BENCHMARK
ENVIRONMENTAL CORPORATION

April 14, 1992

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HAZARDOUS WASTE
PROGRAM

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Revision No. 1

Mr. Larry Maassen
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P.O. Box 1663
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Los Alamos, NM 87545

Process Knowledge and Chemical Use at TA-35 TSL-125
Supplement to the TA-35 TSL-125 Surface Impoundment Closure

Dear Mr. Maassen:

Based on your comments on Benchmark's letter dated April 13, 1992, regarding the above referenced subject, we have made some slight revisions to the following text. The revisions include referencing the source of the information presented in the section below entitled, TA-35 TSL-125 Historical Summary, and clarifying the statement regarding the levels of quantitation relative to the risk assessment in sentence two under the section entitled, Discussion of Relevant Closure Analytical Results. The information contained herein supersedes our prior submittal dated April 13, 1992.

Benchmark has completed a review of additional historical data related to process knowledge for the TA-35 TSL-125 site. Included herein is a discussion of the operation of the facility during the active life of the surface impoundment, documentation of chemical use based on interviews with Laboratory staff, and review of relevant historical data obtained from the Laboratory. In support of this evaluation, the following attachments are enclosed with this letter:

Attachment 1 - Standard Maintenance and C/O Procedures for Antares Energy Storage System

Attachment 2 - MSDSs for Chemicals Used in Building 125 During the Active Life of the Impoundment

TA-35 TSL 125 Historical Summary

The information presented in the following section is based on interviews with Jerry Umphres of Los Alamos National Laboratory (the Laboratory) conducted during July, 1991, and March and April, 1992. Mr. Umphres is currently an employee of the Chemical and Laser Science Division of the Laboratory (CLS-6). Mr. Umphres was employed by the Laboratory and involved with the operations at TA-35 TSL-125 during the use of the Antares laser, and during

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the active life of the surface impoundment. Mr. Umphres has had first-hand experience in all aspects of the operations at Building 125 since the inception of activities at the site.

Building 125 is used for developing and testing electron guns and related laser assemblies/equipment for a Laser Technology Research Program. The laser equipment that was present in Building 125, concurrent with the use of the TA-35 TSL 125 surface impoundment, was first employed in late 1979 or early 1980. The entire building was utilized to support the testing of an Antares laser system; and included the laser system, associated equipment, and a supporting machine shop.

The laser system was being utilized to conduct inertial confinement fusion experiments by firing the laser at a glass target, usually the size of a grain of salt. The experiments were conducted to evaluate the performance of the laser equipment relative to the fusion reaction. Experiments with this laser were conducted from late 1979 or early 1980, until September 1985, when researchers became aware that the wavelength of the Antares laser was too long to successfully complete inertial confinement fusion experiments. The Antares laser equipment was subsequently decommissioned and disassembled beginning in May of 1986.

One component of the system, the E-Gun test facility, was retained for further experiments. During the time period between the disassembly of the Antares laser (1986) and the removal of the TA-35 surface impoundment (1989-90), there were only two operations conducted in Building 125; the E-Gun test facility and a small Bright Source laser in the basement which began operation in November 1986.

Antares System Overview

The Antares laser was powered by a series of amplifier stages involving high voltage generators. There were two final amplifier stages, each stage consisting of five pulse Marx generators. The five generators were made up of one Gun Marx, and four Gas Marx pulser units. The entire system, therefore, contained 10 pulser units, each capable of supplying a high current pulse. In addition, separate E-Gun test pulser also utilized a Marx generator.

Physically, each pulser unit consisted of a main Marx generator assembly and tank, with other components attached. The generator assembly was contained within the Marx tanks which were filled with dielectric insulating oil. The building contained a total of 11 Marx tanks (one for each generator) filled with the insulating oil. The three Gun Marx tanks each had a 3500-gallon oil capacity, and the eight Gas Marx tanks each had a 5300-gallon oil capacity.

As stated in the Interim Status Closure Plan for the TA-35 TSL-125 Surface Impoundment (Benchmark, July 1991), any small spills from the Marx tanks were directed to a floor trough or floor drains located throughout the center of the building. The trough and drains subsequently directed fluids to a four-inch pipe, which flowed outside Building 125 and into a six-inch pipe, that delivered fluids to the impoundment.

Chemical Usage in Building 125

The operation of the Antares laser required the use of a dielectric insulating oil contained in the Marx tanks. As stated in the Closure Plan (July 1991), the oil that was used was Shell DIALA(R) OIL AX. The oil brand did not vary during the time of use of the Antares laser.

The Closure Plan also indicates that the impoundment became subject to regulation as a hazardous waste management unit because of the suspected introduction of degreasers into the waste stream during cleaning and maintenance of equipment parts and the building's floors. During an interview between Alice Barr of the Laboratory, Barbara Graves of Benchmark, and Jerry Umphres of the Laboratory on March 31, 1992, Mr. Umphres verified that chemical solvents were used in Building 125 to wipe-off and clean equipment parts of the Antares laser. The chemicals that were identified during this interview include the following compounds:

Freon TF Solvent	Methanol	Cupric Sulfate, Anhydrous (dilute solution)
Ethyl Alcohol	2-Propanol	Ammonium Chloride (dilute solution)

The MSDSs for these compounds are provided in Attachment 2. None of the identified chemical solvents, with the exception of Freon TF, are included on the Appendix VIII list. Freon TF was analyzed during the final soil verification sampling and was not detected at a quantification limit of 5 micrograms/kilogram (ug/kg).

According to Mr. Umphres (March, 1992), the machine shop in Building 125 was devoted entirely to supporting the Antares laser system. Machine shop activities included machining aluminum, brass and copper parts for maintenance of the Antares laser components. No beryllium was used in the machine shop (J. Umphres, March 1992). A small amount of water-soluble cutting oils were used in this process.

As stated earlier after the Antares laser was disassembled, a small Bright Source laser was constructed in the basement of Building 125, and testing began on this laser in November, 1986. This system used two laser dyes, DODCI and Rhodamine. MSDSs for these chemicals are provided in Attachment 2.

Based on the interviews with Mr. Umphres and review of historical documents related to the Antares laser and the operations in Building 125 (Attachment 1), the previous text summarizes the use of chemicals in Building 125 during the active life of the impoundment.

Discussion of Relevant Closure Analytical Results

The Closure Certification Report (Benchmark, July 1991), discusses the results of the sampling and analysis activities associated with the closure of the TA-35 TSL-125 impoundment. As stated in the Closure Report three semivolatile organic constituents and one metal had levels of quantitation that exceeded the calculated action levels, although none of the constituents were detected above their levels of quantitation. The supplementary information regarding chemical use at Building 125 included in the previous section indicates

that these four constituents were not utilized in association with operations conducted in Building 125 during the active life of the impoundment. Additional data in support of this process knowledge relative to the four constituents in question is presented in subsequent text.

As stated in the Closure Report, benzidine, n-nitrosodimethylamine, and n-nitrosodi-n-propylamine, were analyzed using a level of quantitation of 330 parts per billion because of petroleum hydrocarbon interference. None of these three constituents were detected at or above the level of quantitation, but the level of quantitation exceeded the calculated action level. During the March 1992 interview with Mr. Umphres and a telephone interview between Mary Lou Leonard of Benchmark and Mr. Umphres (July 24, 1991), he stated that benzidine, n-nitrosodimethylamine, and n-nitrosodi-n-propylamine were not used in the process and/or operations conducted at Building 125.

Benchmark supported this information by conducting a literature review of the compounds in question which indicated that these three semivolatiles were not associated with operations in Building 125 (Closure Certification Report, July, 1991, p. 20). While conducting the current supplementary evaluation/review of the TA-35 Building 125 process knowledge, it was discovered that benzidine may be a component of laser dyes. Benzidine was identified in the Closure Certification Report as a compound used in the manufacture of dyes. As previously stated, two laser dyes; DODCI and Rhodamine, were used in the Bright Source laser beginning in 1986. Review of the MSDSs for the two laser dyes indicate that benzidine is not a component of these dyes.

Beryllium was not detected at or above its detection limit, however, the 2.5 ppm detection limit was above the calculated action level and the reported background level for beryllium. As stated in the Closure Report, beryllium uses are not consistent with operations and practices in Building 125. In addition, Mr. Umphres stated during both interviews (July, 1991 and March 1992) that beryllium was not used in the processes or operations at Building 125.

This concludes our supplementary evaluation and review of process knowledge for the TA-35 TSL-125 site. Should you require additional information in support of this effort, please feel free to contact us.

Sincerely,

Mary Lou Leonard / FOR RGC

Rita Carnes
Principal Investigator

Barbara Graves

Barbara Graves
Environmental Scientist

References

Interim Status Closure Plan, TA-35 TSL-125 Surface Impoundment for Los Alamos National Laboratory, Benchmark Environmental Corporation, 1991.

Closure Certification Report, TA-35 TSL-125 Surface Impoundment for Los Alamos National Laboratory, Benchmark Environmental Corporation, 1991.

Attachments

cc: Central File
Mary Lou Leonard, Benchmark, w/o enclosures
Bruce Marron, Benchmark, w/o enclosures
Jerry Umphres, CLS-6, Los Alamos National Laboratory, w/o enclosures
Alice Barr EM-8, Los Alamos National Laboratory, w/o enclosures
David McInroy EM-8, Los Alamos National Laboratory, w/o enclosures

ATTACHMENT 1

Standard Maintenance and C/O Procedures for Antares Energy Storage System

ANTARES APPROVAL

J. Umphres, Author	Date
G. Allen, Group Leader P-7	Date
C. Mansfield, Operations Mgr.	Date
J. Hansen, Safety Officer	Date
C. King, P-DO ENG	Date
	Date
	Date
	Date
	Date

STANDARD MAINTENANCE AND C/O PROCEDURES FOR ANTARES ENERGY STORAGE SYSTEM

TA-35, TSL-125

GROUP P-7

TECH AREA 35

BUILDING TSL 125

STANDARD OPERATING PROCEDURE NO. 26

PAGE 1 OF 12

REVISED 10/1/85

ANTARES

Los Alamos National Laboratory
Los Alamos, New Mexico 87545

REVISION RECORD SHEET

REV. LETTER	CLASS REVIEW	REVISION DESCRIPTION	APPROVED BY	DATE
A				
C		P-11 Change 1 Oxygen content of the tank atmosphere must be checked prior to entry. No entry can be made if the level is below 20.5%. The observer must halt the entry if the level falls below 19.5% (No. 4) Page 11 Change 2 Use of any solvent other than ethanol or Freon TF will require a special work permit. (No. 6)		

TITLE:

SOP NO. 26

PAGE

ANTARES

STANDARD MAINTENANCE AND C/O PROCEDURES FOR
ANTARES
ENERGY STORAGE SYSTEM
TA-35, TSL-125
Group P-7

SOP NO. 26

I. INTRODUCTION

The Antares laser system requires that the Gas Pulsers and Gun Pulser be entirely controlled by the Control computer system. The purpose of this SOP is to cover the maintenance and checkout of one, two, three, or four Gas Pulsers and/or an Electron Gun Pulser.

