FINAL REPORT
JANUARY 1998

REPORT NO. 96-03

BULLPUP
CHEMICAL OVERPACK
CONTAINER EVALUATION

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Prepared for:
U.S. Army Chemical and Biological
Defense Command
ATTN: AMSCB-CMO
Aberdeen Proving Ground, MD 21010-5423

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VALIDATION ENGINEERING DIVISION
SAVANNA, ILLINOIS 61074-9639
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The U.S. Army Defense Ammunition Center (DAC), Validation Engineering Division (SIOAC-DEV), was tasked by the U.S. Army Chemical and Biological Defense Command (CBDCOM) to perform an engineering evaluation on the BULLPUP chemical overpack container. It was found that the proposed container modifications and 200 in-lbs of torque applied to the Tee-bolts produce a container with adequate leak integrity. This report contains the results of this evaluation.
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</table>
PART 1

INTRODUCTION

A. BACKGROUND. The U.S. Army Defense Ammunition Center (DAC), Validation Engineering Division (SIOAC-DEV), was tasked by U.S. Army Chemical and Biological Defense Command (CBDCOM) to perform an engineering evaluation on the BULLPUP chemical overpack container.

B. AUTHORITY. This test was conducted IAW mission responsibilities delegated by the U.S. Army Armament Munitions and Chemical Command (AMCCOM), Rock Island, IL.

C. OBJECTIVE. The objective of the engineering evaluation was to determine the torque required to provide an adequate closure seal between the BULLPUP body and lid. It must be verified that the Tee-bolts currently used are capable of withstanding the necessary torque and that the amount of torque applied to the Tee-bolts does not damage the container flange. Additionally, testing was conducted to ascertain proposed modifications could be administered without disrupting the leak integrity of the container.

D. CONCLUSION. The humidity indicator cover and the breather valve with a butyl rubber gasket and butyl adhesive sealant on the threads provides an adequate seal. A solid plug with a butyl rubber gasket and butyl adhesive sealant on the threads in place of the breather valve or the humidity indicator cover also provides an adequate seal. An adequate closure seal along the container body and lid was obtained with 200 in-lbs of applied torque to each Tee-bolt. The current Tee-bolts are capable of withstanding the 200 in-lbs of torque. At this torque, no damage to the container flange was noted.

E. RECOMMENDATIONS. The Tee-bolts currently utilized should be tightened to a torque of 200 +/- 5 in-lbs. The humidity indicator or the breather valve can be replaced by a plug in
combination with a butyl rubber gasket and butyl rubber sealant torqued to 350 in-lbs. Upon assembly of the container, a pressure decay test should be performed to verify its leak integrity.
PART 2

OCTOBER - NOVEMBER 1997

ATTENDEES

Bradley J. Haas
Mechanical Engineer
DSN 585-8336
815-273-8336

Director
U.S. Army Defense Ammunition Center
ATTN: SIOAC-DEV
3700 Army Depot Road
Savanna, IL 61074-9639
PART 3

TEST EQUIPMENT

A. BULLPUP Container No. 1:
1. Diameter: 25.5 inches
2. Length: 71 inches
3. Date of Manufacture: July 1980
4. Status of Container: Serviceable

B. BULLPUP Container No. 2:
1. Diameter: 25.5 inches
2. Length: 71 inches
3. Date of Manufacture: June 1980
4. Status of Container: Non-serviceable

C. Mass Spectrometer:
1. Manufacturer: Leybold Inc.
2. Date of Manufacture: 1997
3. Model: UL 200
4. Serial Number: 14100D9711 00065

D. Torqometer:
1. Manufacturer: Snap-on Tools Corp
2. Date of Manufacture: February 1978
3. Identification Number: 1846
4. Effective Length: 12 inches
5. Range: 0-600 in-lbs

E. Butyl Sealant:
1. Manufacturer: Tremco
2. Specification: U.S. TT-S 001657
3. Color: Black
4. Tremco Product Number: 982-802
F. Pipe Sealant with Teflon:
   1. Manufacture: Hernon Manufacturing Inc.
   2. Product Name: Dripstop 920

