOHOL

Ingredient Name: ISOPROPYL ALCOHOL (SARA III)
Ingredient CAS Number: 67-63-0 Ingredient CAS Code: M
RTECS Number: NT8050000 RTECS Code: M
=WT: =WT Code:
=Volume: =Volume Code:
>WT: >WT Code:
>Volume: >Volume Code:
<WT: <WT Code:
<Volume: <Volume Code:
% Low WT: % Low WT Code:
% High WT: % High WT Code:
% Low Volume: % Low Volume Code:
% High Volume: % High Volume Code:
% Text: >99
% Environmental Weight:
Other REC Limits: N/P
OSHA PEL: 400 PPM/500 STEL OSHA PEL Code: M
OSHA STEL: OSHA STEL Code:
ACGIH TLV: 400 PPM/500 STEL; 9192 ACGIH TLV Code: M
ACGIH STEL: N/P ACGIH STEL Code:
EPA Reporting Quantity:
DOT Reporting Quantity:
Ozone Depleting Chemical: N

Section 3 - Hazards Identification, Including Emergency Overview
ISOPROPANOL; ISOPROPYL ALCOHOL

Health Hazards Acute & Chronic: N/P

Signs & Symptoms of Overexposure:
NONE EXPECTED EXCEPT FOR GIDDINESS

Medical Conditions Aggravated by Exposure:
N/P

LD50 LC50 Mixture: N/P

Route of Entry Indicators:
Inhalation: N/P
Skin: N/P
Ingestion: N/P

Carcenogenicity Indicators
NTP: N/P
IARC: N/P
OSHA: N/P
Carcinogenicity Explanation: N/P

Section 4 - First Aid Measures
ISOPROPANOL; ISOPROPYL ALCOHOL

First Aid:
INHALE: REMOVE TO FRESH AIR. INGESTED: INDUCE VOMITING, GET MEDICAL ATTENTION. EYES/SKIN: FLUSH IMMEDIATELY WITH WATER.

Section 5 - Fire Fighting Measures
ISOPROPANOL; ISOPROPYL ALCOHOL

Fire Fighting Procedures:
DILUTION OF BURNING LIQ W/ 22-25 VOL H*2O WILL EXTINGUISH
Unusual Fire or Explosion Hazard:
MAY BE IGNIITED BY SPARKS, FLAME. CONTAINER MAY EXPLODE IN FIRE. VAPOR IS HAZARD.
Extinguishing Media:
CO*2, DRY CHEM FOR SM FIRES. ALCOHOL FOAM TYPE FOR LG.
Flash Point: Flash Point Text: 53F TCC
Autoignition Temperature:
Autoignition Temperature Text: N/A

Lower Limit(s): 2.0

Upper Limit(s): 12.0

Section 6 - Accidental Release Measures
ISOPROPANOL;ISOPROPYL ALCOHOL

Spill Release Procedures:
ELIMINATE ALL SOURCES OF IGNITION. SM SPILLS SHOULD BE FLUSHED W/LG QTY WATER. LARGER SPILLS SHOULD BE COLLECTED FOR DISPOSAL.

Section 7 - Handling and Storage
ISOPROPANOL;ISOPROPYL ALCOHOL

Handling and Storage Precautions:

Other Precautions:

Section 8 - Exposure Controls & Personal Protection
ISOPROPANOL;ISOPROPYL ALCOHOL
Respiratory Protection:
AIR-SUPP MASKS IN CONFINED AREAS

Ventilation:
LOCAL EXHST PREFERRED, MECH ACCEPTABLE

Protective Gloves:
RUBBER

Eye Protection: GOGGLES

Other Protective Equipment: EYEBATH/SAFETY SHOWER

Work Hygenic Practices: N/P

Supplemental Health & Safety Information: ITEM MEETS REQUIREMENTS FOR GRADE A UNDER FED SPEC TT-I-735