II. FACILITY DESCRIPTION

The primary energy storage elements of each Antares Beamline are the four high voltage Gas Pulsers located in the low bay area south of its associated power amplifier, the Electron Gun Pulser connected at the south end of each power amplifier, and the power supplies for the Pulsers, located at the southeast end of the Laser Hall. The Gas Pulsers are connected to the PA with HV cables. Associated with each pulser is a four stage trigger unit which is inserted through the Pulsers lid and with each Gun Pulser a diverter system. Checkout of a Gas Pulser is accomplished by use of an internal dummy load inserted into the PA HV cable wells or by use of the internal overvoltage gap resistors. The Electron Gun Pulser may be tested using its internal dummy load, or when it is disconnected and removed from the immediate area of the Power Amplifier a bolt-on dummy loac is available. This load is connected to the Pulser tank output flange. The high voltage from each Gas Pulser output to its dummy load is contained within a single tank under oil. The high voltage pulse from a Gun Pulser to either dummy load is also essentially contained within a single tank, under oil.

Normally each Gun Pulser is situated upon a stand within the fenced area of each PA and the Gas Pulsers are within a fenced area. The power supplies are located within the Gas Pulser area located at the southeast area of the Laser Hall.

1. Gas Pulser: Each gas pulser is contained within an 8 ft. x 12 ft. x 10 ft. high, closed tank which is filled with oil for insulation. The Gas Pulser Marx generator is connected to the tank lid and is removed by removing the tank lid. The pertinent electrical parameters of the Marx generator are:

a.	Open-circuit voltage	1.2 MV
b.	Stored energy	300 kJ
c.	Waveshape	Several microsecond pulse

The typical spark-gap operating pressure range is 40 to 50 psig. The spark gaps are vented outside the building during the purge cycle.

2. Gun Pulser: The Gun Pulser is contained within a closed tank which is filled with transformer oil for insulation. The Marx generator is connected to the tank lid and is removed by removing the tank lid. The pertinent electrical parameters of the Marx generators are:

a.	Open circuit voltage	600kV
b.	Stored energy	67kJ
c.	Waveshape	Several microsecond pulse

The typical spark gap operating pressure range is 10 to 30 psig.

3. Four stage trigger Marx. The unit rests on each Gas and Gun Pulsers tank lid with the Marx components residing in the Gas or Gun Pulsers tank. It is a small Marx of an energy output of 780 joules and an output voltage of 280KV.

4. Gun Pulser Diverter System: The Diverter consists of a mid-plane triggered gas gap and an overvolted gas gap both of which reside in the Gun Pulser tank. The trigger system consists of a Marx generator, a 100 kV power supply, a Maxwell-type 40107 trigger unit, and

a control rack. On one of the beamlines the Marx generator is suspended from the Gun Pulser tank lid, on the other beamline, it resides in a separate 42" x 33" x 50" high tank. A large 3.5 inch diameter cable connects the trigger Marx output to the overvolted gas gap. The power for these systems is derived from a 115 VAC, single phase source.

5. High Voltage Power Supplies: There is one ±60kV dc supply for all four Gas Pulsers. It is operated from a 440 VAC, 3-phase source. There is a ±60kV dc supply for the Gun Pulser. It is operated from a 208 VAC, 3-phase supply. Both units consist of a control chassis and high voltage tank. Both high voltage tanks are filled with transformer oil for insulation. There are two RG 220 lines connected between each pulser and it's respective power supply tank.

6. Gas Pulser Internal Dummy Load: These units plug into the output cable cups of a gas pulser through the cable ports.

III. Checkout Procedures

A. General Layout and Comments

The gas Pulser and all power supplies will always be operated within the fenced areas discussed previously. The Gun Pulsers may or may not be operated within a fenced area, depending on the circumstances. If not the test area must be roped off and high voltage signs used. The Gun Pulser may be tested into its built-in dummy load while its tank is bolted to the Power Amplifier. In this case the cathode connection to the Electron Gun must be removed.

Operation will be from one of the beamline Energy Storage Screen Rooms.

B. Normal Operation

1. Prior to testing: The console operator or his designated assistant must check the enclosed area for personnel before testing can begin. Entry is to be restricted to only those concerned with the test.

The barrier around the pulser or pulsers and associated HV equipment to be tested will be secure. In addition to the console (test) operator, there must be one other individual present in case of trouble with equipment. His duty is to be the safety observer during the time the console operator makes routine equipment checks inside the secured area. After any such checks, all personnel must leave the test area unless special permission is granted by the operator. The console operator will be in an Energy Storage Screen Room. For checkout, the cathode output of an Electron Gun Pulser must be disconnected from the Electron Gun and all the Power Amplifier cables removed from a Gas Pulser unless approved by the Antares Test Director.

2. The system is activated by turning on the control circuit breakers for the HV power supplies, Gas Pulsers and the Gun Pulsers. To turn on the HV power supplies, the safety keys must be inserted to enable one to activate the control unit power breakers.

The system is charged by computer control. The computer system through interaction with the operator:

a. Activates the high voltage to the type 40107 trigger units.
b. Starts charging of the trigger Marxes.
c. Activates the high voltage power supplies.
d. Opens the dump switches and closes the series switches in the pulsers, thus activating pulser charge.
e. Activates charging of the Gun Pulser diverter.

This sequence may be automatically accomplished by use of the "CNF" computer sequence. Upon complete charging of the system, the dead man switch must be depressed to allow the computer to fire the pulsers.

By use of "component control", one may individually enable the above mentioned operations. The Pulsers cannot be fired in this way.

By use of the "Maintenance Trigger" sequence, the Pulser and Diverter trigger systems may be fired.

In any event, the above mentioned conditions must be met any time high voltage is enabled.

3. When "CNF" or "Maintenance Trigger" programs are used, the shutdown of the system is also computer controlled. The computer disengages the power supplies from the Gas and Gun Pulsers, trigger Marxes, type 40107 components and Diverter trigger systems. The respective dump switches are then closed.

When using "Component Control", the components must be individually deactivated.

The operator may then turn off the power supply switches and remove the keys.

4. In an emergency, the system may be deactivated by one of the following methods:

a. Push the ABORT "button" on the control monitor.

b. Push the dump-scram button by the computer console.

IV. POTENTIAL HAZARDS AND CONTROL MEASURES

A. General

1. Noise. In any high-voltage energy-storage system, the possibility exists that a discharge can cause a loud noise. It can be caused by electrical breakdown in the insulating medium, capacitor bushings, cables, charge resistors, etc. In this test facility, the Marx generators and cable termination components are under oil, which effectively damps any noise. However, a diverter cable breakdown may emit a very loud explosive noise. The level has been determined not to be damaging to the ears.

2. Fire. The insulating oil has a flash point in excess of 300°F. It is very difficult to make it burn.

Rags, papers, and other flammable materials, when soaked with mineral oil, will burn. Care will be taken that oil-soaked rags, etc., are not left lying around the building. A dry chemical or Halon fire extinguisher must be kept in the area.

B. High Voltage

1. Normal Operation. During operation, the high voltage is contained within the Gas and Gun Pulser tanks, Diverter trigger tank, type 40107-trigger units, dc power supplies, the diverter cable, and cables connecting the power supplies and pulsers.

2. Gas Pulser Maintenance Operations. In the event of a Marx generator component failure, the Marx must be removed from the tank to allow repair to proceed. This exposes all the capacitor terminals and presents a potential high-voltage hazard. This hazard is controlled by adherence to the following procedure:

Two people, one of which may be the console operator, are required to be present before and during electrical safing of the Marx and anytime that voltage is used during maintenance operations.

All remote connections of the Gas Pulser tank are removed. The power supply cables should also be disconnected from the power supply tank. The gas lines are bled to a pressure of 5-15 psig by "backing off" the regulators and venting the lines by use of the computer console. Any personnel barrier is removed. The air bearings are activated and the Gas Pulser is moved to a location where overhead handling equipment is available. The lid is unbolted from the tank, and the Marx generator is transported by the overhead crane, using the Maxwell Lab's supplied strongback, from it's tank to the service frame.

After the Marx generator is placed in the service frame, a visual check will be made of the unit at a safe distance for obvious problems, such as broken charge resistors. If this situation arises, one person should notify the Energy Storage System Manager or other knowledgeable person before proceeding while the other person stays with the unit to keep people at a safe distance. If everything is satisfactory, the capacitors are then shorted in the following manner:

Two shorting rods are connected to the tank lid, and the capacitors are shorted in the following manner:

The shorting rod assembly consists of two shorting rods, One shorting rod contains an energy absorbing resistor and two contacts. Refer to Figure 1. The upper contact (A) is connected through the resistor to a ground wire and the other (B) is connected directly to the ground wire. The ground wire is first connected to an easily accessible point at Marx ground potential. Each capacitor is individually shorted by touching the singularly contacted rod on the capacitor case and the upper contact (A) of the other rod to the capacitor terminal. Then the lower (B) contact is touched to the capacitor terminal while the contact of the singularly contacted rod remains touching the case. The purpose of the dual rod assembly is to discharge each individual stage in the event that a stage resistor may be open.

