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Exercise Manual for the Augmented Computer Exercise for Inspection Training (ACE-*IT*) Software

Pauline R. Dobranich, Thomas W. Widney, Pauline T. Goolsby, Deborah A. Evanko, Jon D. Nelson

Prepared by
Sandia National Laboratories
Albuquerque, New Mexico 87185 and Livermore, California 94550

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EXERCISE MANUAL FOR THE AUGMENTED COMPUTER EXERCISE FOR INSPECTION TRAINING (ACE-*IT*) SOFTWARE

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ABSTRACT

The on-site inspection provisions in many current and proposed arms control agreements require extensive preparation and training on the part of both the Inspected Party and the Inspection Team. Current training techniques include table-top inspections and practice inspections. The Augmented Computer Exercise for Inspection Training (**ACE-*IT***), an interactive computer training tool, increases the utility of table-top inspections. **ACE-*IT*** has been designed to provide training for a hypothetical "challenge inspection" under the Chemical Weapons Convention (CWC); however, this training tool can be modified for other inspection regimes. Although **ACE-*IT*** provides training from notification of an inspection through post-inspection activities, the primary emphasis of **ACE-*IT*** is in the inspection itself - particularly with the concept of "managed access." **ACE-*IT*** also demonstrates how inspection provisions impact compliance determination and the protection of sensitive information. The Exercise Manual supplements the **ACE-*IT*** software by providing general information on on-site inspections and detailed information for the CWC "challenge inspection" exercise. The detailed information includes the pre-inspection briefing, maps, list of sensitive items, medical records, and shipping records.

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Executive Summary

The Chemical Weapons Convention (CWC) includes several on-site inspection regimes. The Augmented Computer Exercise for Inspection Training (**ACE-*IT***) is a tool for training both the Inspection Team (inspectors) and the Inspected Party (host) to conduct a hypothetical "challenge inspection" under the CWC. "Challenge inspections" are inspections that take place anywhere, at any time, and cannot be refused. Also, the inspection occurs shortly after the Inspected Party receives notification that an inspection will occur, so the Inspected Party will have little time to prepare for the inspection. Therefore, advance training is important.

ACE-*IT* training is conducted with two teams: an "Inspection Team" and an "Inspected Party". An exercise moderator controls the exercise. The training includes all of the events in the CWC "challenge inspection" regime, from initial notification of an inspection, through negotiating the perimeter, to the actual inspection. But the focus of the training tool is on the actual inspection. Three buildings can be inspected.

The **ACE-*IT*** "challenge inspection" exercise teaches the teams

- how to collect information to determine compliance;
- how to balance the obligation to demonstrate compliance with the need to protect sensitive information that is unrelated to the Treaty;
- and how to manage time during an inspection, since the duration of an inspection is limited.

The tool can also be used by policymakers to show how on-site inspection provisions impact the ability to determine compliance with an agreement and to protect unrelated sensitive information.

The "challenge inspection" exercise has been preceded by a "declared inspection" of a "Single Small-Scale Facility," as allowed by the Treaty. Although the "Single Small-Scale Facility" was found to be in compliance with the Treaty, the inspectors noted another process line in the building, but this was not inspectable under the "declared inspection." In addition, two co-located buildings could be storing chemical weapons agents. Thus, the inspection mandate for the "challenge inspection," is

> *"Inspect an undeclared facility for possible noncompliance with the CWC, specifically regarding alleged development, production, or storage of chemicals or chemical munitions prohibited by the CWC."*

This is the basis of the "challenge inspection."

Under the CWC "challenge inspection" regime, the host can control the movement of the inspectors by using "managed access." Access to the room can be controlled by limiting inspector access such as only granting a view through the door or window of a room in question. Access to shrouded (or covered) items can be controlled by partially removing the shroud or by providing "alternate information," such as chemical sampling, to assure the inspectors that the site is in compliance with the Treaty while protecting sensitive information that is not related to the Treaty.

The Exercise Manual contains the following sections:

Section	Title
1	Introduction to On-Site Inspections (OSI) *(with addendum on challenge inspections under the Chemical Weapons Convention)*
2	Inspection Team and Inspected Party Tips
3	Augmented Computer Exercise for Inspection Training (**ACE-*IT***)
4	Training Goals
5	Single Small-Scale Facility Declaration and Results of Last Inspection
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19	List of Findings
20	Glossary

The Inspected Party receives all sections, except 18 and 19, at the start of the exercise. The Inspection Team only receives sections 1 through 6, 8, and 20. The other sections are given to the Inspection Team as the exercise proceeds or as access to the information has been granted by the Inspected Party.

Introduction to On-Site Inspections (OSI)

(with addendum on challenge inspections under the Chemical Weapons Convention)

Definition of OSI: Examinations by inspectors of items and activities within sites -- as permitted by an agreement.

An Overview of OSI in the Twentieth Century

- Post-Versailles European Peace Accords
- Nuclear material control proposals in the 1940s
- Initial negotiations on banning nuclear tests in the 1950s
- Antarctic Treaty in the 1960s
- International Atomic Energy Agency Safeguards Agreements *(and transparency visits)*
- Intermediate-Range Nuclear Forces Treaty (INF)
- Strategic Arms Reduction Treaty (START I)
- Conventional Forces in Europe Treaty (CFE)
- Chemical Weapons Convention (CWC)

Why On-Site Inspections?

- OSI can supplement other means of verification *(such as national technical means)*
- OSI can deter noncompliance by making noncompliance more complex and costly
- OSI provides an opportunity for people to interact

Types of On-Site Inspections

- *Baseline*: initial inspections to check the accuracy of declarations
- *Routine*: periodic inspections of declared sites
- *Challenge*: inspections at declared and undeclared sites
- *Elimination*: inspections to witness the elimination of items or sites
- *Continuous*: inspections at declared sites for an extended time
- *Special:* inspections for a specific purpose
- *Transparency:* site visits offered by the host to provide openness about activities

Inspector Objectives during On-Site Inspections

- Know the agreement and inspection provisions
- Conduct the inspection according to the agreement
  - only request access and information relevant to the compliance concern
  - assert rights
  - manage resources, especially time
- Write a thorough and objective inspection report

Collect enough information so that compliance can be determined.

Host Objectives during On-Site Inspections

- Demonstrate compliance with the agreement
- Protect unrelated sensitive information *(private, proprietary, and national security information)*
- Make every reasonable effort to resolve compliance concerns
- Minimize cost and disruption to the normal operations at the site

Balance the obligation to demonstrate compliance with the need to protect sensitive information not related to the agreement.

Findings

- It is not possible to prove the absence of an item, a process, or a capability.
- Inspections increase the risk of information compromise.
  - The size of treaty-limited items affects the information placed at risk.
  - Sampling activities may compromise information.
  - The Inspected Party must be trained to provide only information relevant to the agreement.
- The likelihood of compromising information depends on both the degree of access and the preparation level of the site.

Findings *(continued)*

- Prior planning is essential -- including formal inspection plans, escort training, & inspection exercises.
  - The diplomatic status of inspectors may conflict with security requirements.
  - Logistics can be complex.
  - Indemnification, contracting, and other legal issues should be addressed.
- Costs of planning and conducting on-site inspections may be significant.

Conclusions

- On-site inspections are most useful when considered in the context of the full spectrum of available cooperative monitoring techniques.
- Because inadequate preparation can make inspections less valuable and increase the probability of compromising information, planning is essential to effective on-site inspection management.
- The inclusion of on-site inspections in agreements is increasing, and on-site inspections may be included in future regional security arrangements.

Thus, policymakers must understand the impacts of various inspection regimes to make informed judgments as to their utility.