Section 9 - Physical & Chemical Properties
ISOPROPANOL; ISOPROPYL ALCOHOL

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HCC: F2
NRC/State License Number:
Net Property Weight for Ammo:
Boiling Point: Boiling Point Text: 180°F/82.3°C
Melting/Freezing Point: Melting/Freezing Text: N/A
Decomposition Point: Decomposition Text: N/A
Vapor Pressure: 33 Vapor Density: 2.07
Percent Volatile Organic Content:
Specific Gravity: 0.786
Volatile Organic Content Pounds per Gallon:
pH: N/P
Volatile Organic Content Grams per Liter:
Viscosity: N/P

Evaporation Weight and Reference: (BUTYL AC=1)=2.3

Solubility in Water: COMPLETE

Appearance and Odor: CLEAR APPEARANCE, SHARP ODOR

Percent Volatiles by Volume: 100

Corrosion Rate: N/P

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Section 10 - Stability & Reactivity Data

ISOPROPANOL; ISOPROPYL ALCOHOL

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Stability Indicator: YES

Materials to Avoid:

N/P

Stability Condition to Avoid:

AVOID HEAT, SPARK, OPEN FLAMES

Hazardous Decomposition Products:

CARBON DIOXIDE, CARBON MONOXIDE GENERATED WHEN COMBUSTED

Hazardous Polymerization Indicator: NO

Conditions to Avoid Polymerization:

N/P

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Section 11 - Toxicological Information

ISOPROPANOL; ISOPROPYL ALCOHOL

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Toxicological Information:
N/P

Section 12 - Ecological Information
ISOPROPANOL;ISOPROPYL ALCOHOL

Ecological Information:
N/P

Section 13 - Disposal Considerations
ISOPROPANOL;ISOPROPYL ALCOHOL

Waste Disposal Methods:
ATOMIZE INTO INCINERATOR WHERE PERMITTED UNDER APPROPRIATE FED, STATE, LOCAL REG.

Section 14 - MSDS Transport Information
ISOPROPANOL;ISOPROPYL ALCOHOL

Transport Information:
N/P
Section 15 - Regulatory Information

ISOPROPANOL; ISOPROPYL ALCOHOL

SARA Title III Information:
N/P

Federal Regulatory Information:
N/P

State Regulatory Information:
N/P

Section 16 - Other Information

ISOPROPANOL; ISOPROPYL ALCOHOL

Other Information:
N/P

HMIS Transportation Information
Product Identification: ISOPROPANOL; ISOPROPYL ALCOHOL
Transportation ID Number: 96332
Responsible Party CAGE: 61637
Date MSDS Prepared: 01/01/1985
Date MSDS Reviewed: 09/05/1986
MFN: 09/05/1986
Submitter: D DG
Status Code: C

Container Information
Unit of Issue: QT
Container Quantity: G
Type of Container: CAN
Net Unit Weight:
Article without MSDS: N
Technical Entry NOS Shipping Number:
Radioactivity:
Form:
Net Explosive Weight:
Coast Guard Ammunition Code:
Magnetism: N/P
AF MMAC Code:
DOD Exemption Number:
Limited Quantity Indicator:
Multiple Kit Number: 0
Kit Indicator: N
Kit Part Indicator: N
Review Indicator: Y
Additional Data:

Department of Transportation Information
DOT Proper Shipping Name: ISOPROPANOL OR ISOPROPYL ALCOHOL
DOT PSN Code: HWY
Symbols:
DOT PSN Modifier:

Hazard Class: 3

UN ID Number: UN1219

DOT Packaging Group: II

Label: FLAMMABLE LIQUID

Special Provision(s): T1

Packaging Exception: 150

Non Bulk Packaging: 202

Bulk Packaging: 242

Maximum Quantity in Passenger Area: 5 L

Maximum Quantity in Cargo Area: 60 L

Stow in Vessel Requirements: B

Requirements Water/Sp/Other:

IMO Detail Information

IMO Proper Shipping Name: ISOPROPNOL

IMO PSN Code: ITA

IMO PSN Modifier:

IMDG Page Number: 3244

UN Number: 1219

UN Hazard Class: 3.2

IMO Packaging Group: II

Subsidiary Risk Label: -

EMS Number: 3-06

Medical First Aid Guide Number: 305

IATA Detail Information

IATA Proper Shipping Name: ISOPROPNOL

IATA PSN Code: ONH

IATA PSN Modifier:
IATA UN Id Number: 1219
IATA UN Class: 3
Subsidiary Risk Class:
UN Packaging Group: II
IATA Label: FLAMMABLE LIQUID
Packaging Note for Passengers: 305
Maximum Quantity for Passengers: 5L
Packaging Note for Cargo: 307
Maximum Quantity for Cargo: 60L
Exceptions:

AFI Detail Information
AFI Proper Shipping Name: ISOPROPANOL
AFI Symbols:
AFI PSN Code: ONH
AFI PSN Modifier:
AFI UN Id Number: UN1219
AFI Hazard Class: 3
AFI Packing Group: II
AFI Label:
Special Provisions: P5
Back Pack Reference: A7.3

HAZCOM Label Information
Product Identification: ISOPROPANOL;ISOPROPYL ALCOHOL
CAGE: 61637
Assigned Individual: N
Company Name: UNION CARBIDE CORP INDUSTRIAL
Company PO Box:
Company Street Address1: 39 OLD RIDGEBURY ROAD CHEMICALS DIV
Company Street Address2: DANBURY, CT 06817-0001 US
Health Emergency Telephone: 800-822-4357
Label Required Indicator: Y
Date Label Reviewed: 12/16/1998
Status Code: C
Manufacturer's Label Number:
Date of Label: 12/16/1998
Year Procured: N/K
Organization Code: F
Chronic Hazard Indicator: N/P
Eye Protection Indicator: N/P
Skin Protection Indicator: N/P
Respiratory Protection Indicator: N/P
Signal Word: N/P
Health Hazard:
Contact Hazard:
Fire Hazard:
Reactivity Hazard:

8/8/2002 1:31:21 AM
SULTAN CHEMISTS INC            -- SODIUM HYPOCHLORITE - BLEACH

MSDS Safety Information
FSC: 6810
NIIN: 00-900-6276
MSDS Date: 05/01/1998
MSDS Num: CLLCD
Product ID: SODIUM HYPOCHLORITE - BLEACH
MPN: 01
Responsible Party
Cage: 63536
Name: SULTAN CHEMISTS INC
Address: 85 W FOREST AVE
City: ENGLEWOOD NJ 07631-4001
Info Phone Number: 201-871-1232
Emergency Phone Number: 800-535-5053
Review Ind: Y
Published: Y

Contractor Summary
Cage: 63536
Name: SULTAN CHEMISTS INC
Address: 85 W FOREST AVE
City: ENGLEWOOD NJ 07631-4001
Phone: 201-871-1232

Item Description Information
Item Manager: S9G
Item Name: SODIUM HYPOCHLORITE SOLUTION
Unit of Issue: CN
Quantitative Expression: 00000000005GL
UI Container Qty: 1
Type of Container: CAN

Ingredients
Cas: 7681-52-9
RTECS #: NH3486300
Name: SODIUM HYPOCHLORITE
< Wt: 6.
ACGIH TLV: 200MG/M3;8 HR
EPA Rpt Qty: 100 LBS
DOT Rpt Qty: 100 LBS

Health Hazards Data
Route Of Entry Inds - Inhalation: YES
Skin: YES
Ingestion: YES
Effects of Exposure: CAUSES CAUSTIC BURNS. MAY BE HARMFUL BY INHALATION, INGESTION, OR SKIN ABSORPTION. CAUSES EYE AND SKIN IRRITANT. MATERIAL IS IRRITATING TO MUCOUS MEMBRANES AND UPPER RESPIRATORY TRACT.
Signs And Symptoms Of Overexposure: CAUSES CAUSTIC BURNS. MAY BE HARMFUL BY INHALATION, INGESTION, OR SKIN ABSORPTION. CAUSES EYE AND SKIN IRRITANT.
MATERIAL IS IRRITATING TO MUCOUS MEMBRANES AND UPPER RESPIRATORY TRACT.
First Aid: SKIN AND EYES: FLUSH WELL WITH WARM WATER FOR AT LEAST 15 MINUTES.
INGESTION: DO NOT INDUCE VOMITING. DILUTE WITH LARGE QUANTITIES OF MILK OR
WATER. INHALATION: REMOVE TO FRESH AIR. IF BREATHING IS DIFFICULT, GIVE
OXYGEN. GET MEDICAL ATTENTION.