Now, the specially designed hardwire capacitor shorting wires are installed. The procedure to be used is to have one person hold the ground contact of one shorting rod on the capacitor terminal and that of the other shorting rod on the capacitor case while a second person installs the shorting wire. The first person is in a safe position, so he may observe the work of the second. This process is repeated stage by stage until all capacitors have been shorted with hardwire shorting clips. The four trigger Marx capacitors are now shorted by touching the two shorting rods to opposite terminals of each capacitor. If the trigger Marx is to be removed, shorting clips will be placed across each capacitor upon its removal from the tank lid, as explained above.

Repair work on the Marx generator may now begin. If a capacitor is removed from the Marx assembly, a hardwire short must be placed from each capacitor terminal to the capacitor case. The Marx generator may be put back into operation by first removing all the hardwire shorts, transporting the Marx generator back to its tank by use of the strongback, and reversing the rest of the above procedure.
Note that as the shorting wires are being removed, they should be counted to insure that they have all been removed.

3. Gun Pulser Maintenance Operations: The procedures are essentially the same as those for the Gas Pulsers. The Marx generator

can, however, be moved directly to the service frame without removing its tank from the Power Amplifiers. Remember to disconnect the Electron Gun connections which are located in the oil.

4. Diverter Trigger Marx Maintenance. The procedures are esentially the same as those for the Gas Pulser. Here the power supply lead and the 40107 output cable must be shorted touching them to the tank. The power supply cable on the diverter unit which is remote from the gun Pulser tank must also be removed from the power supply tank.

Here the shorting contacts need to be connected to the two capacitor terminals instead of a single terminal and capacitor case as before. Shorting straps or loops are used instead of shorting wires. They are wedged between the spark gaps metallic plates after the shorting rod contacts are touching the capacitors terminals.

5. High Voltage Power Supplies Maintenance. Maintenance and safety procedures for the power supplies are detailed in SOP No. 28, entitled "Standard Operating Procedure for Computer - Local Tests of Electron Gun and Gas Pulser Power Supplies and Controllers".

C. Limited Egress Areas: Gas and Gun Pulser Tanks

Both of these tanks are considered a Class B LE/CS area. The general procedures are contained in SOP No.2, entitled "Limited Egress/Confined Space Operations at Antares" which is posted in TSL-125 Laser Hall. If entry is required into the Gun Pulser tank while the Marx Generator is in place, a special work permit is required. If entry into either tank is necessary with the Marx Generator removed, the following procedure applies:

1. An observer is required who remains outside the tank and maintains visual or vocal communication with the worker(s) inside the tank. In the event of an emergency, he must summon help as detailed in SOP No. 2. Also, there must be at least one other person within the facility trained in the use of the supplied-air respirator. The observer must be able to communicate with the trained helper at all times, either by direct voice or radio.

2. The portable breathing air supply must be checked and be operable prior to entry.

3. A blower whose flow rate is 100cfm minimum will be used to ventilate the tank. It will be located at an appropriate location outside the tank. A hose of sufficient length to reach to within 2 feet of the tank bottom will be connected to the blower and the hose will then be lowered into the tank. The air flow will be directed in such a manner to exhaust air from the tank. The blower must be operating a minimum of 15 minutes before personnel may enter the tank and remain operating as long as personnel are in the tank.

4. Air quality in the tank is to be evaluated with a portable oxygen meter. Readings above 20.5 percent oxygen are considered acceptable. Any reading below 20.5 percent oxygen will immediately halt the entry. The observer must be familiar with the oxygen monitor, if not assistance can be obtained from the H-5 representative. Prior to entry, air quality is to be checked at floor level, mid-hight level and tank-top level inside the pulser tank. An operational oxygen monitor, checked just before use, must have its sensing device in the tank at floor level all the time that people are in the tank. The readout must be in view of the observer.

5. If an emergency arises, first contact the "rescuer" then dial (9-911) on the telephone and give detail of emergency and location (Laser Hall, TSL 125, TA-35) or activate the nearest fire alarm box.

6. Only one pint or less of ethynol alcohol or TF Freon may be taken inside the tank. Use of any other solvent will require a Special Work Permit. If one of the solvents is used, a fire extinguisher must be located nearby. It must be a CO_2 or other type approved by H Division for oil fires. The observer must never leave his post to take the extinguisher into the tank.

7. Electric equipment and portable lights must be battery powered, or on ground fault circuit interruptors.

V. RESPONSIBILITIES

ATTACHMENT 2

MSDSs for Chemicals Used in Building 125
During the Active Life of the Impoundment

SOC:39-82
(Supersedes SOC:39-77R)

Technical Bulletin
Shell Oil Company

1

DIALA A OIL, DIALA AX OIL

Electrical insulating oils for rapid heat transmission with high oxidation stability

Meet ANSI/ASTM/NEMA standards

Product description

Shell's *Diala*® Oils meet the ANSI/ASTM D 3487 and the NEMA TR-P8-1975 Specifications.

Two oils (designated Type I and Type II) are covered in these specifications. Type I oil is intended for use where normal oxidation resistance is required. Type II oil is for more severe service applications requiring greater oxidation resistance.

Diala A Oil meets the ANSI/ASTM/NEMA Type I requirements and is uninhibited. *Diala* AX Oil meets Type II requirements and contains approximately 0.2%w of Shell's *Ionol*® oxidation inhibitor. Anti-oxidant concentration is varied to meet Rotating Bomb Oxidation Test requirements, but does not exceed the 0.3%w maximum of Type II requirements.

Diala A Oil is approved under G.E.'s Specification A13A1310C and Westinghouse's PD 55822 AG Rev. G-WEMCO C. *Diala* AX Oil has G.E. A13A13 10CA and Westinghouse PD 55822 AV Rev. T-WEMCO CI approvals.

Diala base oils are well-refined from wax-free low pour point naphthenic stocks.

Applications

Shell's *Diala* Oils are excellent for use in transformers, circuit breakers, oil-filled switches and in X-ray equipment. These oils provide electrical insulation and heat transfer in such electrical devices. *Diala* Oils have the oxidation stability required to resist the formation of acids that might attack construction materials and the formation of other oxidation products that can reduce the oil's ability to insulate and cool electrical windings.

Availability

Diala A and AX Oils are available nationwide for domestic use or export. Contact your Shell Oil Sales Office for your requirements.

Typical Properties Diala® Oils

	ASTM Test method	ANSI/ASTM/ NEMA limits Type I & Type II	Diala A/AX Oils Typical values
Physical properties			
Aniline point, °C	D 611	63-78	74
Color	D 1500	0.5 max	<0.5
Flash point, °C	D 92	145 min	148
Interfacial tension, 25°C, dynes/centimeter	D 971	40 min	45
Pour Point °C	D 97	-40 max	-50
Specific gravity, 15/15°C	D 1298	0.91 max	0.886
Viscosity, cSt/SUS at: 100°C	D 445/D 88	3.0/36 max	2.34/34.3
40°C	D 445/D 88	12.0/66 max	9.37/56.7
0°C	D 445/D 88	76.0/350 max	66/304
Visual examination	D 1524	Clear & bright	Clear & bright
Electrical properties			
Dielectric breakdown voltage at 60 hertz:			
Disc electrodes, Kv	D 877	30 min	35
VDE electrodes, Kv, either: 0.040 inch (1.02mm) gap	D 1816[1]	28 min	>28
0.080 inch (2.04mm) gap		56	>56
Dielectric breakdown voltage impulse, 25°C, needle-to-sphere grounded, 1-inch (25.4mm) gap, Kv	D 3300	145 min	176
Power factor, 60 hertz, % at: 25°C	D 924	0.05 max	0.01
100°C	D 924	0.30 max	0.07

Chemical properties		Type I	Type II	Diala A Oil	Diala AX Oil
Oxidation inhibitor content, %w	D 2668 or	0.08 max	0.3 max	None	0.19
2,6-ditertiary butyl paracresol	D 1473				
Corrosive sulfur	D 1275	Non-corrosive		Non-corrosive	
Water, ppm	D 1533 or	35 max		30	
	D 1315				
Neutralization no., mg KOH/g of oil	D 974	0.03 max		0.01	
Oxidation stability at:					
72 hrs	D 2440				
Sludge, %w		0.15 max	0.10 max	0.04	0.03
TAN-C, mg KOH/g of oil		0.50 max	0.30 max	0.27	0.21
164 hrs					
Sludge, %w		0.30 max	0.20 max	0.15	0.05
TAN-C, mg KOH/g of oil		0.60 max	0.40 max	0.35	0.26
Oxidation stability, rotating bomb, minutes	D 2112		195 min		250

[1]D 1816 applies only to new, filtered, dehydrated and degassed oil.

Supplemental Information Diala® Oils

	ASTM Test method	ANSI/ASTM NEMA Oils Typical values	Diala A/AX Oils Typical values
Gassing tendency, l/min.	D 2300	Report	16
Coefficient of expansion, ml/°C/ml	D 1903	0.0007-0.0008	0.00075
Dielectric constant at 25°C	D 924	2.2-2.3	2.2-2.3
Specific heat, gm-cal/gm at 20°C	D 2766	0.44	0.445
Thermal conductivity, cal/cm/sec/°C	D 2717	0.0003-0.0004	0.0003
API gravity, 60/60°F	D 287		28.1
Color, Saybolt	D 156		20
Viscosity, SUS at 100°F	D 445/D 2161		58.8
210°F	D 445/D 2161		34.1
Viscosity, cSt at 100°F	D 445		10.0
210°F	D 445		2.38
Viscosity index	D 2270		45
Steam emulsion no.	D 1935		15
Sulfur, %w	D 2622		0.07
Molecular weight	D 2503		261
Refractive index	D 1218		1.4815
Viscosity-gravity constant	D 2140		0.865
Carbon type composition: % C_A	D 2140		7
% C_N			47
% C_P			46

3426385 ITON CHEMICAL CO INC 54C 05127 CH H-15-17

U.S. DEPARTMENT OF L OR

Occupational Safety and Health Administration

Form Approved
OMB No. 44-R1387

MATERIAL SAFETY DATA SHEET

SECTION I

MANUFACTURER'S NAME: EXCITON CHEMICAL COMPANY, INC.	EMERGENCY TELEPHONE NO.: 513-252-2989
ADDRESS (Number, Street, City, State, and ZIP Code): P.O. Box 3204 Overlook Station, Dayton, Ohio 45431	
CHEMICAL NAME AND SYNONYMS:	TRADE NAME AND SYNONYMS: DODC I
CHEMICAL FAMILY: Dicarbocyanine	FORMULA: CAS# 14806-50-9