Addendum on "Challenge Inspections" under the Chemical Weapons Convention (CWC)

Challenge Inspections under the CWC

- Anytime, anywhere without the right of refusal *(and little advance notice)*
- Conducted by a team of international inspectors
- The host may use "managed access" to restrict access of the inspectors to an area that has national security or proprietary concerns unrelated to the agreement

"Managed Access"

- A method of restricting Inspection Team access to an area of a facility that has overriding national security or proprietary concerns not related to the agreement
- Some options for controlling access
  - Deny access
  - Provide alternative information *(records, personnel interviews, chemical sampling, and public relations information)*
  - Allow access for selected inspectors
  - Allow "random selected access" to rooms
  - Allow viewing from outside the room
  - Shroud objects or areas

Additional Details on "Managed Access" Options

Buildings:

- Provide access to building perimeter
- Allow partial inspection of building interior

Rooms:

- Allow viewing through window
- Allow viewing through door
- Measure objects
- Allow object to be partially unshrouded

Sample "Challenge Inspection" Mandate

Inspect an undeclared site for possible non-compliance with the Chemical Weapons Convention (CWC), specifically regarding alleged

- development,
- production, or
- storage

of chemicals or chemical munitions prohibited by the CWC.

Sample Inspection Objectives

- Evaluate the ability to demonstrate compliance with the CWC
- Evaluate the ability to protect unrelated, sensitive activities

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Inspection Team and Inspected Party Tips

from DynMeridian Corp.

The authors acknowledge the contribution of DynMeridian Corp. for the viewgraphs in this section.

International Arms Control Inspections

- Mandate
- Inspectors
- Escorts
- Common goals
- Scenario

Inspection Mandate

- Declared or Routine Inspection
  - No potential violation is implied -- inspection takes place on routine basis to declared sites
- Challenge Inspection
  - Enough evidence on potential non-compliance exists to raise a question of compliance
  - In a multi-lateral treaty the governing body decides if an inspection is needed

Inspector's Position

- Inspectors are professional observers
  - No accusations of wrongdoing and no decisions regarding treaty compliance
- Inspectors gather data in accordance with treaty
  - Others will verify treaty compliance
- Inspectors have special protected status
- Inspectors must maintain professional objectivity

Inspector Attributes

- Treaty expert
  - Understands the treaty or inspection agreement
  - Understands the inspection mandate
- Subject matter expert
- Skilled observer
- Thoroughly trained

The Inspector's Goals

- To conduct inspection in accordance with treaty provisions and inspection mandate
- To write a thorough and objective inspection report that fulfills the inspection mandate

Guidelines for Inspectors

- Do not attempt surreptitiously to pick up or acquire objects
- You do not have the right to demand -- keep in mind that an inspection is a cooperative effort
- If difficulties cannot be resolved at subgroup level, bring them to the attention of the Inspection Team Chief

Guidelines for Inspectors

- Understand and follow inspection plan route and timing
- Remain focused on Inspection Mandate
- Allow escorts to precede inspectors through doors, into buildings and rooms
- Ask for permission to touch objects or to examine documents

Guidelines for Inspectors

- Divide Inspectors into sub-groups
  - Balance skills to equalize sub-group capabilities
  - Specifically tailor a sub-group for certain tasks
- Take initiative: dictate tempo of activities at arrival, pre-inspection briefings, and during inspection

Guidelines for Inspectors

- Become familiar with site and facility to be inspected prior to arrival
- Compare Pre-Inspection briefings with prior knowledge of site
- Gather data from Pre-Inspection Briefings to guide inspection activities
- Carefully develop the inspection plan

Escort's Position

- Controls access of inspection team by balancing rights and obligations:
  - IS OBLIGATED to provide access so Inspectors can gather data in accordance with treaty procedures
  - HAS THE RIGHT to protect classified, proprietary, and sensitive information not related to the inspection mandate
- Provides logistics and support services to host the Inspectors

Escort's Goals

- Demonstrate Treaty Compliance
  - May include briefings, access, records, personnel interviews, sampling, photography, etc. to demonstrate that the facility is in compliance
- Protect National Security Information
- Minimize disruption of operations during inspection

Guidelines for Escorts

- Be courteous and helpful during interactions with inspectors
- Exercise same access procedures that would normally be used for uncleared personnel
- Cover up or remove any classified material
- Do not volunteer information or make idle conversation, especially about unit capabilities

Guidelines for Escorts

- Do not lie to inspectors
- Do not give inspectors documents without official permission
- Keep wandering inspector in his/her group
- Do not touch inspectors; do not take items out of inspector's hands
- Do not speak for the facility without previous coordination

Guidelines for Escorts

Always remember:

- Inspectors are professionals and will conduct themselves as such
- Inspectors have diplomatic immunities and privileges
- Inspectors are dependent upon their escorts for access

Mutual Interests

- The Inspector and Escorts have a common goal -- a successful inspection
  - Inspector obtains enough information for a compliance judgment to be made
  - Facility demonstrates compliance without compromise of security
- Recognition of mutual interests fosters professional courtesy, objectivity, and cooperation in conducting the inspection

Inspection Scenario

- Inspection Team has arrived at the inspected facility
- Inspected facility has provided required orientation briefing, pre-inspection briefing, safety briefing
- Reviewed the inspection schedule
- Inspection begins

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Augmented Computer Exercise for Inspection Training (ACE-*IT*)

TECHNOLOGY

Many current and proposed arms control agreements have on-site inspection requirements. Either government facilities or private firms may be subject to these inspections. The Augmented Computer Exercise for Inspection Training (ACE-*IT*) is a tool for training both inspectors and hosts.

Description

ACE-*IT* is an interactive computer program. It teaches users (1) how to conduct an inspection and (2) how the provisions of an on-site inspection affect the ability to determine compliance and protect sensitive information. ACE-*IT* has been developed for practicing a "challenge inspection" under the Chemical Weapons Convention (CWC).

"Challenge inspections" may occur at anytime and anywhere–without the right of refusal and with little advance notice. Therefore, advance training is important.

ACE-*IT* training is conducted with two teams: an "Inspection Team" (inspectors) and an "Inspected Party" (hosts). An exercise moderator controls the exercise. The training includes all of the events allowed by the CWC, from notification of an inspection through the post-inspection procedures.

Technical Details

Control Module
The control module shows the schedule for the "challenge inspection." The time that would be required for an actual inspection is compressed for the training exercise to either four or sixteen hours. All events are automatically recorded in an inspection log; users may also add their own notes. The moderator may pause the exercise or jump ahead to the next event.

Geographic Information System (GIS) Building Maps
There are three buildings available for inspection: a "single small-scale facility," an office building, and a demonstration building.

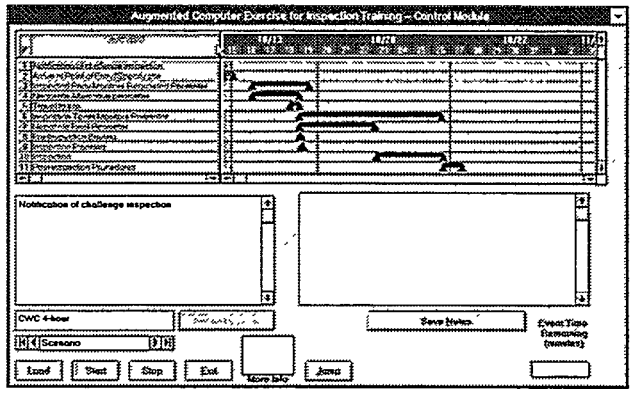

Figure 1. ACE-*IT* control module showing the schedule of events for the "challenge inspection."