Handling and Disposal
Spill Release Procedures: FLUSH SMALL AMOUNT TO DRAIN. ADJUST PH TO
NEUTRALIZE
WITH DILUTE ACIDS FOR LARGE SPILLS. COLLECT AND RETURN LARGE AMOUNTS TO
CONTAINER.
Waste Disposal Methods: ADJUST PH TO NEUTRAL. FLUSH THE AQUEOUS SOLUTION DOWN
THE DRAIN WITH PLENTY OF WATER. OBSERVE ALL FEDERAL, STATE AND LOCAL LAWS.
Handling And Storage Precautions: IRRITANT. KEEP TIGHTLY CLOSED. STORE IN A
COOL DRY PLACE. WASH THOROUGHLY AFTER HANDLING.
Other Precautions: DO NOT GET IN EYES, ON SKIN, ON CLOTHING.
Fire and Explosion Hazard Information
Flash Point Text: NON-FLAMMABLE
Lower Limits: 0
Upper Limits: 0
Extinguishing Media: NOT REQUIRED.
Fire Fighting Procedures: WEAR SELF-CONTAINED BREATHING APPARATUS AND
PROTECTIVE CLOTHING TO PREVENT CONTACT WITH SKIN AND EYES.
Unusual Fire/Explosion Hazard: EMITS TOXIC FUMES UNDER FIRE CONDITIONS.
Control Measures
Respiratory Protection: WEAR NIOSH/MSHA-APPROVED RESPIRATOR.
Ventilation: LOCAL EXHAUST: FACE VELOCITY 60 FPM. CHEMICAL FUME HOOD. DO NOT
BREATHE DUST.
Protective Gloves: CHEMICAL RESISTANT
Eye Protection: CHEMICAL RESISTANT GOGGLES
Other Protective Equipment: SAFETY SHOWER AND EYE BATH.
Work Hygienic Practices: WASH THOROUGHLY AFTER USE.
Physical/Chemical Properties
HCC: B1
Boiling Point: =104.4C, 220.F
Melt/Freeze Pt: =-8.8C, 30.5F
Vapor Pres: 23 MMHG/25C
Spec Gravity: 1.210/25C
PH: 11.5
Solubility in Water: MISCIBLE
Appearance and Odor: COLORLESS TO LIGHT YELLOW LIQUID ODOR OF CHLORINE
Percent Volatiles by Volume: 93
Reactivity Data
Stability Indicator: YES
Stability Condition To Avoid: CONTACT WITH ACIDS.
Materials To Avoid: ACIDS AND ACID SOLUTIONS.
Hazardous Decomposition Products: CHLORINE.
Hazardous Polymerization Indicator: NO
Conditions To Avoid Polymerization: WILL NOT OCCUR.

Toxicological Information

Ecological Information

MSDS Transport Information

Transport Information: PROPER SHIPPING NAME: SODIUM HYPOCHLORITE SOLUTION.
HAZARDOUS CLASSIFICATION: CORROSIVE LIQUID. IDENTIFICATION NUMBER:NONE.
ADDITIONAL LABELING: CORROSIVE LIQUID.

Regulatory Information

Sara Title III Information: THIS PRODUCT CONTAINS THE FOLLOWING TOXIC CHEMICAL

Other Information

All chemicals may pose unknown hazards and should be used with caution. This material safety data sheet (MSDS) applies only to the material as packaged. If this product is combined with other materials, deteriorates, or becomes contaminated, it may pose hazards not mentioned in this MSDS.