SECTION II - HAZARDOUS INGREDIENTS

PAINTS, PRESERVATIVES, & SOLVENTS	%	TLV (Units)	ALLOYS AND METALLIC COATINGS	%	TLV (Units)
PIGMENTS Not Applicable			BASE METAL Not Applicable		
CATALYST " "			ALLOYS " "		
VEHICLE " "			METALLIC COATINGS "		
SOLVENTS " "			FILLER METAL " PLUS COATING OR CORE FLUX "		
ADDITIVES " "			OTHERS " "		
OTHERS " "					

HAZARDOUS MIXTURES OF OTHER LIQUIDS, SOLIDS, OR GASES	%	TLV (Units)
Not Applicable		

SECTION III - PHYSICAL DATA

BOILING POINT (°F.)	NA	SPECIFIC GRAVITY (H_2O=1)	NA
VAPOR PRESSURE (mm Hg.)	"	PERCENT, VOLATILE BY VOLUME (%)	"
VAPOR DENSITY (AIR=1)	"	EVAPORATION RATE (_____ =1)	"
SOLUBILITY IN WATER slightly			
APPEARANCE AND ODOR Blue-gray crystals, no odor			

SECTION IV - FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (Method used) Not Applicable	FLAMMABLE LIMITS Not Determined	LEL	UEL
EXTINGUISHING MEDIA Water, Foam, Dry chemical or CO_2			
SPECIAL FIRE FIGHTING PROCEDURES			
UNUSUAL FIRE AND EXPLOSION HAZARDS Product not readily flammable but could burn if ignited.			

(Continued on reverse side)

Form OSHA-20
Rev. May 72

NEXT FRAME

SECTION V - HEALTH HAZARD DATA

THRESHOLD LIMIT VALUE

LD_{100} (mouse) = 50mg/kg Laser focus May 1975 p 59

EFFECTS OF OVEREXPOSURE

Warning: Product should be considered Hazardous.

Overexposure could produce toxic effects. Dust may be irritating to eyes, skin, mucous membranes.

EMERGENCY AND FIRST AID PROCEDURES

See attachment

SECTION VI - REACTIVITY DATA

STABILITY			CONDITIONS TO AVOID
	UNSTABLE		
	STABLE	X	

INCOMPATABILITY *(Materials to avoid)*

HAZARDOUS DECOMPOSITION PRODUCTS

HAZARDOUS POLYMERIZATION			CONDITIONS TO AVOID
	MAY OCCUR		
	WILL NOT OCCUR	X	

SECTION VII - SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED

Clean up spills and place in a container reserved for waste.

WASTE DISPOSAL METHOD

Dispose of waste product and or wash solution in accordance with Federal, State, and local regulations.

SECTION VIII - SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION *(Specify type)*

Not required.

VENTILATION		
	LOCAL EXHAUST: General exhaust ventilation.	SPECIAL
	MECHANICAL *(General)*	OTHER

PROTECTIVE GLOVES	EYE PROTECTION
Rubber or other impervious material	Chemical goggles

OTHER PROTECTIVE EQUIPMENT

SECTION IX - SPECIAL PRECAUTIONS

PRECAUTIONS TO BE TAKEN IN HANDLING AND STORING

Keep containers closed

OTHER PRECAUTIONS

Avoid direct contact, wash thoroughly after handling.

ATTACHMENT TO MATERIAL SAFETY DATA SHEET

EMERGENCY AND FIRST AID PROCEDURES

SKIN CONTACT: Immediately wash skin with soap and plenty of water.

EYE CONTACT: Immediately flush eyes with plenty of water for at least 15 minutes. Call a physician.

INGESTION: Induce vomiting by sticking finger down throat or by giving soapy or strong salty water to drink. Repeat until vomit is clear. Call a physician.
Never give anything by mouth to an unconscious person.

INHALATION: Remove to fresh air. Call a physician.

NEXT FRAME

MATERIAL SAFETY DATA SHEET

508-263-1100 not in service

SECTION I

MANUFACTURER'S NAME: LAMBDA PHYSIK	EMERGENCY TELEPHONE NO.: ~~617~~-263-1100 508
ADDRESS: 289 Great Road, Acton, MA 01720	
CHEMICAL NAME AND SYNONYMS: Rhodamine 6G	TRADE NAME AND SYNONYMS: LC 5900
CHEMICAL FAMILY: Xanthene	FORMULA: C.A. 989-38-8

SECTION II - HAZARDOUS INGREDIENTS

PAINTS, PRESERVATIVES, & SOLVENTS	%	TLV (Units)	ALLOYS AND METALLIC COATINGS	%	TLV (Units)
PIGMENTS Not Applicable			BASE METAL Not Applicable		
CATALYST " "			ALLOYS " "		
VEHICLE " "			METALLIC COATINGS "		
SOLVENTS " "			FILLER METAL " PLUS COATING OR CORE FLUX		
ADDITIVES " "			OTHERS " "		
OTHERS " "					

HAZARDOUS MIXTURES OF OTHER LIQUIDS, SOLIDS, OR GASES	%	TLV (Units)
Not Applicable		

SECTION III - PHYSICAL DATA

BOILING POINT (°C)	N.A.	SPECIFIC GRAVITY (gcm^{-3})	N.A.
VAPOR PRESSURE (mm Hg)	"	PERCENT, VOLATILE BY VOLUME (%)	"
VAPOR DENSITY (AIR=1)	"	EVAPORATION RATE	"
SOLUBILITY IN WATER	0.5 g/l		

APPEARANCE AND ODOR: red-brown crystals

SECTION IV - FIRE AND EXPLOSION HAZARD DATA

FLASH POINT: Not Applicable	FLAMMABLE LIMITS		

EXTINGUISHING MEDIA: Water, Foam, Dry Chemical or CO_2

SPECIAL FIRE FIGHTING PROCEDURES: none

SECTION V - HEALTH HAZARD DATA

THRESHOLD LIMIT VALUE	RTECS: DH 0175000
EFFECTS OF OVEREXPOSURE	cancer suspect agent

EMERGENCY AND FIRST AID PROCEDURES

INHALATION: Remove to fresh air. Get medical attention. EYES: Immediately flush eyes with plenty of water and get medical attention.

SKIN: Wash with plenty of water.

SECTION VI - REACTIVITY DATA

STABILITY			CONDITIONS TO AVOID
	UNSTABLE		
	STABLE	X	

INCOMPATABILITY (Materials to avoid)	Strong oxidizers
HAZARDOUS DECOMPOSITION PRODUCTS	Thermal decomposition or burning may produce carbon monoxide and/or carbon dioxide

HAZARDOUS POLYMERIZATION			CONDITIONS TO AVOID
	MAY OCCUR		
	WILL NOT OCCUR	X	

SECTION VII - SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED

Clean up spills and place in a container reserved for waste

WASTE DISPOSAL METHOD

Dispose of waste product and or wash solution in accordance with Federal, State, and Local regulations

SECTION VIII - SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION	Not required	
VENTILATION	LOCAL EXHAUST: General exhaust ventilation	SPECIAL
	MECHANICAL	OTHER
PROTECTIVE GLOVES	Rubber or other impervious material	EYE PROTECTION: Chemical goggles
OTHER PROTECTIVE EQUIPMENT	As necessary to prevent skin contact	

SECTION IX - SPECIAL PRECAUTIONS

PRECAUTIONS TO BE TAKEN IN HANDLING AND STORING

Keep container closed

OTHER PRECAUTIONS

Avoid direct contact, wash thoroughly after handling

E M SCIENCE
A DIVISION OF E M INDUSTRIES, INC.
111 WOODCREST DRIVE, CHERRY HILL, N.J. 08034
PHONE (609) 354-9200

MATERIAL SAFETY DATA SHEET
ESSENTIALLY SIMILAR TO U.S. DEPARTMENT OF LABOR FORM OSHA-20
DATE OF PREP. 12/10/85

SECTION 1 NAME & PRODUCT

CHEMICAL NAME: ALCOHOL, REAGENT, ANHYDROUS

CATALOG NUMBER: AX0441

TRADE NAME: ETHYL ALCOHOL, REAGENT; DENATURED ALCOHOL
CAS #: UNKNOWN CHEMICAL FAMILY: ALIPHATIC ALCOHOL
FORMULA: C2H5OH (90%)

MOLECULAR WEIGHT 46.07

SECTION 2 PHYSICAL DATA

BOILING POINT 760 MM HG 77C	SPECIFIC GRAVITY (H2O=1) 0.79
MELTING POINT (-114C	SOLUBILITY IN H2O,% BY WT @20 C MISCIBLE
VAPOR PRES. @ 20C 48 MM HG	EVAPORATION RATE (BUTYL ACETATE=1) 3.1
VAPOR DENSITY (AIR=1) 1.6	APPEARANCE AND ODOR CLEAR, COLORLESS LIQUID
% VOLATILES BY VOLUME 100	WITH CHARACTERISTIC ODOR

SECTION 3 FIRE & EXPLOSION HAZARD DATA

FLASH POINT/TEST METHOD: 54F (CC) FLAMMABLE LIMITS:LEL% 3.3 UEL% 19

EXTINGUISHING MEDIA:
DRY CHEMICAL, CO2, 'ALCOHOL' FOAM. WATER SPRAY TO COOL EXPOSED CONTAINERS AND DISPERSE VAPORS

SPECIAL HAZARDS:
WEAR SELF-CONTAINED BREATHING APPARATUS, FULL FACE SHIELD

UNUSUAL FIRE AND EXPLOSION HAZARDS:
VAPOR CAN TRAVEL TO DISTANT IGNITION SOURCE AND FLASH BACK

SECTION 4 REACTIVITY DATA

STABLE X CONDITIONS TO AVOID:
HEAT, SPARKS, OPEN FLAME

MATERIALS TO AVOID:
( ) WATER ( ) ACIDS ( ) BASES ( ) CORROSIVES (X) OXIDIZERS
( ) OTHER:

CONTINUED ON PAGE 2

E M SCIENCE
A DIVISION OF E M INDUSTRIES, INC.