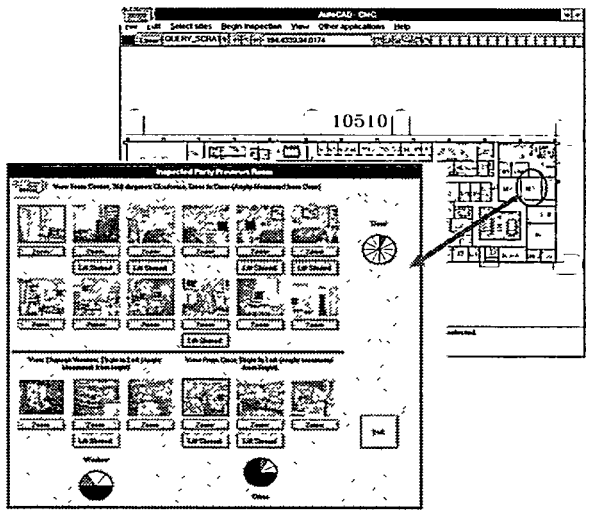

Figure 2. Sample building map and interactive menu with digital images of a room to be inspected.

Interactive Menus
Interactive menus allow the Inspection Team and the Inspected Party to "conduct" the inspection. These menus teach the important concept of *managed access*—i.e., how the Inspected Party can protect sensitive information that is unrelated to the CWC. This includes controlling

physical access to a room, negotiating permission to look behind shrouds, and controlling requests for alternate information.

Digital Images
Digital images provide multiple views of each room. The images may be zoomed to full screen.

Tabular Data
The Inspection Team can obtain data associated with each room, if permission to access this information is granted by the Inspected Party. The data include inventory of items in each room, chemical sampling results, proprietary research information, hazardous waste information, and other related documents.

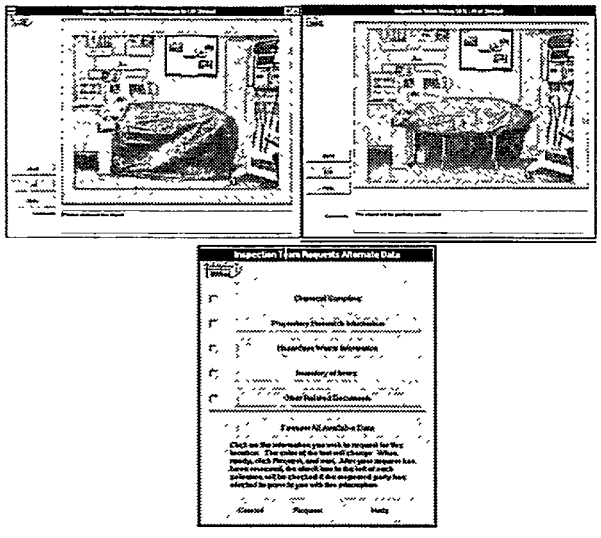

Figure 3. Examples of managed access using ACE-*IT*: object shrouding and requests for alternate information.

Text Retrieval
Documents that are not associated with a particular location (such as CWC text and safety plans) are included as "hypertext" documents.

Requirements

ACE-*IT* consists of a suite of commercial software that runs on a local area network with three personal computers. Each computer is at least 486/66-class, with 32 MB RAM and 2 GB hard drive, capable of video display at a resolution of at least 1024 by 768.

Custom applications have been developed to integrate the system components using several commercial products:

- AutoCAD® by Autodesk—graphics engine
- ArcCAD® by ESRI—geographical information system
- Access® by Microsoft—database
- ZyIndex® by ZyLAB—text retrieval
- Visual BASIC® by Microsoft—program development
- Windows for Workgroups® by Microsoft—local area network

Applications

In addition to providing training in conducting "challenge inspections" under the CWC, ACE-*IT* can be used to study managed access techniques for other inspection regimes, or to manage time during an inspection. Other agreements, inspection regimes, and buildings could be added to ACE-*IT*.

Availability

All of the equipment and most of the software is commercially available. The customized code is copyrighted, and available from Sandia National Laboratories and Ogden Environmental and Energy Services.

Credits

This work was performed by Sandia National Laboratories and Ogden Environmental and Energy Services. Support from the U. S. Department of Energy is gratefully acknowledged.

More Information

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Cooperative Monitoring Center

Training Goals

Sandia National Laboratories

Training Goals

- Teach participants about on-site inspections by allowing them to be part of the Inspection Team or the Inspected Party
- Teach participants about the impact of on-site inspection provisions on compliance determination and protection of sensitive information

Specific Inspection Concepts Addressed

- For both the Inspected Party and Inspection Team:
  - Managed access techniques
  - Sampling
  - Specific treaty requirements
  - Resolution of ambiguities
  - Facilitating the inspection
- For the Inspected Party:
  - Protection of sensitive information
- For the Inspection Team:
  - Time management
  - Thoroughness

Other Training Goals

- Establish the objectives of the inspection
- Explain the inspection process for each agreement
- Teach participants about perimeter negotiations
- Teach participants about perimeter monitoring techniques
- Explain pre-inspection briefing requirements
- Provide an evaluation of the training exercise
- Collect participant feedback

Single Small-Scale Facility Declaration and Results of Last Inspection

The declaration is entirely composed of hypothetical data.

SSSF Annual Declaration for Building 10500 CMC Site, Albuquerque, New Mexico (6 Months Ago)

A "Single Small-Scale Facility" may produce Schedule 1 chemicals for research, medical, pharmaceutical or protective purposes.

The Single Small Scale Facility (SSSF) is located in Building 10500 of the CMC Site, Albuquerque, NM. The facility is limited to the ground floor of this building. The Cooperative Monitoring Center (CMC) facility is operated through Sandia National Laboratories which is managed by Sandia Corporation, a Lockheed-Martin company, for the US Department of Energy.

The production at the designated time was limited to the Schedule 1 compound HN1.

HN1 is produced by the reaction of thionyl chloride in an excess (80%) solution of hydrochloric acid with ethyldiethanolamine in the presence of peroxides. An alternate method uses triethanolamine with sulfuric acid and peroxides over a catalytic bed of ammonium nitrate. The reaction is usually run at approximately 30°C for about 2 hours until the liberation of chlorine gas (Cl_2) stops. The reactor is quenched by the addition of methylene chloride (CH_2Cl_2) and cooling to room temperature. The reaction mixture separates into organic and inorganic phases. The organic phase is removed with the use of a separatory funnel and washed with water, aqueous base, and water in that order until all residual acid is neutralized. The neutralization is generally carried out in another, larger, reaction vessel. HN1 is stored as the resulting organic-phase solution (referred to from now on as HNSOL). HNSOL is approximately 15% by weight pure HN1 and is stored and transported in this method for Environmental, Safety, and Health (ES&H) concerns.

MATERIAL BALANCE

HNSOL	Produced	57.600 kg
HNSOL	Transferred to Tooele Facility	57.600 kg
HNSOL	Received from other facilities	0.000 kg
HNSOL	**Remaining in storage at 10500**	**0.000 kg**

HN1	Produced	8.640 kg
HN1	Transferred to Tooele Facility	8.640 kg
HN1	Received form other facilities	0.000 kg
HN1	**Remaining in storage at 10500**	**0.000 kg**

The declaration is entirely composed of hypothetical data.

Building 10500 includes a Single Small-Scale Facility to produce materials listed in Schedule 1 of the Chemical Weapons Convention. Equipment located on the ground floor of Building 10500, used in the manufacturing and storage of the Schedule 1 compound HN1, is listed as follows:

Item	Quantity	Capacity or Size
glass spherical reactor vessel	1	100 liters
glass spherical reactor vessel	1	50 liters
glass spherical reactor vessel	1	25 liters
reflux/distillation columns	3	varies
heating/cooling jackets	3	varies
separation column	1	30 liters
spherical, jacketed receiver flask	1	20 liters
spherical, jacketed receiver flask	1	10 liters
mounting frame	1	N/A

In addition, a portable hood with buchner funnels is used as needed to separate solids. All equipment can be operated under reduced pressure or in an inert atmosphere using a portable vacuum and gas system brought into the operating cell.