Transportation Information

Responsible Party Cage: 63536
Trans ID NO: 158729
Product ID: SODIUM HYPOCHLORITE - BLEACH
MSDS Prepared Date: 05/01/1998
Review Date: 09/06/2001
MFN: 1
Multiple KIT Number: 0
Unit Of Issue: CN
Container QTY: 1
Type Of Container: CAN

Detail DOT Information

DOT PSN Code: DWG
Symbols: G
DOT Proper Shipping Name: CORROSIVE LIQUIDS, N.O.S.
Hazard Class: 8
UN ID Num: UN1760
DOT Packaging Group: III
Label: CORROSIVE
Special Provision: T7
Non Bulk Pack: 203
Bulk Pack: 241
Max Qty Pass: 5 L
Max Qty Cargo: 60 L

Vessel Stow Req: A
Water/Ship/Other Req: 40

Detail IMO Information

IMO PSN Code: ESH
IMO Proper Shipping Name: CORROSIVE LIQUID, N.O.S. o
IMDG Page Number: 8147
UN Number: 1760
UN Hazard Class: 8
IMO Packaging Group: I/II/III
Subsidiary Risk Label: -
EMS Number: 8-15
MED First Aid Guide NUM: 760

Detail IATA Information

IATA PSN Code: HKW
IATA UN ID Num: 1760
IATA Proper Shipping Name: CORROSIVE LIQUID, N.O.S. *
IATA UN Class: 8
IATA Label: CORROSIVE
UN Packing Group: III
Packing Note Passenger: 818
Max Quant Pass: 5L
Max Quant Cargo: 60L
Packaging Note Cargo: 820

Detail AFI Information

AFI PSN Code: HKW
AFI Symbols: *
AFI Proper Shipping Name: CORROSIVE LIQUID, N.O.S.
AFI Hazard Class: 8
AFI UN ID NUM: UN1760
AFI Packing Group: III
Special Provisions: P5
Back Pack Reference: A12.3

HAZCOM Label

Product ID: SODIUM HYPOCHLORITE - BLEACH
Cage: 63536
Company Name: SULTAN CHEMISTS INC
Street: 85 W FOREST AVE
City: ENGLEWOOD NJ
Zipcode: 07631-4001
Health Emergency Phone: 800-535-5053
Label Required IND: Y
Date Of Label Review: 09/06/2001
Status Code: A
Origination Code: F
Eye Protection IND: YES
Skin Protection IND: YES
Signal Word: DANGER
Respiratory Protection IND: YES
Health Hazard: Severe
Contact Hazard: Severe
Fire Hazard: None
Reactivity Hazard: None

Hazard And Precautions: CAUSES CAUSTIC BURNS. MAY BE HARMFUL BY INHALATION, INGESTION, OR SKIN ABSORPTION. CAUSES EYE AND SKIN IRRITANT. MATERIAL IS IRRITATING TO MUCOUS MEMBRANES AND UPPER RESPIRATORY TRACT.

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Disclaimer (provided with this information by the compiling agencies): This information is formulated for use by elements of the Department of Defense. The United States of America in no manner whatsoever expressly or implied warrants, states, or intends said information to have any application, use or viability by or to any person or persons outside the Department of Defense nor any person or persons contracting with any instrumentality of the United States of America and disclaims all liability for such use. Any person utilizing this instruction who is not a military or civilian employee of the United States of America should seek competent professional advice to verify and assume responsibility for the suitability of this information to their particular situation regardless of similarity to a corresponding Department of Defense or other government situation.
ALDON CORPORATION -- SODIUM HYDROXIDE

MSDS Safety Information

MSDS Date: 06/10/1996
MSDS Num: CLFSZ
Product ID: SODIUM HYDROXIDE
MFN: 02

Responsible Party
Cage: 6V042
Name: ALDON CORPORATION
Address: 1533 W HENRIETTA RD
City: AVON NY 14414-9508
Info Phone Number: 716-226-6177
Emergency Phone Number: 716 226-6177 800-424-9300
Resp. Party Other MSDS No.: SS 550 KM00729M
Preparer's Name: MICHAEL RASZEJA
Chemtrec IND/Phone: (800)424-9300
Review Ind: Y
Published: Y