G. Hex Bushing:
   1. Supplier: McMaster Carr Supply Company
   2. Part Number: 4638K641
   3. Size: 3/4" X 1/8"
   4. Material: Standard Black Pipe
   5. Catalog Number: 102

H. Hex Head Pipe Plug:
   1. Supplier: Cajon Precision Pipe Fitting
   2. Part Number: 3/4-12-P
   3. Material: Brass
PART 4

TEST SETUP

At one time, pressure-decay leak testing was the prevalent method of leak testing performed on chemical overpack containers. The pressure-decay test is capable of detecting leaks in the range of $1 \times 10^{-2}$ cc/he/sec/atm. As time has progressed, helium-leak testing has become more feasible. Helium-leak tests are capable of detecting smaller leaks than pressure-decay leak testing. Mass spectrometers are capable of detecting leaks of $1 \times 10^{-8}$ cc/he/sec/atm and beyond. Previous helium-leak tests on various serviceable stockpile chemical overpack containers have shown leak rates ranging from $1 \times 10^{-5}$ cc/he/sec/atm to $1 \times 10^{-8}$ cc/he/sec/atm (reference SIOAC-DEV Report No. 94-10). Portable equipment that will be fielded in the near future is capable of detecting a leak rate of $1 \times 10^{-5}$ cc/he/sec/atm. For the purpose of this test, a leak rate of $1 \times 10^{-5}$ cc/he/sec/atm will be considered acceptable.

Two BULLPUP chemical overpack containers were selected for engineering evaluations. The containers were numbered. Container No. 2 was marked “Nonserviceable.” Each BULLPUP container arrived with a humidity indicator cover and a breather valve inserted into threaded receptacles. The breather valve was removed and replaced with 3/4-inch to 1/8-inch hex bushing equipped with a shraeder valve. An adequate seal around these receptacles must exist prior to further testing, otherwise escaping gases may provide false readings at other critical locations. The container lid was removed and the gasket was cleaned and properly positioned prior to the lid being placed back on the container. No silicone or talcum powder was applied to the gasket. A Tee-bolt was placed in each slot in the flange. Each bolt was tightened to the specified torque in the order specified by the optional sequence of AMCCOM DMWR 3-1325-E388-P1. This order is displayed on page 7-2 in the Appendix. Helium (5 psi) was inserted into the container. The sniffer probe of the mass spectrometer was used to check the leak integrity of the container. The probe was moved along each seam and around the plugs.
inserted in the humidity indicator and breather valve holes. Increased torque was applied to the Tee-bolts in increments with the leak integrity checked following each increment. Following each leak test iteration, a visual inspection of the flange was performed to ascertain no permanent deformation resulted from the torque applied to the Tee-bolts. This procedure was applied to each container.

The torque applied to the Tee-bolts resulting in failure is determined by applying increasing torque to a bolt until it failed. The applied torque was monitored with a torque wrench and maximum applied torque was recorded.
PART 5

TEST RESULTS

A visual inspection of the two BULLPUP containers was performed prior to testing. Container No. 1 was marked “Serviceable.” It appeared to be in generally good condition. Small indentations existed in the flange, apparently caused by excessive torque applied to the Tee-bolts. Container No. 2 was marked “Nonserviceable.” The flange had also been damaged, apparently from excessive force applied to the Tee-bolts during previous use.