All other equipment in Building 10500 is not relevant to the CWC Treaty.

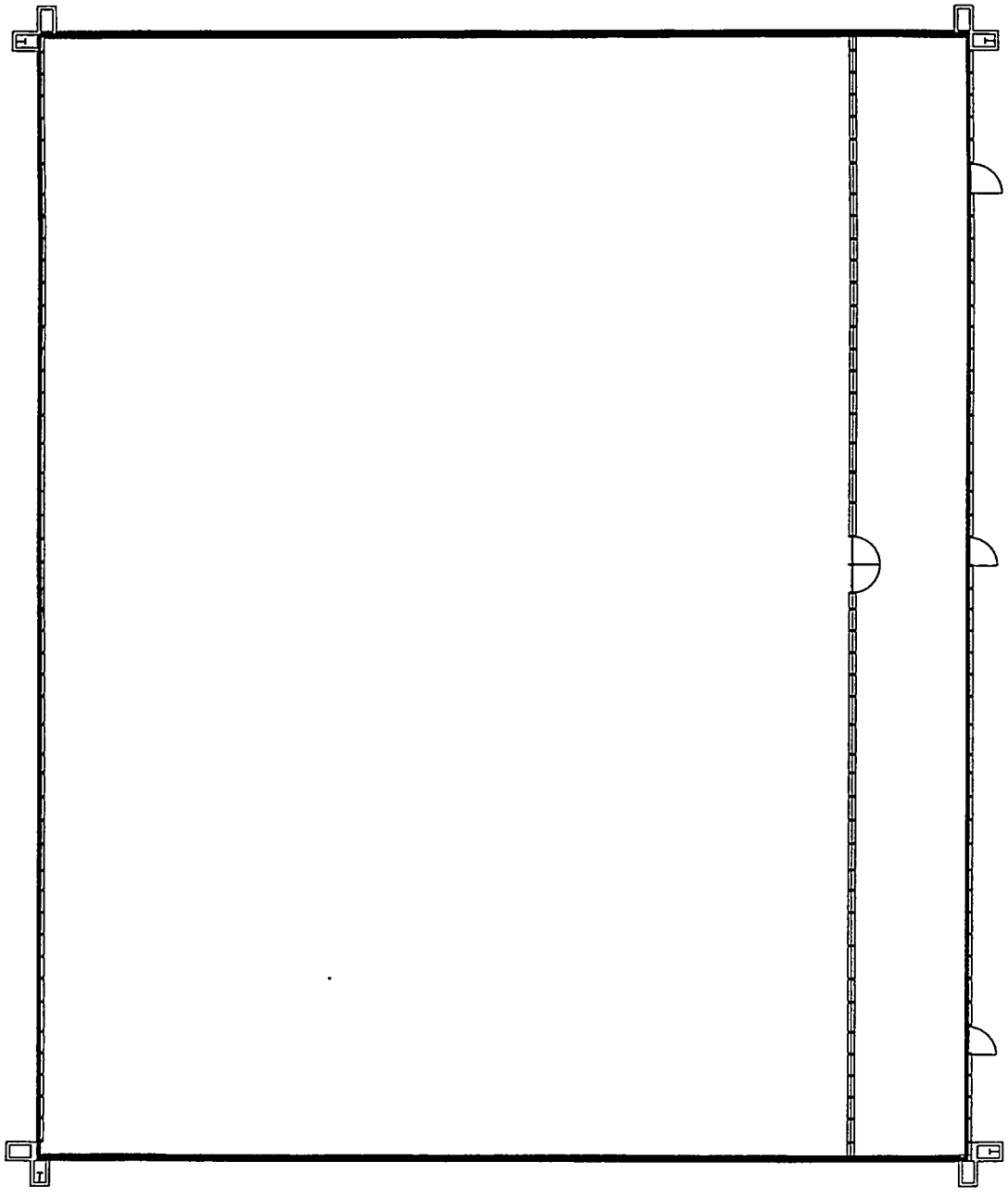
The declaration is entirely composed of hypothetical data.

Inspection Report

The reported quantities produced were within the production limits of the treaty and consistent with the declared equipment process.

The declaration is entirely composed of hypothetical data.

10500



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Background

Six months ago, a "single small-scale facility" (Building 10500) was inspected as a declared inspection under the Chemical Weapons Convention. Only the ground floor was inspectable; thus the mezzanine was not inspected. The declared inspection determined that the "single small-scale facility" was in compliance with the Chemical Weapons Convention. The other two co-located buildings were not inspectable.

CWC Exercise Package for Inspection Team (Inspectors) and Inspected Party (Host)

Step # 1: Notification of challenge inspection

The inspection will involve a challenge inspection under the Chemical Weapons Convention.

"Inspect an undeclared facility for possible non-compliance with the Chemical Weapons Convention (CWC), specifically regarding alleged

- development,
- production, or
- storage of chemicals or chemical munitions prohibited by the CWC."

For this exercise, the size of a container with a "significant quantity" of CWC chemicals will have a diameter of 51 cm and a height of 71 cm.

Inspection objectives:

- Information is gathered relevant to compliance with the CWC
- Inspection Team is granted access to the maximum extent possible while protecting national security, proprietary information, and constitutional rights
- When access is denied, every reasonable effort is made to demonstrate the area's (object, building, structure, container, or vehicle) lack of relevance to the CWC

Note: Possible external building signatures for CWC buildings include stacks, garage bay doors, security fences (and other security measures).

Step # 2: Arrive at "Point of Entry" and specify site

Inspection Team specifies site and requested perimeter. The requested perimeter includes three buildings, commonly known as the CMC Complex. The buildings are 10500, 10510, and 10520. *Note: A portion of Building 10500 has been inspected (6 months ago) as a declared "Single Small-Scale Facility.*

Inspected Party inspects the Inspection Team's equipment (hardware and software). The Inspected Party must not damage the equipment or unduly delay the inspection. The Inspected Party must ask the Inspection Team to actually operate the equipment.

Step # 3: Inspected Party monitors "requested" perimeter

No later than 12 hours after arrival of the Inspection Team at the Point-of-Entry, the Inspected Party must begin collecting information on all vehicular exit activity from all exit points of the "requested" perimeter (land, air, water, and vehicles).

Some options for monitoring include:

- Exits --
  - Lock and seal exits
  - Station personnel at exits
  - Log traffic
  - Place cameras at exits
  - Place detection sensors at exits
  - Inspect vehicles
- Perimeter --
  - Patrol perimeter
  - Place detection sensors at perimeter
  - Place cameras around perimeter
  - Place chemical sampling equipment around perimeter *(provided by the Inspection Team)*
  - Log traffic

Step # 4: Negotiate alternative/final perimeter

"Requested" perimeter rules --

- Should be at least 10 m outside any building/structure
- Should not cut through existing enclosures
- Should be at least 10 m distance outside any existing security enclosures

"Alternative" perimeter rules --

- Should include all of the "requested" perimeter
- Should run close to surrounding security enclosures
- Establish relationship between "requested" and "alternative" perimeters by a combination of two of the following:
  - An "alternative" perimeter does not extend to an area significantly greater than the "requested" perimeter
  - An "alternative" perimeter that is a short, uniform distance from the "requested" perimeter
  - At least part of the "requested" perimeter is visible from an "alternative" perimeter

Note: If the Inspection Team and Inspected Party cannot agree on a perimeter within the allotted time, the "alternative" perimeter is the "final" perimeter. Also, when the Inspection Team arrives at the site, the Inspection Team begins perimeter monitoring at the "alternative" or "final" perimeter. With regard to perimeter activities, the Inspection Team (1) may conduct perimeter activities in a 50 m band outward from the "alternative" or "final" perimeter; (2) may have access to buildings within the 50 m band, if the Inspected Party agrees; and (3) must have all directional monitoring oriented inward.