ALCOHOL, REAGENT, ANHYDROUS
MATERIAL SAFETY DATA SHEET

SECTION 4 REACTIVITY DATA

HAZARDOUS DECOMPOSITION PRODUCTS:
COX, VARIOUS HYDROCARBONS

SECTION 5 SPILL OR LEAK PROCEDURES AND DISPOSAL

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED:
ELIMINATE IGNITION SOURCES. EVACUATE NON-ESSENTIAL PERSONNEL
ABSORB WITH VERMICULITE; CONTAINERIZE FOR PROPER DISPOSAL

WASTE DISPOSAL METHOD: TO BE PERFORMED IN COMPLIANCE WITH ALL CURRENT LOCAL, STATE AND FEDERAL REGULATIONS.

SECTION 6 HEALTH HAZARD DATA

THRESHOLD LIMIT VALUE:
TLV-AIR: 1000 PPM

TXDS:
ORL-HMN LDLO: 500 MG/KG
ORL-RAT LD50: 13.7 G/KG
ORL-MAN TDLO: 50 MG/KG
TOXIC EFFECT: G.I. TRACT

THRESHOLD VALUE:
UNKNOWN
EFFECTS OF OVEREXPOSURE:
SLIGHT TO MODERATE HAZARD.
UNCONSCIOUSNESS, BLINDNESS, DEATH FROM INGESTION.
IRRITATION TO EYES AND MUCOUS MEMBRANES, DROWSINESS, STUPOR, HEADACHE

CENTRAL NERVOUS SYSTEM DEPRESSANT, G.I. TRACT IRRITANT
FIRST AID PROCEDURES:
SKIN: WASH WITH SOAP/WATER; REMOVE CONTAMINATED CLOTHING
EYES: FLUSH WITH WATER, LIFTING LIDS OCCASIONALLY; GET MEDICAL ASSISTANCE
INHALATION: REMOVE TO FRESH AIR; GET MEDICAL ASSISTANCE
INGESTION: GIVE 2 GLASSES OF WATER AND INDUCE VOMITING IF CONSCIOUS; GET MEDICAL ASSISTANCE

SECTION 7 SPECIAL PROTECTION INFORMATION

VENTILATION, RESPIRATORY PROTECTION, PROTECTIVE CLOTHING, EYE PROTECTION:

CONTINUED ON PAGE 3

ALCOHOL, REAGENT, ANHYDROUS
MATERIAL SAFETY DATA SHEET

SECTION 7 SPECIAL PROTECTION INFORMATION

VENTILATION, RESPIRATORY PROTECTION, PROTECTIVE CLOTHING, EYE PROTECTION:
PROVIDE ADEQUATE GENERAL MECHANICAL AND LOCAL EXHAUST VENTILATION
PROTECT EYES AND SKIN WITH SAFETY GOGGLES AND GLOVES
WEAR AIR-SUPPLIED MASK IN CONFINED AREAS
WEAR IMPERVIOUS CLOTHING AND BOOTS

SECTION 8 SPECIAL HANDLING AND STORING PRECAUTIONS

SPECIAL HANDLING AND STORING PRECAUTIONS:
KEEP CONTAINER TIGHTLY CLOSED
STORE IN A DRY AREA AWAY FROM HEAT, SPARKS, OPEN FLAME
NEVER USE CUTTING OR WELDING TORCH ON OR NEAR DRUM, BECAUSE PRODUCT, OR RESIDUE CAN IGNITE EXPLOSIVELY

SECTION 9 HAZARDOUS INGREDIENTS

HAZARDOUS INGREDIENTS:

ETHANOL	APPROX. 90%	TLV: 1000 PPM
METHANOL	5%	200 PPM
ISOPROPANOL	5%	400 PPM

SECTION 10 OTHER INFORMATION

NFPA 704 :
HEALTH FLAMMABILITY REACTIVITY

COMMENTS:
CONTAINERS ARE HAZARDOUS WHEN EMPTY; OBSERVE ALL STATED PRECAUTIONS

M A T E A L S A F E T Y D A T S H E E T

EM SCIENCE
A DIVISION OF EM INDUSTRIES
111 WOODCREST
CHERRY HILL, N.J. 08034-0395

PREPARATION DATE .....: OCT 27, '87

INFORMATION PHONE NUMBER.:
(609) 354-9200
CHEMTREC EMERGENCY NUMBER:
1-800-424-9300

NFPA HAZARD RATINGS

HEALTH ....: 1 FLAMMABILITY ...: 3
REACTIVITY : 0 SPECIAL HAZARDS.: N/A

SECTION I - GENERAL INFORMATION

CATALOG NUMBER(S): MX0480 MX0483 MX0484 MX0485 MX0485C
MX0487 MX0488 MX0489 MX0490 AX1699M
CHEMICAL NAME....: **METHANOL**
TRADE NAME.....: METHYL ALCOHOL, WOOD ALCOHOL
C.A.S. NUMBER....: 67-56-1
CHEMICAL FAMILY..: ALIPHATIC ALCOHOL
FORMULA.....: CH3OH
MOLECULAR WEIGHT.: 32.04
DOT SHIPPING NAME: N/A
DOT NUMBER.....: N/A

SECTION II - HAZARDOUS INGREDIENTS

-NONE OTHER THAN SPECIFIED PRODUCT

SECTION III- PHYSICAL DATA

BOILING POINT (C 760 MM HG).: 64.5C
MELTING POINT (C).....: -98C
SPECIFIC GRAVITY(H.2.O = 1)....: 0.791
VAPOR PRESSURE..(MM HG).....: 97 20C
PERCENT VOLATILE BY VOL (%)..: 99.9+
VAPOR DENSITY (AIR=1).....: 1.1
EVAPORATION RATE (BUAC=1)....: 5.91
SOLUBILITY IN WATER (%).....: MISCIBLE
APPEARANCE AND ODOR.....: COLORLESS LIQUID
CHARACTERISTIC ALCOHOLIC ODOR

SECTION IV - FIRE & EXPLOSION HAZARD DATA

FLASH POINT (F).....: 52F (TCC)
FLAMMABLE LIMITS LEL %.: 6.7
FLAMMABLE LIMITS UEL %.: 36.5
EXTINGUISHING MEDIA....:
CO2, DRY CHEMICAL, "ALCOHOL" FOAM, WATER MIST

FIRE FIGHTING P ....:
WEAR SELF-CONTAINED BREATHING APPARATUS
FIRE & EXPL. HAZARDS...:
-CLOSED CONTAINERS MAY EXPLODE UPON HEATING

SECTION V - HEALTH HAZARD DATA (ACUTE AND CHRONIC)

ACGIH TLV/OSHA PEL (TWA).....:
& PEL: 200 PPM (TWA) STEL: 250 PPM (SKIN)
TOXICITY DATA.....:
-ORL-HMN LDLO: 143 MG/KG ORL-RAT LD50: 5628 MG/KG
IHL-RAT LC50: 64000 PPM/4H
SYMPTOMS OF EXPOSURE .....:
-TOXIC BY INGESTION AND INHALATION
AFFECTS CENTRAL NERVOUS SYSTEM, ESPECIALLY OPTIC NERVE
CAUSES DIZZINESS, NAUSEA, MUSCLE WEAKNESS, NARCOSIS,
RESPIRATORY FAILURE
INGESTION CAN PRODUCE BLINDNESS
100 ML CAN BE FATAL
CAN BE TOXIC BY SKIN ABSORPTION
PROLONGED OR REPEATED SKIN CONTACT MAY CAUSE IRRITATION
MEDICAL COND. AGGRAVATED BY EXP: DATA NOT AVAILABLE.
ROUTES OF ENTRY.....: INHALATION, INGESTION OR SKIN CONTACT.
CARCINOGENICITY.....: SEE COMMENTS, SECTION X; IF NO INFORM-
ATION APPEARS, THE MATERIAL IS NOT LISTED AS A CANCER CAUSING AGENT.
EMERGENCY FIRST AID.....:
GET MEDICAL ASSISTANCE FOR ALL CASES OF OVEREXPOSURE
SKIN: WASH THOROUGHLY WITH SOAP AND WATER
EYES: IMMEDIATELY FLUSH THOROUGHLY WITH LARGE AMOUNTS OF WATER
INHALATION: REMOVE TO FRESH AIR; GIVE ARTIFICIAL RESPIRATION IF
BREATHING HAS STOPPED
INGESTION: GET IMMEDIATE MEDICAL ATTENTION
REMOVE CONTAMINATED CLOTHING AND WASH BEFORE REUSE

SECTION VI - REACTIVITY DATA

STABILITY.....: YES
CONDITIONS TO AVOID .....:
-HEAT; CONTACT WITH IGNITION SOURCE
MATERIALS TO AVOID.....: ( ) WATER ( ) ACIDS
( ) BASES ( ) CORROSIVES (X) OXIDIZERS
(X) OTHER (SPECIFY)- REACTIVE METALS
HAZARDOUS POLYMERIZATION.: DATA NOT AVAILABLE.
HAZARDOUS DECOMPOSITION..: -COX, FORMALDEHYDE

SECTION VII - ENVIRONMENTAL PROTECTION PROCEDURES

SPILL RESPONSE:
-DIKE SPILL; TAKE UP WITH ABSORBENT; CONTAINERIZE FOR PROPER DISPOSAL
WASTE DISPOSAL: TO BE PERFORMED IN COMPLIANCE WITH ALL CURRENT LOCAL,
STATE AND FEDERAL REGULATIONS.

SECTION II - SPECIAL PROTECTION INFORMATION

VENTILATION, RESPIRATORY PROTECTION, PROTECTIVE CLOTHING, EYE PROTECTION:

-MATERIAL SHOULD BE HANDLED OR TRANSFERRED IN AN APPROVED FUME HOOD OR WITH ADEQUATE VENTILATION

PROTECTIVE GLOVES (BUTYL RUBBER, VITON OR EQUIVALENT) SHOULD BE WORN TO PREVENT SKIN CONTACT

SAFETY GLASSES WITH SIDE SHIELDS SHOULD BE WORN AT ALL TIMES

NIOSH-APPROVED RESPIRATOR SHOULD BE WORN IN THE ABSENCE OF ADEQUATE VENTILATION

SECTION IX - SPECIAL PROTECTION INFORMATION

HANDLING & STORAGE ....:

-KEEP CONTAINER CLOSED

STORE IN A COOL AREA AWAY FROM IGNITION SOURCES AND OXIDIZERS

DO NOT BREATHE VAPOR

DO NOT GET IN EYES

AVOID PROLONGED OR REPEATED SKIN CONTACT

DO NOT TAKE INTERNALLY

ELECTRICALLY GROUND ALL EQUIPMENT WHEN HANDLING THIS PRODUCT

WORK/HYGIENIC PRACTICES: WASH THOROUGHLY AFTER HANDLING. DO NOT TAKE INTERNALLY. EYE WASH AND SAFETY EQUIPMENT SHOULD BE READILY AVAILABLE.