Two pipe-threaded receptacles were inside each container at the location of the humidity indicator and the breather valve. A humidity indicator cover (a threaded hex head cover [see photo on page 6-3]) was threaded into one of the receptacles and the breather valve in the other receptacle in each container upon delivery. The threads of the humidity indicator cover that was shipped with the container was covered with Loc-tite and reinserted. A 3/4- to 1/8-inch hex bushing was coated with Loc-tite and inserted into the other receptacle. The threads of a shraeder valve were coated with pipe sealant with Teflon and inserted into the 1/8-inch hole of the reducer. The container was pressurized. A severe leak developed at the threads of the humidity indicator cover and the reducer. The humidity indicator cover and the reducer were removed and cleaned. A 1/8-inch-thick butyl rubber gasket with a 1-inch inner diameter and a 1-7/16-inch outer diameter was placed over the threads of each. In accordance with AMCCOM DMWR 3-1325-E388-P1, these gaskets can be fabricated to the dimensions of the original gasket out of a butyl rubber sheet. A sketch of this gasket is included in the appendix on page 7-3. Butyl adhesive sealant was applied to the threads of the humidity indicator cover and the reducer and each was reinstalled to a torque of 350 +/- 15 in-lbs (see photo on page 6-4). After 24 hours of curing time, the container was pressurized again. No leaks existed at either receptacle or the shraeder valve. The humidity indicator was then replaced with a 3/4-inch hex head plug. Again, a butyl rubber gasket was placed over the threads and butyl adhesive sealant was placed on the
threads and torqued to 350 +/- 15 in-lbs. No reduction in the leak integrity of the container occurred.

Container No. 1 was assembled and tested first. A Tee-bolt was placed in each hole in the flange. Each Tee-bolt was initially tightened to a torque of 50 in-lbs. At this torque, no seal was achieved. The torque was increased to 80 in-lbs. The container was pressurized using up to 5 psi of helium. The torque applied to the Tee-bolts was increased at various increments to a maximum of 250 in-lbs. The same procedure was applied to container No. 2. Approximately 15 Tee-bolts were used for both tests due to a shortage of the Tee-bolts. For each container, most of the leaks occurred at the heads of the Tee-bolts. The results of leak testing are shown in Table 1.

<table>
<thead>
<tr>
<th>Applied Torque (In-lbs)</th>
<th>Container No. 1 (Serviceable) Max Leak Rate</th>
<th>Container No. 2 (Nonserviceable) Max Leak Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>80</td>
<td>$1 \times 10^{-3}$</td>
<td>No Seal</td>
</tr>
<tr>
<td>100</td>
<td>$5 \times 10^{-5}$</td>
<td>$4 \times 10^{-3}$</td>
</tr>
<tr>
<td>120</td>
<td>$3 \times 10^{-5}$</td>
<td>$2 \times 10^{-3}$</td>
</tr>
<tr>
<td>130</td>
<td>$2 \times 10^{-5}$</td>
<td>$8 \times 10^{-4}$</td>
</tr>
<tr>
<td>150</td>
<td>$2 \times 10^{-5}$</td>
<td>$4 \times 10^{-4}$</td>
</tr>
<tr>
<td>200</td>
<td>$4 \times 10^{-6}$</td>
<td>$3 \times 10^{-4}$</td>
</tr>
<tr>
<td>250</td>
<td>$2 \times 10^{-6}$</td>
<td>$2 \times 10^{-4}$</td>
</tr>
</tbody>
</table>

Leak rate values in cc/he/sec/atm

The maximum acceptable leak rate is $1 \times 10^{-5}$ cc/he/sec/atm. The nonserviceable container No. 2 never reached this level of leak integrity (failed). Container No. 1 reached this leak integrity (passed) with 200 in-lbs of torque applied to the Tee-bolts.

During previous testing, every Tee-bolt had been taken to a torque of 250 in-lbs with no failures occurring. To determine the torque at which the currently utilized Tee-bolts fail, a torque test was applied to three Tee-bolts. Increasing torque was applied to each Tee-bolt until
failure occurred. The minimum torque required to cause failure for any of the three bolts tested was 300 in-lbs. Table 2 displays the required torque to cause failure of each bolt.

TABLE 2: TORQUE REQUIRED FOR FAILURE

<table>
<thead>
<tr>
<th>Tee-bolt No.</th>
<th>Torque (In-lbs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>300</td>
</tr>
<tr>
<td>2</td>
<td>310</td>
</tr>
<tr>
<td>3</td>
<td>300</td>
</tr>
</tbody>
</table>

As previously stated, each BULLPUP container has small indentations in the flange caused by excessive torque applied to Tee-bolts during previous applications. The indentations existing in the flange prior to the testing made it difficult to determine the exact torque that resulted in permanent deformation of the flange. At 200 in-lbs, visual inspection did not identify any permanent deformation to the flange of the containers. A torque of 250 in-lbs appeared to cause minimal permanent deformation of the flange. At 300 in-lbs, permanent indentations occurring in the flange were easily identified.
PART 6