Contractor Summary

Cage: 6V042
Name: AL-DON CHEMICALS INC
Address: 1533 W HENRIETTA RD
City: AVON NY 14414-9508
Phone: 716-226-6177
Cage: 33089
Name: NASCO INTL INC., NASCO DIV
Address: 901 JANESVILL AVE
City: FORT ATKINSON WI 53538-0901
Phone: 920-563-2446

Ingredients

Cas: 1310-73-2
RTECS #: WB4900000
Name: SODIUM HYDROXIDE
% low Wt: 90.
% high Wt: 100.
OSHA PEL: 2 MG/M3
ACGIH TLV: NOT ESTABLISHED
ACGIH STEL: C2 MG/M3
EPA Rpt Qty: 1000 LBS
DOT Rpt Qty: 1000 LBS

Health Hazards Data

Effects of Exposure: INGESTION: MAY RESULT IN SEVERE INTESTINAL IRRITATION WITH BURNS TO MOUTH, THROAT AND STOMACH WITH NAUSEA AND VOMITING. SKIN AND EYES:
CONTACT WITH SKIN OR EYES MAY CAUSE SEVERE IRRITATION OR BURNS. INHALATION:
SEVERE IRRITATION TO RESPIRATORY SYSTEM WITH PULMONARY EDEMA, LUNG INFLAMMATION.

Signs And Symptoms Of Overexposure: INGESTION: MAY RESULT IN SEVERE INTESTINAL IRRITATION WITH BURNS TO MOUTH, THROAT AND STOMACH WITH NAUSEA AND VOMITING.
SKIN AND EYES: CONTACT WITH SKIN OR EYES MAY CAUSE SEVERE IRRITATION OR BURNS. INHALATION: SEVERE IRRITATION TO RESPIRATORY SYSTEM WITH PULMONARY
EDEMA, LUNG INFLAMMATION.

First Aid: INGESTION: IF SWALLOWED, DO NOT INDUCE VOMITING. IF CONSCIOUS, GIVE LARGE AMOUNTS OF WATER TO DRINK. FOLLOW WITH WHITE OF EGGS, BEATEN WITH WATER. CALL PHYSICIAN IMMEDIATELY. NEVER GIVE ANYTHING BY MOUTH TO AN UNCONSCIOUS PERSON. EYES: IMMEDIATELY FLUSH WITH LARGE AMOUNTS OF WATER FOR 15 MINUTES, LIFTING LOWER AND UPPER EYELIDS OCCASIONALLY. GET PROMPT MEDICAL ATTENTION. SKIN: FLOOD WITH WATER, THEN WASH WITH VINEGAR. INHALATION: REMOVE TO FRESH AIR. IF NOT BREATHING, GIVE ARTIFICIAL RESPIRATION. IF BREATHING IS DIFFICULT, GIVE OXYGEN. GET MEDICAL ATTENTION.

Handling and Disposal

Spill Release Procedures: CAREFULLY AND WEARING PROTECTIVE CLOTHING, SWEEP UP AND PLACE IN A SUITABLE CONTAINER. FLUSH SPILL AREA WITH WATER, FINSE WITH DILUTE ACID, PREFERABLY ACETIC, AND FINALLY WITH WATER.