SECTION X - OTHER INFORMATION

COMMENTS.....:

-TESTS ON LABORATORY ANIMALS INDICATE MATERIAL MAY PRODUCE ADVERSE MUTAGENIC AND REPRODUCTIVE EFFECTS

REV. 8/87

N/A

REVISION HISTORY.....: 02/01/83, N/A

OCT 27, '87

N/A = NOT AVAILABLE:

J. T. BAKER CHEMICAL CO. 222 RED SCHOOL LANE, PHILLIPSBURG, NJ 08865

M A T E R I A L S A F E T Y D A T A S H E E T

24-HOUR EMERGENCY TELEPHONE -- (201) 859-2151

CHEMTREC # (800) 424-9300 -- NATIONAL RESPONSE CENTER # (800) 424-8802

EFFECTIVE: 09/23/85 ISSUED: 01/23/86

SECTION I - PRODUCT IDENTIFICATION

PRODUCT NAME: 2-PROPANOL
FORMULA: CH3CHOHCH3
FORMULA WT: 60.10
CAS NO.: 00067-63-0
NIOSH/RTECS NO.: NT805000
COMMON SYNONYMS: ISOPROPANOL; ISOPROPYL ALCOHOL; IPA; SEC-PROPANOL; DIMETHYLCARBINOL
PRODUCT CODES: 5610,9083,9088,9334,9095,9079,9089,9084,5373,9081,5375,9082

PRECAUTIONARY LABELLING

BAKER SAF-T-DATA(TM) SYSTEM

HEALTH - 1
FLAMMABILITY - 3 (FLAMMABLE)
REACTIVITY - 1
CONTACT - 1

LA(ATORY PROTECTIVE EQUIPMENT

SAFETY GLASSES; LAB COAT; VENT HOOD; PROPER GLOVES; CLASS B EXTINGUISHER

PRECAUTIONARY LABEL STATEMENTS

WARNING
FLAMMABLE
HARMFUL IF SWALLOWED OR INHALED
CAUSES IRRITATION

KEEP AWAY FROM HEAT, SPARKS, FLAME. AVOID CONTACT WITH EYES, SKIN, CLOTHING. AVOID BREATHING VAPOR. KEEP IN TIGHTLY CLOSED CONTAINER. USE WITH ADEQUATE VENTILATION. WASH THOROUGHLY AFTER HANDLING. IN CASE OF FIRE, USE WATER SPRAY, ALCOHOL FOAM, DRY CHEMICAL, OR CARBON DIOXIDE. FLUSH SPILL AREA WITH WATER SPRAY.

SECTION II - HAZARDOUS COMPONENTS

COMPONENT	%	CAS NO.
2-PROPANOL	90-100	67-63-0

SECTION III - PHYSICAL DATA

BOILING POINT: 83 C (181 F)

ME IG POINT: -89 C (-128 F)

SPECIFIC GRAVITY: 0.78 (H2O=1)

VAPOR PRESSURE(MM HG): 33

VAPOR DENSITY(AIR=1): 2.1

EVAPORATION RATE: 2.83 (BUTYL ACETATE=1)

CONTINUED ON PAGE: 2

SECTION III - PHYSICAL DATA (CONTINUED)

SOLUBILITY(H2O): COMPLETE (IN ALL PROPORTIONS) % VOLATILES BY VOLUME: 100

APPEARANCE & ODOR: LIQUID WITH SLIGHT ODOR OF RUBBING ALCOHOL.

SECTION IV - FIRE AND EXPLOSION HAZARD DATA

FLASH POINT: 12 C (53 F) NFPA 704M RATING: 1-3-0

FLAMMABLE LIMITS: UPPER - 12.7 % LOWER - 2.0 %

FIRE EXTINGUISHING MEDIA
USE ALCOHOL FOAM, DRY CHEMICAL OR CARBON DIOXIDE.
(WATER MAY BE INEFFECTIVE.)

SPECIAL FIRE-FIGHTING PROCEDURES
FIREFIGHTERS SHOULD WEAR PROPER PROTECTIVE EQUIPMENT AND SELF-CONTAINED (POSITIVE PRESSURE IF AVAILABLE) BREATHING APPARATUS WITH FULL FACEPIECE. MOVE EXPOSED CONTAINERS FROM FIRE AREA IF IT CAN BE DONE WITHOUT RISK. USE WATER TO KEEP FIRE-EXPOSED CONTAINERS COOL.

UNUSUAL FIRE & EXPLOSION HAZARDS
VAPORS MAY FLOW ALONG SURFACES TO DISTANT IGNITION SOURCES AND FLASH BACK. CLOSED CONTAINERS EXPOSED TO HEAT MAY EXPLODE. CONTACT WITH STRONG OXIDIZERS MAY CAUSE FIRE.

SECTION V - HEALTH HAZARD DATA

THRESHOLD LIMIT VALUE (TLV/TWA): 980 MG/M3 (400 PPM)

SHORT-TERM EXPOSURE LIMIT (STEL): 1225 MG/M3 (500 PPM)

TOXICITY:

LD50 (ORAL-RAT)(MG/KG)	- 5840
LD50 (IPR-MOUSE)(MG/KG)	- 933
LD50 (ORAL-DOG)(MG/KG)	- 6150

EFFECTS OF OVEREXPOSURE
INGESTION MAY CAUSE NAUSEA, VOMITING, HEADACHES, DIZZINESS, GASTROINTESTINAL IRRITATION.

EMERGENCY AND FIRST AID PROCEDURES
CALL A PHYSICIAN.
IF SWALLOWED, IF CONSCIOUS, IMMEDIATELY INDUCE VOMITING.
IF INHALED, REMOVE TO FRESH AIR. IF NOT BREATHING, GIVE ARTIFICIAL RESPIRATION. IF BREATHING IS DIFFICULT, GIVE OXYGEN.
IN CASE OF CONTACT, IMMEDIATELY FLUSH EYES WITH PLENTY OF WATER FOR AT LEAST 15 MINUTES. FLUSH SKIN WITH WATER.

CONTINUED ON PAGE: 3

SECTION VI - REACTIVITY DATA

STABILITY: STABLE HAZARDOUS POLYMERIZATION: WILL NOT OCCUR

CONDITIONS TO AVOID: HEAT, SOURCES OF IGNITION, FLAME

INCOMPATIBLES: STRONG OXIDIZING AGENTS

SECTION VII - SPILL AND DISPOSAL PROCEDURES

STEPS TO BE TAKEN IN THE EVENT OF A SPILL OR DISCHARGE
WEAR SUITABLE PROTECTIVE CLOTHING. SHUT OFF IGNITION SOURCES; NO FLARES, SMOKING, OR FLAMES IN AREA. STOP LEAK IF YOU CAN DO SO WITHOUT RISK. USE WATER SPRAY TO REDUCE VAPORS. TAKE UP WITH SAND OR OTHER NON-COMBUSTIBLE ABSORBENT MATERIAL AND PLACE INTO CONTAINER FOR LATER DISPOSAL. FLUSH AREA WITH WATER.

J. T. BAKER SOLUSORB(R) SOLVENT ADSORBENT IS RECOMMENDED FOR SPILLS OF THIS PRODUCT.

DISPOSAL PROCEDURE
DISPOSE IN ACCORDANCE WITH ALL APPLICABLE FEDERAL, STATE, AND LOCAL ENVIRONMENTAL REGULATIONS.

EPA HAZARDOUS WASTE NUMBER: D001 (IGNITABLE WASTE)

SECTION VIII - PROTECTIVE EQUIPMENT

VENTILATION: USE GENERAL OR LOCAL EXHAUST VENTILATION TO MEET TLV REQUIREMENTS.

RESPIRATORY PROTECTION: RESPIRATORY PROTECTION REQUIRED IF AIRBORNE CONCENTRATION EXCEEDS TLV. AT CONCENTRATIONS UP TO 1000 PPM, A CHEMICAL CARTRIDGE RESPIRATOR WITH ORGANIC VAPOR CARTRIDGE IS RECOMMENDED. ABOVE THIS LEVEL, A SELF-CONTAINED BREATHING APPARATUS IS RECOMMENDED.

EYE/SKIN PROTECTION: SAFETY GLASSES WITH SIDESHIELDS, NEOPRENE GLOVES ARE RECOMMENDED.

SECTION IX - STORAGE AND HANDLING PRECAUTIONS

SAF-T-DATA(TM) STORAGE COLOR CODE: RED

SPECIAL PRECAUTIONS
BOND AND GROUND CONTAINERS WHEN TRANSFERRING LIQUID. KEEP CONTAINER TIGHTLY CLOSED. STORE IN A COOL, DRY, WELL-VENTILATED, FLAMMABLE LIQUID STORAGE AREA.

CONTINUED ON PAGE: 4

SECTION X - TRANSPORTATION DATA AND ADDITIONAL INFORMATION

DOMESTIC (D.O.T.)

PROPER SHIPPING NAME	ISOPROPANOL
HAZARD CLASS	FLAMMABLE LIQUID
UN/NA	UN1219
LABELS	FLAMMABLE LIQUID

INTERNATIONAL (I.M.O.)