PHOTOGRAPHS
PHOTO NO. A0317-SCN98-DEVOVPK01.TIF. This photo shows an overview of the two BULLPUP containers used in the evaluation.
PHOTO NO. A0317-SCN98-DEVOVPK8.TIF. The arrow indicates the humidity indicator cover. A butyl rubber washer is placed over the threads. Butyl rubber sealant was also placed on the threads prior to installation.
PHOTO NO. A0317-SCN98-DEVVPK8.TIF. The arrow indicates a threaded plug with a shraeder valve installed. The plug had a butyl rubber washer and butyl rubber sealant placed on it prior to installation. The shraeder valve threads were covered with thread sealant with Teflon prior to installation.
PHOTO NO. A0317-SCN98-DEV0VPK7.TIF. This photo shows the indentation in the container flange resulting from excessive torque applied to the Tee-bolts.
TEE BOLTS MAY BE TIGHTENED BY GOING AROUND THE CONTAINER IN EITHER DIRECTION, OR BY THE TORQUING SEQUENCE ILLUSTRATED ABOVE.

Figure 2-9. Optional tee bolt torquing sequence.
BUTYL RUBBER GASKET

1-7/16" OUTSIDE DIAMETER

1" INSIDE DIAMETER

1/8"
I. PRODUCT IDENTIFICATION

Product Name: Dripstop 920
Product Type: Pipe Sealant with Teflon

II. COMPOSITION

Ingredients

<table>
<thead>
<tr>
<th>Ingredient</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bisphenol A fumarate resin</td>
<td>25-30</td>
</tr>
<tr>
<td>Mica</td>
<td>15-20</td>
</tr>
<tr>
<td>Polyglycol Dimethacrylate</td>
<td>10-15</td>
</tr>
<tr>
<td>Polyglycol dicotanoate</td>
<td>10-15</td>
</tr>
<tr>
<td>Poly (tetrafluoroethylene)</td>
<td>5-10</td>
</tr>
<tr>
<td>Silica, amorphous, treated</td>
<td>3-5</td>
</tr>
<tr>
<td>Cumene hydroperoxide*</td>
<td>1-3</td>
</tr>
<tr>
<td>Titanium Dioxide</td>
<td>1-3</td>
</tr>
</tbody>
</table>

*This component is listed as a SARA Section 313 Toxic Chemical

III. CHEMICAL AND PHYSICAL PROPERTIES

Vapor Pressure: Less than 10 mm at 80°F (27°C)
Vapor Density: Not Available
Solubility in Water: Slight
Specific Gravity: 1.21 at 80°F (27°C)
Boiling Point: More than 300°F (149°C)
Volatile Organic Compound (EPA Method 24): 2.07%
Evaporation Rate (Ether = 1): Not available
pH: Does not apply
Appearance: White paste
Odor: Mild

IV. FLAMMABILITY AND EXPLOSIVE PROPERTIES

Flash Point: More than 200°F (93°C)
Method: Tag Closed Cup

Estimated NFPA Code:
- Health Hazard: 1
- Fire Hazard: 1
- Reactivity Hazard: 1
- Specific Hazard: Does not apply

Estimated HMIS Code:
- Health Hazard: 1
- Flammability Hazard: 1
- Reactivity Hazard: 1
- Personal Protection: See Section X

Explosive Limits:
- (% by volume in air) Lower Approximately 1% Octanol
- (% by volume in air) Upper Approximately 8% Octanol

Recommended Extinguishing Agents:
- Carbon dioxide, foam, dry chemical

Hazardous Products Formed by Fire or Thermal Decomposition:
- Toxic fluorides

Unusual Fire of Explosion Hazards:
- None

Compressed Gases:
- None

Pressure at Room Temperature:
- Does not apply
V. SPILL OR LEAK AND DISPOSAL PROCEDURES

Steps to be taken in case of spill or leak: Soak up in an inert absorbent. Store in partly filled, closed container until disposal.