Step # 5: Travel to site

Inspection Team travels from the Point-of-Entry to the site.

Step # 6: Inspection Team monitors perimeter

Upon arrival at the site, the Inspection Team may begin collecting information on all vehicles exiting the site, from all exit points (land, air, and water) of the "alternative" or "final" perimeter.

Some options for monitoring include:

- Exits --
  - Lock and seal exits
  - Station personnel at exits
  - Log traffic
  - Place cameras at exits
  - Place detection sensors at exits
  - Inspect vehicles, if permitted
- Perimeter --
  - Patrol perimeter
  - Place detection sensors at perimeter
  - Place cameras around perimeter
  - Place chemical sampling equipment around perimeter *(provided by the Inspection Team)*

Note: personnel and personal passenger vehicles exiting the site are not subject to inspection.

Step # 7: Negotiate alternative/final perimeter

If the "final" perimeter has not been determined in Step # 4, continue perimeter negotiations.

"Requested" perimeter rules --

- Should be at least 10 m outside any building/structure
- Should not cut through existing enclosures
- Should be at least 10 m distance outside any existing security enclosures

"Alternative" perimeter rules --

- Should include all of the "requested" perimeter
- Should run close to surrounding security enclosures
- Establish relationship between "requested" and "alternative" perimeters by a combination of two of the following:
  - An "alternative" perimeter does not extend to an area significantly greater than the "requested" perimeter
  - An "alternative" perimeter that is a short, uniform distance from the "requested" perimeter
  - At least part of the "requested" perimeter is visible from an "alternative" perimeter

Note: If the Inspection Team and Inspected Party cannot agree on a perimeter within the allotted time, the "alternative" perimeter is the "final" perimeter. Also, when the Inspection Team arrives at the site, the Inspection Team begins perimeter monitoring at the "alternative" or "final" perimeter. With regard to perimeter activities, the Inspection Team (1) may conduct perimeter activities in a 50 m band outward from the "alternative" or "final" perimeter; (2) may have access to buildings within the 50 m band, if the Inspected Party agrees; and (3) must have all directional monitoring oriented inward.

Step # 8: Pre-inspection briefing

- Facility diagram
- Basic facility overview, including pertinent historical information
- Site specific safety hazards (evacuation plan, safety hazards, alarms)
- Results of perimeter monitoring by Inspected Party

Step # 9: Inspection planning

Based on information provided during the pre-inspection briefing, the Inspection Team plans the inspection

- which buildings should be inspected
- the order of the buildings to be inspected
- any walking around the perimeter of the site or individual buildings

Note: The Inspection Team plans must be negotiated with the Inspected Party.

Step # 10: Inspection

The Inspection Team requests access to buildings and rooms. Then, the Inspected Party responds to the request. A final position is negotiated.

The options for access to buildings include:

- No access
- Provide alternate information
  - Proprietary database
  - Equipment database
  - Hazardous waste database
  - Medical records
  - Environmental Safety and Health information
  - General public relations information
  - Shipping/receiving records
- Provide access to perimeter of building
- Access for only selected inspectors
- Random selected access
- Partial inspection of interior
- Allow inspection of entire interior

The options for access to rooms include:

- No access
- Provide alternate information
  - Proprietary database
  - Equipment database
  - Hazardous waste database
  - Medical records
  - Environmental Safety and Health data
  - General public relations data
- View through the window only
- View through the door only
- Access for only selected inspectors
- Access for all inspectors
- Measure objects
- Sampling *(for further information, see next page)*
- Partial unshrouding
- Unshrouding
- Interview personnel

Sampling Information

Analysis of a sample takes two hours. Six to ten samples could reasonably be taken and analyzed during an inspection using CWC-approved equipment [gas chromatograph/mass spectrometer (GC/MS) and Fourier transform infrared (FTIR)]. Sample types include soil samples; wipes and other solid samples; air filters; water samples; and process samples. Some sampling locations include waste cans; sinks; inside vents; filters (if the filter is old); lab benches; floor drains; filling area floor; gaskets; grease from seals; and heating jacket to reactor vessel interface.

Sampling procedures include:

- Representatives of Inspected Party take samples at the request of the Inspection Team -- in the Inspection Team's presence
- Inspection Team may take samples, if agreed to in advance with the Inspected Party
- Analysis is performed on-site, where possible
  - Inspection Team can analyze samples using approved equipment brought by it
  - Inspection Team may request Inspected Party provide assistance
  - Inspection Team may request Inspected Party analysis be performed in its presence
- Inspected Party has the right to:
  - Retain portions of samples taken
  - Take duplicate samples
  - Be present when samples are analyzed on-site
- Inspection Team shall, if necessary, transfer samples for analysis off-site at designated labs
- For off-site analysis, samples are analyzed in at least two designated labs. Unused portions are returned to the Technical Secretariat

Step # 11: Post-Inspection Procedures

- "List of Findings":
  - Inspection Team writes "List of Findings"
  - List is reviewed and commented on by Inspected Party
  - List is signed by both Inspection Team Chief and Inspected Party Chief

- Inspection of Inspection Team equipment by the Inspected Party:
  - The Inspected Party must not damage the equipment
  - The Inspected Party must not unduly delay the inspection
  - The Inspected Party must ask the Inspection Team to actually operate the equipment

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Addendum to CWC Exercise Package for Inspected Party (Host)

Step # 10: Inspection

Building Information:

Building 10500: Part of this building contains the declared "Single Small-Scale Facility."
A "Single Small-Scale Facility" which produces Schedule 1 chemicals for research, medical, pharmaceutical or protective purposes.
Types of equipment include:
- *Production line not configured for continuous operation*
- *Volume of the single reaction vessel does not exceed 100 liters*
- *Total volume of all reaction vessels does not exceed 500 liters*

Only part of this building is declared; the remainder of the building contains reactor vessels unrelated to the CWC.

Building 10520: This building is an office building. The building has a large garage bay door.

Building 10510: This building is commonly known as the Cooperative Monitoring Center (CMC). The Center supports a range of research, training, and communication needs: demonstration hardware and software; offices for visiting scholars; and conference rooms. Some of the demonstration hardware and software is proprietary and some is classified. The building has two large garage bay doors.

- Room 101B: Contains 1 classified poster display and 3 export-controlled computer displays. These have been shrouded with conformal shrouds.
- Room 103: Contains 3 canisters with nuclear weapon components and a computer screen (the exterior of the canisters must be protected from view due to terrorist concerns); 2 radars (the top of the demonstrations is visually classified); 1 table containing classified radiation detectors and a gas chromatograph. All objects are shrouded with either conformal or non-conformal shrouds.
- Room 104: Contains no classified or proprietary information.
- Room 120: Contains proprietary information with the Hirsch company. The demonstration and 2 computer displays have been shrouded with conformal shrouds.
- Room 132: Contains a hazardous waste can. The wastes include Polaroid film, lead solder, and epoxies. One classified demonstration has been shrouded with a non-conformal shroud.
- All other rooms are offices, conference rooms, or empty rooms.

The Inspected Party has access to the following information:
- Classified database
- Security plans
- Proprietary database
- Equipment database

All "sensitive"data is hypothetical.