PROPER SHIPPING NAME	ISOPROPANOL
HAZARD CLASS	3.2
UN/NA	UN1219
LABELS	FLAMMABLE LIQUID

(TM) AND (R) DESIGNATE TRADEMARKS.
N/A = NOT APPLICABLE OR NOT AVAILABLE

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M A T E A L S A F E T Y D A T S H E E T

EM SCIENCE
A DIVISION OF EM INDUSTRIES
111 WOODCREST
CHERRY HILL, N.J. 08034-0395

PREPARATION DATE .....: OCT 27, '87

INFORMATION PHONE NUMBER.:
(609) 354-9200
CHEMTREC EMERGENCY NUMBER:
1-800-424-9300

NFPA HAZARD RATINGS

HEALTH ....: 2	FLAMMABILITY ...: 0
REACTIVITY : 0	SPECIAL HAZARDS.: N/A

SECTION I - GENERAL INFORMATION

CATALOG NUMBER(S): CX2205 2791
CHEMICAL NAME....: CUPRIC SULFATE, ANHYDROUS
TRADE NAME.....: COPPER (II) SULFATE, BLUE VITRIOL
C.A.S. NUMBER....: 7758-98-7
CHEMICAL FAMILY..: INORGANIC SALT
FORMULA.....: CUSO4
MOLECULAR WEIGHT.: 159.60
DOT SHIPPING NAME: N/A
DOT NUMBER.....: N/A

SECTION II - HAZARDOUS INGREDIENTS

-NONE OTHER THAN SPECIFIED PRODUCT

SECTION III- PHYSICAL DATA

BOILING POINT (C 760 MM HG).: N/A
MELTING POINT (C).....: > 560C
SPECIFIC GRAVITY(H.2.O = 1)....: 3.6
VAPOR PRESSURE..(MM HG).....: N/A 20C
PERCENT VOLATILE BY VOL (%)..: N/A
VAPOR DENSITY (AIR=1).....: N/A
EVAPORATION RATE (BUAC=1)....: N/A
SOLUBILITY IN WATER (%).....: SOLUBLE
APPEARANCE AND ODOR.....: BLUE-GREEN
ODORLESS POWDER

SECTION IV - FIRE & EXPLOSION HAZARD DATA

FLASH POINT (F).....: NONCOMBUSTIBLE
FLAMMABLE LIMITS LEL %.: N/A
FLAMMABLE LIMITS UEL %.: N/A
EXTINGUISHING MEDIA....:
ANY SUITABLE FOR SURROUNDING MATERIALS

FIRE FIGHTING PRO[illegible] ..:
WEAR SELF-CON[illegible]D BREATHING APPARATUS
FIRE & EXPL. HAZARDS...:
-THERMAL DECOMPOSITION PRODUCES TOXIC FUMES

SECTION V - HEALTH HAZARD DATA (ACUTE AND CHRONIC)

ACGIH TLV/OSHA PEL (TWA).....:
1 MG/CU.M. (AS CU) (TWA) OSHA-PEL: NONE ESTABLISHED
TOXICITY DATA.....:
-ORL-HMN LDLO: 50 MG/KG ORL-RAT LD50: 300 MG/KG
SYMPTOMS OF EXPOSURE .....:
-TOXIC BY INGESTION OR DUST INHALATION
IRRITATING ON CONTACT WITH SKIN, EYES OR MUCOUS MEMBRANES
MEDICAL COND. AGGRAVATED BY EXP: DATA NOT AVAILABLE.
ROUTES OF ENTRY.....: INHALATION, INGESTION OR SKIN CONTACT.
CARCINOGENICITY.....: SEE COMMENTS, SECTION X; IF NO INFORMATION APPEARS, THE MATERIAL IS NOT LISTED AS A CANCER CAUSING AGENT.
EMERGENCY FIRST AID.....:
GET MEDICAL ASSISTANCE FOR ALL CASES OF OVEREXPOSURE
SKIN: WASH THOROUGHLY WITH SOAP AND WATER
EYES: IMMEDIATELY FLUSH THOROUGHLY WITH WATER FOR AT LEAST 15 MINUTES
DUST INHALATION: REMOVE TO FRESH AIR
INGESTION: IF CONSCIOUS, INDUCE VOMITING

SECTION VI - REACTIVITY DATA

STABILITY.....: YES
CONDITIONS TO AVOID .....:
-VERY HYGROSCOPIC WITH GENERATION OF HEAT
MATERIALS TO AVOID.....: ( ) WATER ( ) ACIDS
( ) BASES ( ) CORROSIVES ( ) OXIDIZERS
(X) OTHER (SPECIFY)-HYDROXYLAMINE
HAZARDOUS POLYMERIZATION.: DATA NOT AVAILABLE.
HAZARDOUS DECOMPOSITION..: -SOX

SECTION VII - ENVIRONMENTAL PROTECTION PROCEDURES

SPILL RESPONSE:
-TAKE UP AND CONTAINERIZE FOR PROPER DISPOSAL
WASTE DISPOSAL: TO BE PERFORMED IN COMPLIANCE WITH ALL CURRENT LOCAL, STATE AND FEDERAL REGULATIONS.

SECTION VIII - SPECIAL PROTECTION INFORMATION

VENTILATION, RESPIRATORY PROTECTION, PROTECTIVE CLOTHING, EYE PROTECTION:
-MATERIAL SHOULD BE HANDLED OR TRANSFERRED IN AN APPROVED FUME HOOD OR WITH ADEQUATE VENTILATION
PROTECTIVE GLOVES (NEOPRENE, PVC OR EQUIVALENT) SHOULD BE WORN TO PREVENT SKIN CONTACT
SAFETY GLASSES WITH SIDE SHIELDS SHOULD BE WORN AT ALL TIMES

SECTION IX - SPECIAL PROTECTION INFORMATION

HANDLING & STORAGE ..:
-KEEP CONTAINER TIGHTLY CLOSED
STORE IN A COOL, DRY AREA
DO NOT BREATHE DUST
DO NOT GET IN EYES, ON SKIN OR ON CLOTHING
DO NOT TAKE INTERNALLY
WASH THOROUGHLY AFTER HANDLING
WORK/HYGIENIC PRACTICES: WASH THOROUGHLY AFTER HANDLING. DO NOT TAKE INTERNALLY. EYE WASH AND SAFETY EQUIPMENT SHOULD BE READILY AVAILABLE.

SECTION X - OTHER INFORMATION

COMMENTS.....:
-TESTS ON LABORATORY ANIMALS INDICATE MATERIAL MAY PRODUCE ADVERSE MUTAGENIC AND REPRODUCTIVE EFFECTS
* DECOMPOSES

REV. 6/87

REVISION HISTORY.....: 08/01/81, N/A
OCT 27, '87

N/A = NOT AVAILABLE:

DUPONT

Co 1583

MATERIAL SAFETY DATA SHEET

IDENTIFICATION

Name:
Freon® TF Solvent
Freon® PCA

Chemical Family:
Halogenated Hydrocarbon

Synonyms:
Trichlorotrifluoroethane
R-113, FC-113

Formula:
CCl_2FCClF_2

CAS Name:
Ethane, 1,1,2-Trichloro-1,2,2-Trifluoro

CAS Registry No.
76-13-1

Manufacturer/Distributor:
E. I. du Pont de Nemours & Co. (Inc.)

Medical Emergency Phone:
(800) 441-3637

Address:
Freon® Products Division
Wilmington, DE 19898

Transportation Emergency Phone:
CHEMTREC (800) 424-9300

PHYSICAL DATA

Boiling Point(°F): 117.6

Percent Volatile by Volume: 100%

Density: 1.57 g/cc @/77°F

Vapor Pressure: 334mm Hg @/77°F

Vapor Density (Air = 1): 6.5

Solubility in H_2O: 0.02% by wt. @ 77°F

pH Information: Neutral

Evaporation Rate (CCl_4 = 1): 0.1

Form: Liquid

Appearance: Clear

Color: Colorless

Odor: Slight Ethereal Odor

HAZARDOUS COMPONENTS

Material(s):
Trichlorotrifluoroethane

Approximate % :
100

HAZARDOUS REACTIVITY

Stability:
Material is stable. However, avoid open flames and high temperatures.

Incompatibility:
Alkali or alkaline earth metals - powdered Al, Zn, Be, etc.

Decomposition:
This compound can be decomposed by high temperatures (open flames, glowing metal surfaces, etc.) forming hydrochloric and hydrofluoric acids - possible carbonyl halides.

Polymerization:
Will not occur

FIRE AND EXPLOSION DATA

Flash Point:
None

Method:
TOC

Autoignition Temperature:
Not Determined

Flammable Limits in Air, % by Vol.
Lower: Nonflammable
Upper: Nonflammable

Autodecomposition Temperature:
Not Determined

Fire and Explosion:
Drums may rupture under fire conditions. Decomposition may occur.

Extinguishing Media:
Nonflammable

Special Fire Fighting Instructions:
Self-contained breathing apparatus (SCBA) may be required if drums rupture and contents are spilled under fire conditions.

HEALTH HAZARD INFORMATION

Principal Health Hazards:

Inhalation: Vapor is heavier than air and can cause suffocation by reducing oxygen available for breathing. Breathing high concentrations of vapor may cause light-headedness, giddiness, shortness of breath, and may lead to narcosis, cardiac irregularities, unconsciousness or death. LC 50 Rats 52,000 ppm/4 hrs.

Note: In screening studies with experimental animals, exposure at approximately 5000 ppm (v/v) and above, followed by a large intravenous epinephrine challenge, has induced serious cardiac irregularities.

Skin: Not a corrosive or irritant after single contact; however, repeated liquid contact can cause defatting of the skin resulting in irritation. This material is poorly absorbed through the skin (Rabbit ALD >11,000 mg/kg).

Eye: Liquid contact can cause discomfort, usually no extended effect.

Oral: Although oral toxicity is low [LD 50 Rat 43000 mg/kg], ingestion of FC-113 is to be avoided.

Exposure Limits:

PEL (OSHA) 1,000 ppm

TLV® TWA (ACGIH) 1,000 ppm

Safety Precautions:
Avoid breathing vapors and prolonged skin exposure. Use only in well ventilated area.

First Aid:

Inhalation: Remove to fresh air, call a physician. If not breathing, give artificial respiration, preferably mouth-to-mouth. If breathing is difficult, give oxygen. Do not give epinephrine or similar drugs.

Note to Physician: Because of a possible increased risk of eliciting cardiac dysrythmias, catecholamine drugs, such as epinephrine, should be considered only as a last resort in life threatening emergencies.

Eye: In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Call a physician.

Skin: Flush with water. Get medical attention if irritation is present.