Recommended methods of disposal: Incinerate following EPA and local regulations.

VI. STORAGE AND HANDLING PROCEDURES

Safe Storage: Store below 75°F (24°C) to preserve shelf life.

Handling: Avoid prolonged skin contact. Keep away from eyes. Do not use without adequate ventilation.

VII. SHIPPING REGULATIONS

DOT (49 CFR 172)
Domestic Ground Transport
Proper Shipping Name: Unrestricted
Hazard Class or Division: Unrestricted
Identification Number: None

IATA
Proper Shipping Name: Unrestricted
Class or Division: Unrestricted
UN of ID Number: None

IMO
Substance: Not Available
Marine Pollutant Status: Not Available
Class: Not Available
Subsidiary Risk label: Not Available
IMDG Code Page: Not Available
UN Number: Not Available

VIII. REACTIVITY DATA

Stability: Stable
Hazardous Polymerization: Will not occur
Hazardous Decomposition Products (non-thermal): None
Incompatibility: None

IX. EMERGENCY TREATMENT PROCEDURES

Ingestion: Do not induce vomiting. Keep individual calm. Obtain Medical attention.
Inhalation: Remove to fresh air. If symptoms persist, obtain medical attention.
Skin Contact: Flush with water.
Eye Contact: Flush at least 15 minutes with water. Obtain medical attention.
MATERIAL SAFETY DATA SHEET

Product Name:
Dripstop 920
Pipe Sealant with Teflon

X. PERSONAL PROTECTION

Eyes: Safety glasses of goggles.
Skin: Rubber or plastic gloves.
Ventilation: Local ventilation recommended for prolonged use.

XI. Health Hazard

Toxicity: Eye irritant. Est. Oral LD50 >10,000 mg/kg.
Primary Routes of Entry: Est. Dermal LD50 > 5,000 mg/kg.
Signs and Symptoms of Exposure: None Known
contact
Existing Conditions Aggravated by Exposure: Intoxication, nausea, headache, dizziness. May cause dermatitis on prolonged in sensitive individuals.

None known.

XII. Exposure Limits (TWA)

Ingredients

<table>
<thead>
<tr>
<th>Ingredient</th>
<th>ACGIH (TLV)</th>
<th>OSHA (PEL)</th>
<th>OTHER</th>
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<tbody>
<tr>
<td>Bisphenol A fumarate resin</td>
<td>None</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>Mica</td>
<td>3 mg/m³ TWA</td>
<td>3 mg/m³ TWA</td>
<td>None</td>
</tr>
<tr>
<td>Polyglycol Dimethacrylate</td>
<td>None</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>Polyglycol dioctanoate</td>
<td>None</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>Poly (tetrafluoroethylene)</td>
<td>None</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>Silica, amorphous, treated</td>
<td>10 mg/m³ TWA</td>
<td>6 mg/m³ TWA</td>
<td>None</td>
</tr>
<tr>
<td>Cumene hydroperoxide</td>
<td>None</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>Titanium Dioxide</td>
<td>10 mg/m³ dust</td>
<td>10 mg/m³ dust</td>
<td>None</td>
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XIII. Literature Referenced

Target Organ and Other Health Effects

<table>
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<tr>
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<th>NTP</th>
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<th>OSHA</th>
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<tr>
<td>Bisphenol A fumarate resin</td>
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<td>NO</td>
<td>NO</td>
</tr>
<tr>
<td>Mica</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
</tr>
<tr>
<td>Polyglycol Dimethacrylate</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
</tr>
<tr>
<td>Polyglycol dioctanoate</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
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<tr>
<td>Poly (tetrafluoroethylene)</td>
<td>NO</td>
<td>N/A</td>
<td>NO</td>
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<tr>
<td>Silica, amorphous, treated</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
</tr>
<tr>
<td>Cumene hydroperoxide</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
</tr>
<tr>
<td>Titanium Dioxide</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
</tr>
</tbody>
</table>
HERNON MANUFACTURING
121 TECH DRIVE
SANFORD, FL 32771
(407) 322-4000
FAX: (407) 321-9700
For Emergency: 1-800-255-3924

MATERIAL SAFETY DATA SHEET

Abbreviations

LUN  Lung
SOM  Evidence of some Carcinogenicity
MUT  Mutagen
IRM  Irritant
ALG  Allergen

XII. PREPARATION INFORMATION

Prepared by:
Title:
Company:
Phone:
Emergency:
Revision:

Josef Arnon
Technical Director
Hernon Manufacturing, 121 Tech Drive, Sanford, FL 32771
(407) 322-4000
1-800-255-3924
07/96
FaxBack

1-800-551-2806

INSTANT DELIVERY

right to your fax machine!