- Hazardous waste database
- Medical records
- Environmental Safety and Health information
- General public relations information
- Shipping/receiving records

All "sensitive"data is hypothetical.

Step # 12: Site post-inspection procedures *(not included in the interactive version of ACE-IT)*

These activities are conducted by the Inspected Party -- after the Inspection Team leaves the site.

- Debrief escorts
- Return site to normal
- Write report
- Update site readiness plan

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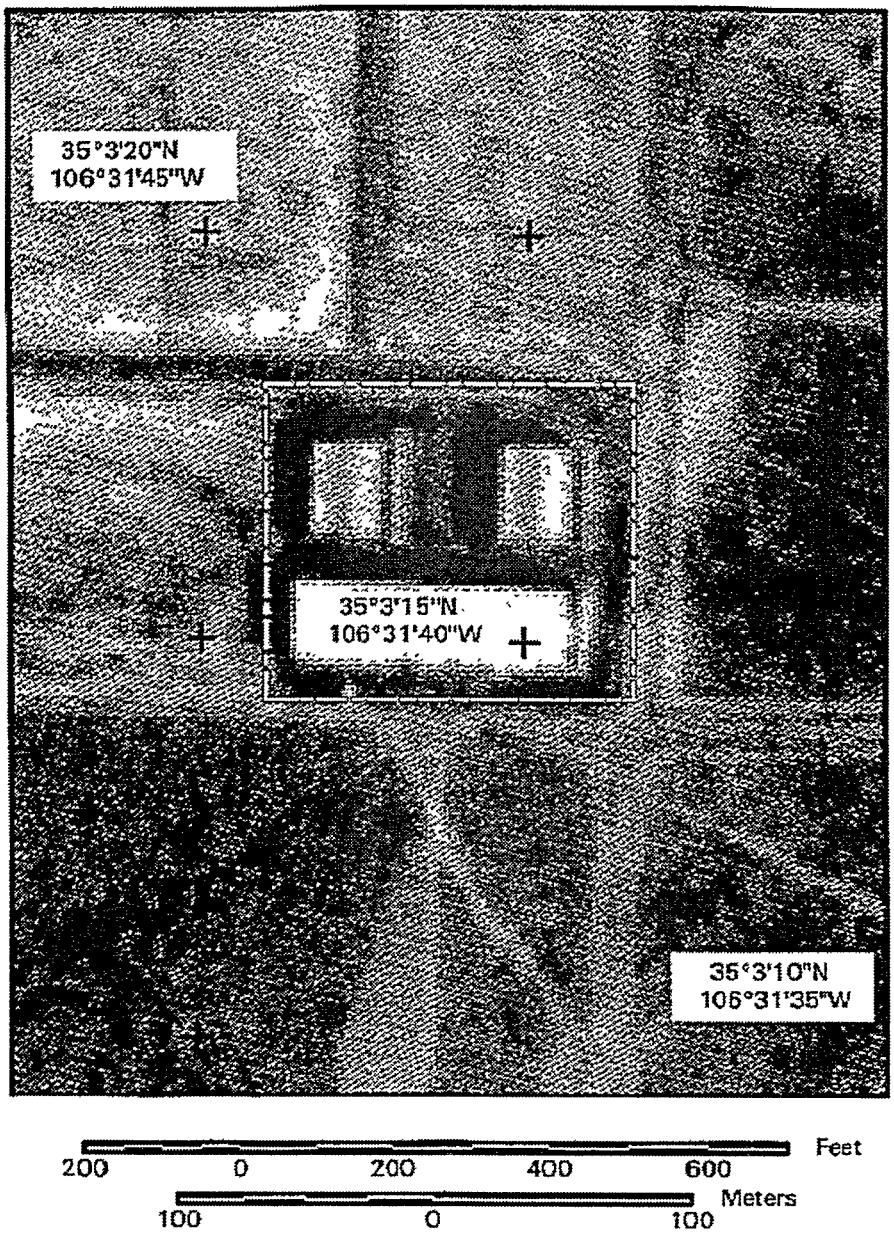
All "sensitive"data is hypothetical.



This image of the Cooperative Monitoring Center Complex at Sandia National Laboratories was acquired on March 3, 1991 by a KVR1000 camera on a Russian Kosmos satellite.