Oral: No specific intervention is indicated as the compound is not likely to be hazardous by ingestion. However, consult a physician if necessary. Do not induce vomiting as the hazard of aspirating the material into the lungs is a greater hazard than allowing it to progress through the intestinal tract.

Medical Conditions Possibly Aggravated by Exposure:

Cardiovascular Disease: See Principal Hazards: Inhalation Section.

Other Health Hazards:

Freon® 113 is not listed as a carcinogen by IARC, NTP or OSHA. Based on animal studies and human experiences this fluorocarbon poses no hazard to man relative to systemic toxicity, carcinogenicity, mutagenicity, or teratogenicity when occupational exposures are below its TLV®.

PROTECTION INFORMATION

Generally Applicable Control Measures:

Normal ventilation for standard manufacturing procedures is generally adequate. Local exhaust should be used when large amounts are released. Mechanical ventilation should be used in low places.

Personal Protective Equipment:

Butyl gloves should be used to avoid prolonged or repeated exposure. Chemical splash goggles should be available for use as needed to prevent eye contact. Under normal manufacturing conditions no respiratory protection is required when using this product. Self-contained breathing apparatus (SCBA) is required if a large spill occurs.

DISPOSAL INFORMATION

Spill, Leak or Release:
Ventilate area. Do not flush into sewers. Dike spill. Collect on absorbent material and transfer to steel drums for recovery or disposal. Comply with federal, state and local regulations on reporting releases.

Waste Disposal: Comply with federal, state and local regulations. Remove to a permitted waste disposal facility. EPA Hazardous Waste Nos. F001 and F002 may apply to waste materials.

SHIPPING INFORMATION

Domestic - Other Than Air (DOT)

Proper Shipping Name	Not Regulated

International Water or Air (IMO/ICAO)

Proper Shipping Name	Not Regulated

Other Information

Shipping Containers	Drums, tank trucks, tank cars
Storage Conditions	Clean, dry area. Do not heat above 125°F.

Date Revised: 10/85
Person responsible: T. D. Armstrong, C&P Dept., Freon® Products Lab, Chestnut Run, Bldg. 711, Wilmington, DE 19898 (302) 999-3847 or (302) 999-4338.

J.T.BAKER INC 22 RED SCHOOL LANE, PHI[illegible]BURG, NJ 08865
M A T E [illegible] A L S A F E T Y D A [illegible] S H E E T
24-HOUR EMERGENCY TELEPHONE -- (201) 859-2151
CHEMTREC # (800) 424-9300 -- NATIONAL RESPONSE CENTER # (800) 424-8802

A5724 -02 AMMONIUM CHLORIDE PAGE: 1
EFFECTIVE: 11/03/86 ISSUED: 11/11/88

SECTION I - PRODUCT IDENTIFICATION

PRODUCT NAME: [redacted]
FORMULA: NH4CL
FORMULA WT: 53.49
CAS NO.: 12125-02-9
NIOSH/RTECS NO.: BP4550000
COMMON SYNONYMS: SAL AMMONIAC
PRODUCT CODES: 0667,0666,0660

PRECAUTIONARY LABELLING

BAKER SAF-T-DATA(*) SYSTEM

HEALTH	-	1	SLIGHT
FLAMMABILITY	-	0	NONE
REACTIVITY	-	0	NONE
CONTACT	-	1	SLIGHT

HAZARD RATINGS ARE 0 TO 4 (0 = NO HAZARD; 4 = EXTREME HAZARD).

. ORATORY PROTECTIVE EQUIPMENT

SAFETY GLASSES; LAB COAT

PRECAUTIONARY LABEL STATEMENTS

CAUTION
MAY CAUSE IRRITATION
MAY BE HARMFUL IF SWALLOWED

DURING USE AVOID CONTACT WITH EYES, SKIN, CLOTHING. WASH THOROUGHLY AFTER HANDLING. WHEN NOT IN USE KEEP IN TIGHTLY CLOSED CONTAINER.

SAF-T-DATA(*) STORAGE COLOR CODE: ORANGE (GENERAL STORAGE)

SECTION II - HAZARDOUS COMPONENTS

COMPONENT	%	CAS NO.
AMMONIUM CHLORIDE	99-100	12125-02-9

SECTION III - PHYSICAL DATA

LING POINT: N/A
VAPOR PRESSURE(MM HG): N/A

MELTING POINT: 338 C (640 F)
VAPOR DENSITY(AIR=1): N/A

SPECIFIC GRAVITY: 1.53 (H2O=1)

ORATION RATE: N/A (BUTYL ACETATE=1)

SOLUBILITY(H2O): APPRECIABLE (MORE THAN 10 %) % VOLATILES BY VOLUME: 0

APPEARANCE & ODOR: WHITE CRYSTALS OR GRANULES. ODORLESS.

SECTION IV - FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (CLOSED CUP N/A NFPA 704M RATING: 1-0-0

FLAMMABLE LIMITS: UPPER - N/A % LOWER - N/A %

FIRE EXTINGUISHING MEDIA

USE EXTINGUISHING MEDIA APPROPRIATE FOR SURROUNDING FIRE.

SPECIAL FIRE-FIGHTING PROCEDURES

FIREFIGHTERS SHOULD WEAR PROPER PROTECTIVE EQUIPMENT AND SELF-CONTAINED BREATHING APPARATUS WITH FULL FACEPIECE OPERATED IN POSITIVE PRESSURE MODE

TOXIC GASES PRODUCED

AMMONIA, HYDROGEN CHLORIDE

SECTION V - HEALTH HAZARD DATA

THERE IS NO PEL VALUE ESTABLISHED FOR THIS PRODUCT.

ESHOLD LIMIT VALUE (TLV/TWA): 10 MG/M3 (PPM)

SHORT-TERM EXPOSURE LIMIT (STEL): 20 MG/M3 (PPM)

TOXICITY: LD50 (ORAL-RAT) (MG/KG) - 1650
LD50 (IPR-MOUSE) (MG/KG) - 485

CARCINOGENICITY: NTP: NO IARC: NO Z LIST: NO OSHA REG: NO

EFFECTS OF OVEREXPOSURE

INHALATION OF DUST MAY CAUSE IRRITATION TO UPPER RESPIRATORY TRACT.
CONTACT WITH SKIN OR EYES MAY CAUSE IRRITATION.
PROLONGED SKIN CONTACT MAY CAUSE DERMATITIS.
INGESTION MAY CAUSE NAUSEA AND VOMITING.
INGESTION MAY CAUSE IRRITATION AND BURNING TO MOUTH AND STOMACH.

TARGET ORGANS

NONE IDENTIFIED

MEDICAL CONDITIONS GENERALLY AGGRAVATED BY EXPOSURE

NONE IDENTIFIED

TES OF ENTRY

INHALATION, INGESTION, SKIN CONTACT, EYE CONTACT

EMERGENCY AND FIRST AID PROCEDURES

INGESTION: IF SWALLOWED AND THE PERSON IS CONSCIOUS, IMMEDIATELY GIVE LARGE AMOUNTS OF WATER. GET MEDICAL ATTENTION.

INHALATION: IF A PERSON BREATHES IN LARGE AMOUNTS, MOVE THE EXPOSED PERSON TO FRESH AIR. GET MEDICAL ATTENTION.

EYE CONTACT: IMMEDIATELY FLUSH WITH PLENTY OF WATER FOR AT LEAST 15 MINUTES. GET MEDICAL ATTENTION.

SKIN CONTACT: IMMEDIATELY WASH WITH PLENTY OF SOAP AND WATER FOR AT LEAST 15 MINUTES.

SECTION VI - REACTIVITY DATA

STABILITY: STABLE

HAZARDOUS POLYMERIZATION: WILL NOT OCCUR

CONDITIONS TO AVOID: MOISTURE, HEAT

INCOMPATIBLES: STRONG OXIDIZING AGENTS, STRONG ACIDS, STRONG BASES, MOST COMMON METALS, BROMINE TRIFLUORIDE AND TRICHLORIDE, SILVER AND SILVER COMPOUNDS

DECOMPOSITION PRODUCTS: AMMONIA, HYDROGEN CHLORIDE

SECTION VII - SPILL AND DISPOSAL PROCEDURES

STEPS TO BE TAKEN IN THE EVENT OF A SPILL OR DISCHARGE

WEAR SUITABLE PROTECTIVE CLOTHING. CAREFULLY SWEEP UP AND REMOVE.

DISPOSAL PROCEDURE

DISPOSE IN ACCORDANCE WITH ALL APPLICABLE FEDERAL, STATE, AND LOCAL ENVIRONMENTAL REGULATIONS.

SECTION VIII - PROTECTIVE EQUIPMENT

VENTILATION: USE GENERAL OR LOCAL EXHAUST VENTILATION TO MEET TLV REQUIREMENTS.

RESPIRATORY PROTECTION: NONE REQUIRED WHERE ADEQUATE VENTILATION CONDITIONS EXIST. IF AIRBORNE CONCENTRATION EXCEEDS TLV, A DUST/MIST RESPIRATOR IS RECOMMENDED. IF CONCENTRATION EXCEEDS CAPACITY OF RESPIRATOR, A SELF-CONTAINED BREATHING APPARATUS IS ADVISED.

EYE/SKIN PROTECTION: SAFETY GOGGLES, RUBBER GLOVES ARE RECOMMENDED.

SECTION IX - STORAGE AND HANDLING PRECAUTIONS

SAF-T-DATA(*) STORAGE COLOR CODE: ORANGE (GENERAL STORAGE)

SPECIAL PRECAUTIONS

KEEP CONTAINER TIGHTLY CLOSED. SUITABLE FOR ANY GENERAL CHEMICAL STORAGE

AREA.
ISOLATE FROM INCO[illegible]BLE MATERIALS.

SECTION X - TRANSPORTATION DATA AND ADDITIONAL INFORMATION

[illegible]STIC (D.O.T.)

PROPER SHIPPING NAME	AMMONIUM CHLORIDE
HAZARD CLASS	ORM-E
UN/NA	NA9085
LABELS	NONE
REPORTABLE QUANTITY	5000 LBS.

INTERNATIONAL (I.M.O.)

PROPER SHIPPING NAME	CHEMICALS, N.O.S. (NON-REGULATED)

(*) AND (R) DESIGNATE TRADEMARKS.
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