Spec Data & MSDS

Sealants
Waterproofing
Firestopping
Glazing
SECTION I

Product Name: TREMCO BUTYL SEALANT
Chemical Family: Sealant
Product Code: 982-BXX
MSDS Preparer: C.R. Bruno
Date Prepared: 12-APR-96
Replaces Date: N/A

Other Applications:
THIS MATERIAL SAFETY DATA SHEET (MSDS) APPLIES TO THE FOLLOWING:
982-801 (BRONZE), 982-802 (BLACK),
982-806 (WHITE), 982-851 (ALUMINUM STONE)

Section 2 - Molecular Composition

Common Name and Chemical Name Weight % CAS Number

CALCIUM CARBONATE (LIMESTONE)
OSHA: TWA 50.0-60.0 1317-65-3
ACGIH: TWA 15 mg/M3 STEL -
(total dust, 5mg/M3 respirable fraction)
OSHA: TWA 10 mg/M3 STEL -
(total dust, no asbestos, <1% SiO2)

POLYBUTENE
OSHA: TWA - STEL -
ACGIH: TWA - STEL -

STODDARD SOLVENT (MINERAL SPIRITS)
OSHA: TWA 100 ppm STEL -
ACGIH: TWA 100 ppm STEL -

TALC (Mg3O2)(SiO3)4 (HYDROUS MAGNESIUM SILICATE)
OSHA: TWA 10.0-15.0 8052-41-3
ACGIH: TWA 10 ppm STEL -

XYLENES (DIMETHYLBENZENES)
OSHA: TWA 100 ppm STEL 150 ppm
ACGIH: TWA 100 ppm STEL 150 ppm

HYDROCARBON RESIN
OSHA: TWA 15 mg/M3 STEL -
ACGIH: TWA 10 mg/M3 STEL -
(total dust)

CRYSTALLINE SILICA (QUARTZ)
OSHA: TWA 0.10 mg/M3 STEL -
ACGIH: TWA 0.10 mg/M3 STEL -
(skin) (respirable dust)

TITANIUM DIOXIDE
OSHA: TWA 10 mg/M3 STEL -
ACGIH: TWA 10 mg/M3 STEL -
(total dust, no asbestos, <1% SiO2)

ETHYL BENZENE
OSHA: TWA 100 ppm STEL 125 ppm
ACGIH: TWA 100 ppm STEL 125 ppm

CASTOR OIL, MODIFIED
OSHA: TWA 15 mg/M3 STEL -
ACGIH: TWA 10 mg/M3 STEL -
(total nuisance dust)

CARBON BLACK
OSHA: TWA 3.50 mg/M3 STEL -
ACGIH: TWA 3.50 mg/M3 STEL -

Section 3 - Hazards Identification

Emergency Overview:
Various colored paste. May cause respiratory irritation, vertigo, nausea, narcotic effects, liver effects, jaundice, and other central nervous system effects including death. Leave area to breathe fresh air. Avoid further overexposure. If symptoms persist, get medical attention immediately.
Potential Health Effect/Route of Entry:

Inhalation:
May cause respiratory irritation, vertigo, headache, nausea, narcotic effects, liver effects, jaundice, and other central nervous system effects including unconsciousness and death.

Eyes:
May cause eye irritation.

Ingestion:
May cause mouth, esophageal, and gastrointestinal irritation, and narcotic and CNS effects. Aspiration into the lungs during swallowing or vomiting can cause lung irritation and damage and can be fatal.