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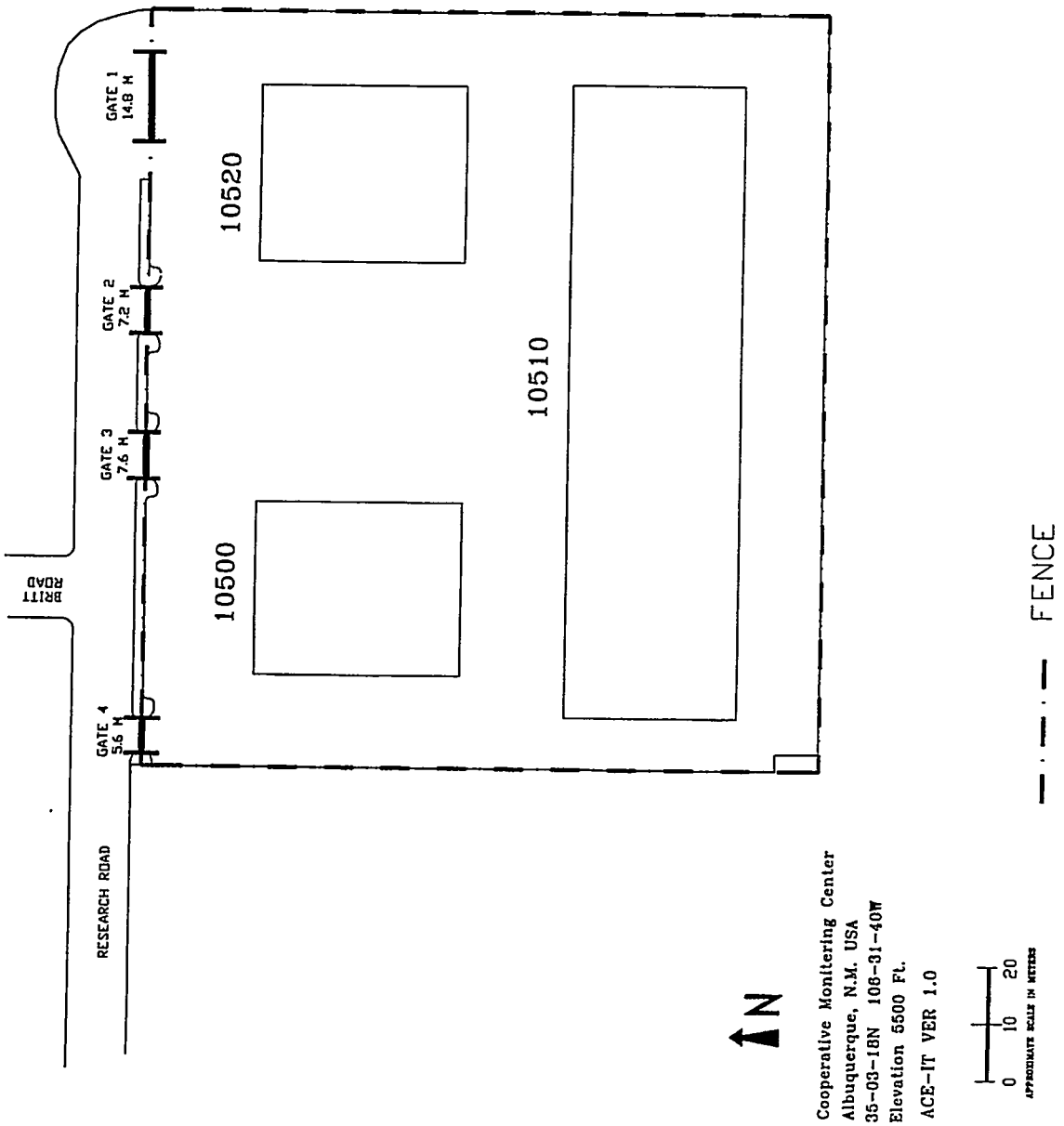
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GATE 2
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GATE 3
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RESEARCH ROAD
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Cooperative Monitering Center
Albuquerque, N.M. USA
35-03-18N 106-31-40W
Elevation 5500 Ft.
ACE-IT VER 1.0
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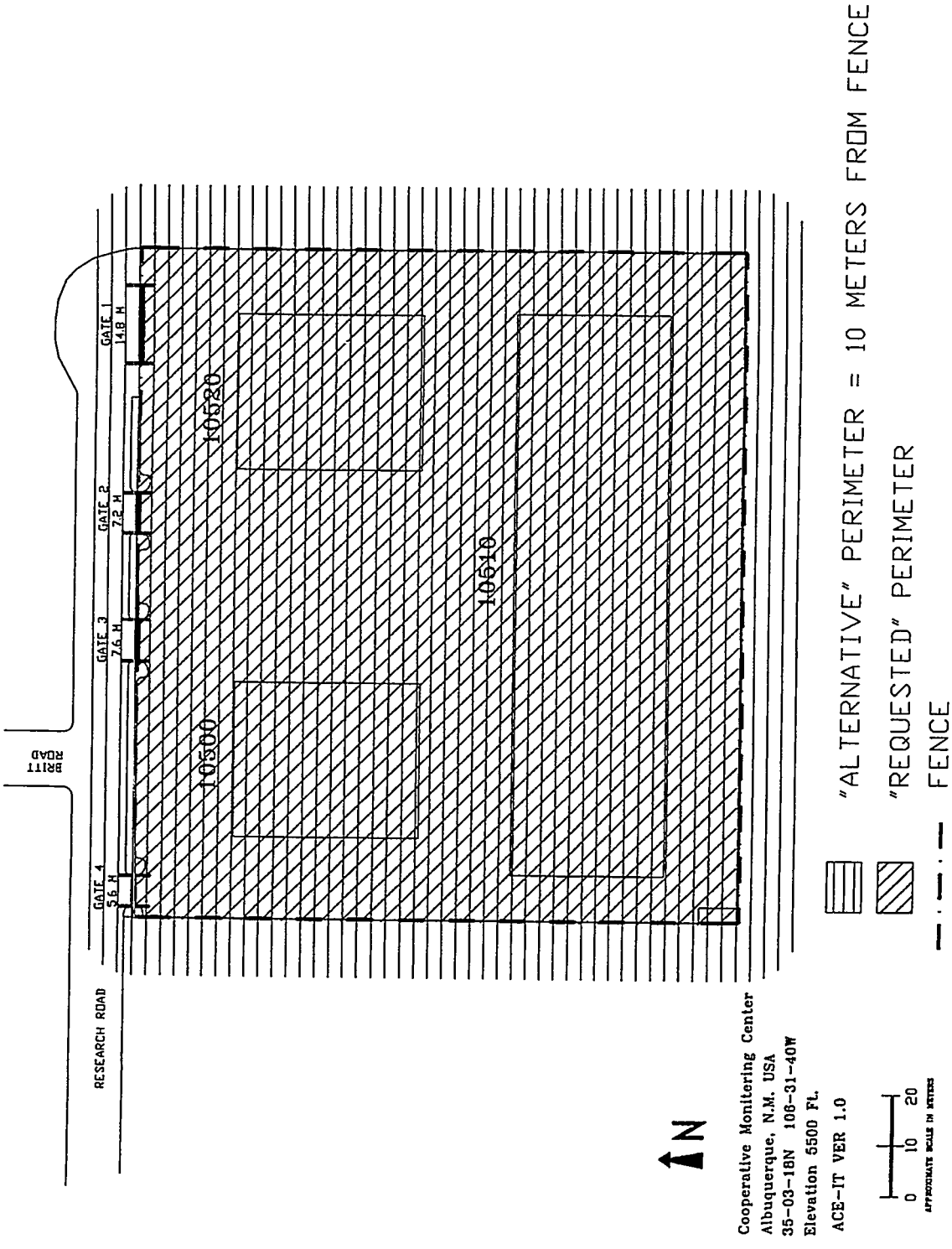
APPROXIMATE SCALE IN METERS
FENCE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"ALTERNATIVE" PERIMETER = 10 METERS FROM FENCE
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Cooperative Monitering Center
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35-03-18N 106-31-40W
Elevation 5500 FL.
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Vehicle Logs

Date: Day 1

Time	Vehicle	Entering the Site	Exiting the Site
0700	passenger car	x	
0711	delivery truck	x	
0719	passenger truck	x	
0720	passenger car	x	
0725	delivery truck		x
0731	bus	x	
0735	passenger car		x
0736	passenger truck	x	
0945	van	x	
1030	van		x
1130	bus		x
1134	van	x	
1135	passenger car		x
1140	passenger car	x	
1300	delivery truck	x	
1311	van		x
1331	passenger car	x	
1455	delivery truck	x	
1555	delivery truck		x
1630	delivery truck		x
1635	passenger car		x
1645	passenger truck		x
1700	passenger car		x
1701	passenger truck		x

Date: Day 2

	Vehicle	Entering the Site	Exiting the Site
0700	passenger car	x	
0701	passenger car	x	
0704	passenger car	x	
0705	passenger truck	x	
0725	van	x	
0730	delivery truck	x	
0735	passenger truck	x	
0736	passenger truck	x	
1000	passenger car	x	
1100	passenger car		x
1130	delivery truck	x	
1135	delivery truck	x	
1136	passenger truck		x
1137	passenger car		x
1300	delivery truck		x
1330	van	x	
1331	passenger car		x
1450	delivery truck		x
1500	delivery truck		x
1630	van		x
1645	passenger car		x
1650	passenger truck		x
1654	passenger truck		x
1659	van		x

Date: Day 3

	Vehicle	Entering the Site	Exiting the Site
0700	passenger car	x	
0715	delivery truck	x	
0716	passenger truck	x	
0717	passenger car	x	
0725	delivery truck		x
0730	bus	x	
0735	passenger car	x	
0736	passenger truck	x	
1000	van	x	
1100	van		x
1130	passenger car	x	
1135	van	x	
1136	passenger truck		x
1137	passenger car	x	
1300	passenger truck		x
1330	van		x
1331	passenger car		x
1450	delivery truck	x	
1500	delivery truck		x
1630	bus		x
1645	passenger car		x
1650	passenger car		x
1700	passenger car		x
1701	passenger car		x