Waste Disposal Methods: DISCHARGE, TREATMENT OR DISPOSAL MAY BE SUBJECT TO FEDERAL, STATE, OR LOCAL LAWS. THESE DISPOSAL GUIDELINES ARE INTENDED FOR THE DISPOSAL OF CATALOG-SIZE QUANTITIES ONLY. AVOID BREATHING DUST OR MIST. WEAR FULL PROTECTIVE CLOTHING INCLUDING GOGGLES OR FACE SHIELD. (SEE SUPPL DATA)

Handling And Storage Precautions: KEEP CONTAINER TIGHTLY CLOSED AND WHEN NOT IN USE. STORE IN A COOL, DRY, PLACE; PROTECT AGAINST MOISTURE AND WATER. SEPARATE FROM ACIDS, METALS, EXPLOSIVES, ORGANIC PEROXIDES AND EASILY IGNITIBLE MATE RIALS. AVOID CONTACT WITH SKIN, EYES AND CLOTHING. WASH THOROUGHLY AFTER HANDLING.
Other Precautions: PRODUCT IS DELIQUESCENT, ABSORBS WATER AND CARBON DIOXIDE
FROM AIR. SODIUM HYDROXIDE AND TRICHLOROETHYLENE ESPECIALLY HAZARDOUS SINCE
THEY REACT TO FORM SPONTANEOUSLY FLAMMABLE DICHLOROACETYLENE. WASH CONTAMINATED CLOTHING PROMPTLY. LABORATORY USE ONLY. NOT FOR DRUG, FOOD OR
HOUSEHOLD USE. KEEP OUT OF REACH OF CHILDREN

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Fire and Explosion Hazard Information

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Flash Point Text: NONCOMBUSTIBLE

Extinguishing Media: USE WATER SPRAY ON FIRE INVOLVING THIS MATERIAL.

Fire Fighting Procedures: IN FIRE CONDITIONS, WEAR A NIOSH/MSHA-APPROVED SELF-CONTAINED BREATHING APPARATUS AND FULL PROTECTIVE CLOTHING. MUST INCLUDE
COMPLETE EYE PROTECTION. FLOOD WITH WATER. USING CARE NOT TO SPLATTER OR SP
LASH THIS MATERIAL. CONTACT WITH WATER PRODUCES INTENSE HEAT AND HIGHLY IRRITATING AND CORROSIVE MIST.

Unusual Fire/Explosion Hazard: NOT COMBUSTIBLE BUT SOLID FORM IN CONTACT WITH MOISTURE OR WATER MAY GENERATE SUFFICIENT HEAT TO IGNITE COMBUSTIBLE MATERIALS. CONTACT WITH MOST METALS CAN GENERATE HYDROGEN GAS. HOT OR MOLTEN
MATERIAL WILL REACT VIOLENTLY WITH WATER LIBERATING HEAT AND CAUSING SPLASHING. A SEVERE EYE HAZARD; SOLID OR CONCENTRATED SOL

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Control Measures

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Respiratory Protection: NONE REQUIRED IN NORMAL LABORATORY HANDLING. IF DUSTY CONDITIONS PREVAIL, USE A HIGH EFFICIENCY PARTICULATE RESPIRATOR.

Ventilation: LOCAL EXHAUST/MECHANICAL (GENERAL) RECOMMENDED.
Protective Gloves: RUBBER.

Eye Protection: CHEMICAL SAFETY GOGGLES, OR FACE SHIELD WHERE APPROPRIATE.

Other Protective Equipment: GOGGLES, LAB COAT, APRON, VENTILATION HOOD, PROPER
GLOVES, EYE WASH STATION.

Supplemental Safety and Health: CONTD FROM WASTE DISPOSAL METHOD: SLOWLY DISSOLVE SPILL IN WATER. WHILE MAKING SOLUTION ADD SLOWLY TO SURFACE OF STIRRED LIQUID TO AVOID VIOLENT SPLATTERING. NEUTRALIZE WITH SODIUM BISULFATE AND FLUS H TO SEWER WITH COPIOUS AMOUNTS OF WATER. NASCO P/N: KM00729M.