Skin:
May cause defatting, irritation, dermatitis, burns, and liver effects and jaundice if absorbed at concentrations associated with nausea.

Aggravated Medical Conditions:
Preexisting eye, skin, respiratory, and liver disorders may be aggravated by exposure.

Acute Health Effects:
See effects described above.

Chronic Health Effects:
Prolonged or repeated exposure to stoddard solvent may cause the defatting, irritation, dermatitis, narcotic and CNS effects described above, liver effects, and jaundice. Kidney and lung effects have been noted in some animal species. Prolonged or repeated contact/exposure to xylene and ethyl benzene may cause defatting, drying, and irritation of the skin, dermatitis, CNS effects described above, heart muscle sensitization and arrhythmia, hearing loss, and brain, liver, and kidney damage. Ethyl benzene may also cause taste damage. Fillers are encapsulated and are not expected to be released in product under normal conditions of use. Prolonged and repeated exposure to excessive airborne concentrations of toluene can result in scarring of the lungs (pneumoconiosis) or the covering of the lungs (pleural thickening). No serious health effects have been established in man when exposed to carbon black. Inflammation, lung fibrosis, and tumors have been observed in animals which overload lung clearance mechanisms. Carbon black contains varying amounts of polynuclear aromatic compounds (PNA’s) which have been found to cause cancer. Crystalline silica (quartz) may cause cancer, but only limited evidence in humans. Prolonged and repeated overexposure to free crystalline silica dust above the TLV level may cause scarring of the lungs with cough and shortness of breath. A delayed lung injury, silicosis may result from breathing free silica.

Section 4 - First Aid Measures

Inhalation:
Leave area to breathe fresh air, avoid further overexposure. If symptoms persist, get medical attention immediately.

Eyes:
Flush immediately with running water for 15 minutes, lifting the upper and lower lids occasionally. Get medical attention immediately.

Ingestion:
Get medical attention immediately.

Skin:
Wash area of contact thoroughly with hand cleaner followed by soap and water. If irritation, rash or other disorders develop, get medical attention immediately.

Notes to Physician: N/A

Section 5 - Fire Fighting Measures

Flash Point: N/A
Method: N/A
Lower Flammability Limit: Not Established
Upper Flammability Limit: Not Established
Autoignition Temperature: Not Established

Extinguishing Media:
If water fog is ineffective, use carbon dioxide, dry chemical or foam.

Fire and Explosion Hazards:
Never use welding or cutting torch on or near container (even empty). Product, residue or vapor may ignite. See section IX for additional precautions.

Special Fire Fighting Procedures:
During a fire, personnel at the scene are to prevent exposure to fumes using accepted fire fighting techniques.

Fire Fighting Equipment: N/A
Other Precautions: Not Applicable

Section 6 - Accidental Release Measures
Release Response Overview:
Remove sources of ignition immediately. Ventilate to reduce the airborne contaminant concentration below the exposure limit in Section II of the MSDS. Absorb spill in sand, earth or other suitable material. Transfer to appropriate container for disposal.

Handling and Storage Precautions:
Store under normal warehouse conditions below 80F. Prevent inhalation of vapor, ingestion, and contact with skin and eyes. Keep container closed when not in use. Precautions also apply to emptied containers. Change soiled work clothes frequently. Clean hands thoroughly after handling.

Section VIII - Exposure Controls/Personal Protection
Respiratory:
Wear appropriate, properly fitted NIOSH/MSHA approved respirator when the airborne contaminant level(s) exceed the exposure limits indicated on the MSDS. Follow respirator manufacturer's directions for respirator use.

Skin:
Protect hands with impervious rubber gloves and wear typical full cover clothing. Prevent contact with skin. Gloves must be checked before each use for signs of degradation and penetration and for proper functioning.

Eyes:
Wear suitable safety eyewear.

Face:
Not required.

Engineering:
Use local exhaust when the general ventilation is not sufficient to keep the airborne contaminant concentration below the exposure limit in Section II of the MSDS.

Section IX - Physical and Chemical Properties
Odor/Appearance:
SOLVENT/VARIOUS COLORED PASTES

Color:
VARIOUS

Physical State:
Paste

pH:
N/A

Vapor Pressure:
Not Establ.

Vapor Density:
N/A

Boiling Point:
N/A

Melting Point:
N/A

Freezing Point:
N/A

Solubility in Water:
Negligible

Specific Gravity:
1.46

% Volatile Weight:
16.26

Section X - Reactivity/Stability
Stability:
Stable

Incompatible Products:
Avoid contact with strong oxidizing agents.

Conditions to Avoid Polymerization:
Hazardous polymerization will not occur.

Section XI - Toxicological Information

Section XII - Ecological Information
Ecotoxicological Data:
N/A

Chemical Fate:
N/A

Section XIII - Disposal Considerations
RCRA Class:
N/A

Disposal Method:
Not regulated by RCRA. Dispose of in compliance with state and local regulations.

EPA Reportable Quantities
Section 14 - Transportation Data

DOT Shipping Name: NOT REGULATED
DOT Hazard Class: NOT APPLICABLE
DOT Label: 
UN/NA Number: N/A
Packing Group: 
Special Provisions: 
Packaging: 

Exceptions: 
Non-Bulk: 
Bulk: 

Quantities Limitations: 

Passenger Aircraft or Railcar: 
Cargo Aircraft: 
Vessel Stowage Requirements: 
Vessel Stowage: 
Other Stowage: 

Transportation Notes: N/A

Section 15 - Regulatory Information

TSCA Status: On the TSCA Inventory
OSHA Status: Considered hazardous based on the following criteria: 
Irritant 
Sensitizer 
Target Organs: 
Liver 
Kidney 
Central Nervous System 
Reproductive 
Lung 
Skin 
Eye 
Heart 
Taste 
Ear

OSHA Hazardous Components: 

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>CAS Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>CALCIUM CARBONATE (LIMESTONE)</td>
<td>1317-65-3</td>
</tr>
<tr>
<td>CRYSTALLINE SILICA (QUARTZ)</td>
<td>14808-60-7</td>
</tr>
<tr>
<td>TALC (Mg3H2)((SiO3)4) (HYDROUS MAGNESIUM SILICATE)</td>
<td>14807-96-6</td>
</tr>
<tr>
<td>CARBON BLACK</td>
<td>1333-86-4</td>
</tr>
<tr>
<td>TITANIUM DIOXIDE</td>
<td>13463-67-7</td>
</tr>
<tr>
<td>ETHYL BENZENE</td>
<td>100-41-4</td>
</tr>
<tr>
<td>STOOGARD SOLVENT (MINERAL SPIRITS)</td>
<td>8052-41-3</td>
</tr>
<tr>
<td>XYLENES (DIMETHYLBENZENES)</td>
<td>1330-20-7</td>
</tr>
</tbody>
</table>

* - CHEMICAL IS LISTED AS AN IARC, NTP, OSHA, or ACGIH CARCINOGEN

Compliance Quantities: 
No Compliance Quantities

SARA 311 Ratings:

Immediate Health Hazard:  Y 
Delayed Health Hazard:  Y 
Fire Hazard:  Y 
Reactivity Hazard:  N 
Sudden Release of Pressure Hazard:  N

SARA 313 Ingredients:

<table>
<thead>
<tr>
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<td>XYLENES (DIMETHYLBENZENES)</td>
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</tbody>
</table>

Proposition 65 Ingredients:

Chemicals known to the State of California to cause cancer, birth defects and/or other reproductive harm:

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>CAS Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>CRYSTALLINE SILICA (QUARTZ)</td>
<td>14808-60-7</td>
</tr>
</tbody>
</table>


Section 16 - Other Information

FOR INDUSTRIAL USE ONLY. KEEP OUT OF REACH OF CHILDREN.
THE HAZARD INFORMATION HEREIN IS OFFERED SOLELY FOR THE CONSIDERATION
OF THE USER, SUBJECT TO HIS OWN INVESTIGATION OF COMPLIANCE WITH APPLICABLE
REGULATIONS, INCLUDING THE SAFE USE OF THE PRODUCT UNDER EVERY FORESEEABLE
CONDITION.