 Physical/Chemical Properties

HCC: B1
Boiling Point: =1390. C, 2534. F
Melt/Freeze Pt: =317.8 C, 604. F
Vapor Pres: <20 C (MM HG)
Spec Gravity: 2.130 AT 25 C
Solubility in Water: 109 GRAMS IN 100ML WATER
Appearance and Odor: WHITE PELLETS, FLAKES, OR BEADS; NO ODOR.
Percent Volatiles by Volume: NEGLIGIBLE

 Reactivity Data

Stability Indicator: YES
Stability Condition To Avoid: MOISTURE, ACIDS AND ACID FUMES.
Materials To Avoid: CAN REACT VIOLENTLY WITH ACIDS AND WITH MANY ORGANIC COMPOUNDS. REACTS WITH MOST COMMON METALS (ZINC, ALUMINUM, TIN, LEAD, ETC.) LIBERATING FLAMMABLE HYDROGEN GAS.
Hazardous Decomposition Products: MAY FORM SODIUM MONOXIDE AND/OR SODIUM
PEROXIDE AT VERY HIGH TEMPERATURES.

Hazardous Polymerization Indicator: NO

Toxicological Information

Ecological Information

MSDS Transport Information

Transport Information: DOT PSN: SODIUM HYDROXIDE, SOLID, 8, UN1823, II.

Regulatory Information

Other Information

Other Information: NFPA RATINGS: HEALTH =3; FLAMMABILITY = 0; REACTIVITY = 1.

Transportation Information

Responsible Party Cage: 6V042

Trans ID NO: 157654

Product ID: SODIUM HYDROXIDE

MSDS Prepared Date: 06/10/1996

Review Date: 06/27/2001

MFN: 2

Multiple KIT Number: 0

Unit Of Issue: CY
Type Of Container: CYLINDER

Additional Data: PSN PER MSDS.

Detail DOT Information

DOT PSN Code: NGU
DOT Proper Shipping Name: SODIUM HYDROXIDE, SOLID
Hazard Class: 8
UN ID Num: UN1823
DOT Packaging Group: II
Label: CORROSIVE
Packaging Exception: 154
Non Bulk Pack: 212
Bulk Pack: 240
Max Qty Pass: 15 KG
Max Qty Cargo: 50 KG
Vessel Stow Req: A

Detail IMO Information

IMO PSN Code: NSX
IMO Proper Shipping Name: SODIUM HYDROXIDE, SOLID
IMDG Page Number: 8225-1
UN Number: 1823
UN Hazard Class: 8
IMO Packaging Group: II
Subsidiary Risk Label: -
EMS Number: 8-06
MED First Aid Guide NUM: 705
Detail IATA Information

IATA PSN Code: WSO
IATA UN ID Num: 1823
IATA Proper Shipping Name: SODIUM HYDROXIDE, SOLID
IATA UN Class: 8
IATA Label: CORROSIVE
UN Packing Group: II
Packing Note Passenger: 814
Max Quant Pass: 15KG
Max Quant Cargo: 50KG
Packaging Note Cargo: 816

Detail AFI Information

AFI PSN Code: WSO
AFI Proper Shipping Name: SODIUM HYDROXIDE, SOLID
AFI Hazard Class: 8
AFI UN ID NUM: UN1823
AFI Packing Group: II
Special Provisions: P5
Back Pack Reference: A12.4

HAZCOM Label

Product ID: SODIUM HYDROXIDE
Cage: 6V042
Company Name: AL-DON CHEMICALS INC
Street: 1533 W HENRIETTA RD
City: AVON NY
Zipcode: 14414-9508
Health Emergency Phone: 716 226-6177 800-424-9300
Label Required IND: Y
Date Of Label Review: 06/27/2001
Status Code: A
Origination Code: F
Eye Protection IND: YES
Skin Protection IND: YES
Signal Word: WARNING
Health Hazard: Moderate
Contact Hazard: Moderate
Fire Hazard: None
Reactivity Hazard: Slight
Hazard And Precautions: INGESTION: MAY RESULT IN SEVERE INTESTINAL IRRITATION WITH BURNS TO MOUTH, THROAT & STOMACH WITH NAUSEA AND VOMITING. SKIN & EYES: MAY CAUSE SEVERE IRRITATION OR BURNS. INHALATION: SEVERE IRRITATION TO RESPIRATORY SYSTEM WITH PULMONARY EDEMA AND LUNG INFLAMMATION.

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of Defense or other government situation.