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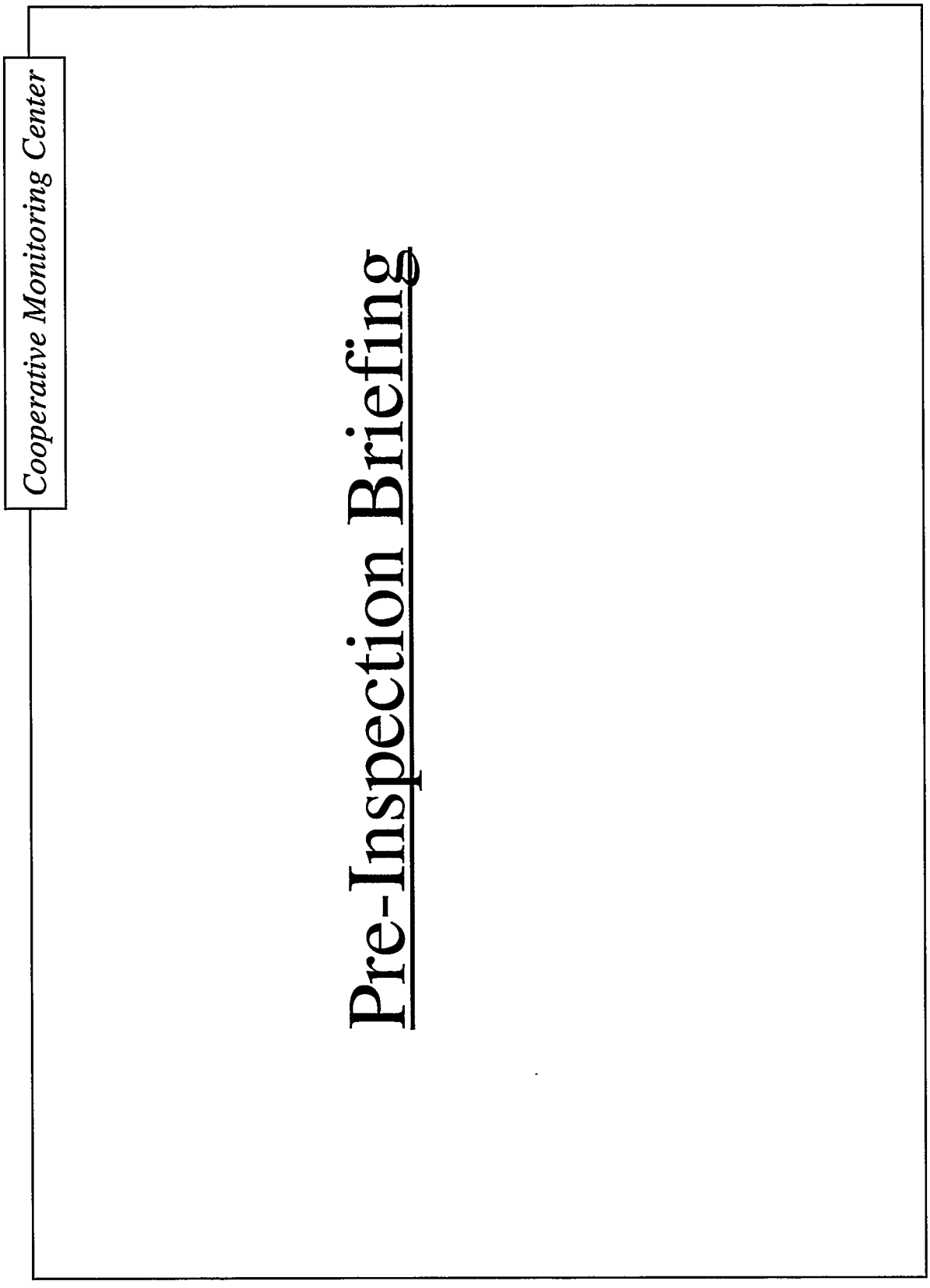

Cooperative Monitoring Center
Pre-Inspection Briefing
Sandia National Laboratories

Welcome to the Cooperative Monitoring Center (CMC) Complex

The CMC Complex is managed by Sandia National Laboratories

Administrative Procedures

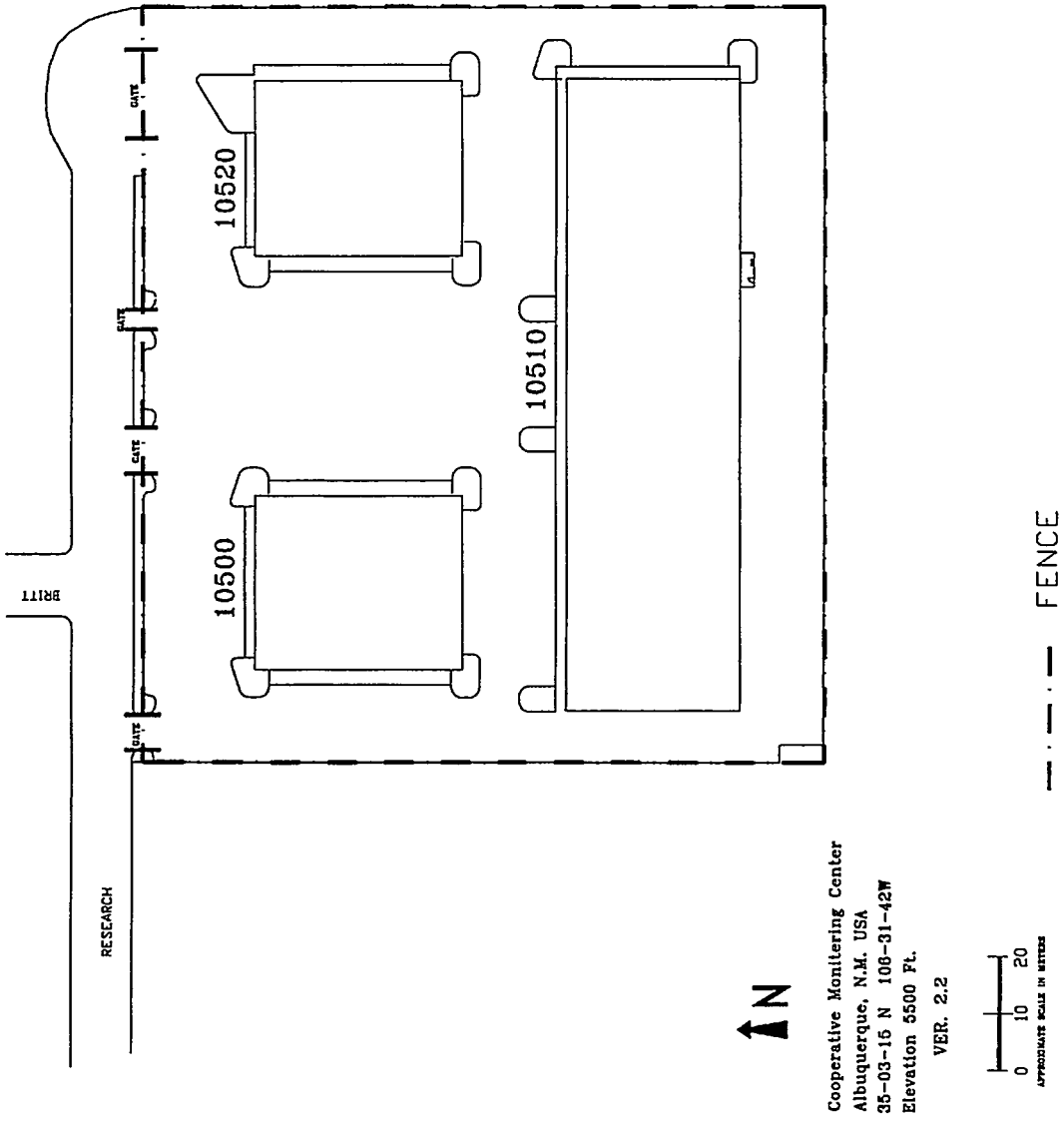
- Office space (& lavatory facilities) for the Inspection Team will be in Building 10520.
- Telecommunications will be provided upon request.
- All food will be catered.
- Hotel accommodations are located 3 km from the site.
- Buses are available for transportation of the Inspection Team between the site and the hotel.
- Medical care will be provided by Presbyterian "Urgent Care."

Note: Hand-held radios, provided by the Inspection Team, will be used to communicate between Inspection Team subgroups.

CMC Complex

The CMC Complex consists of three buildings:

- Building 10500
- Building 10510
- Building 10520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Albuquerque, N.M. USA
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Elevation 5500 Ft.
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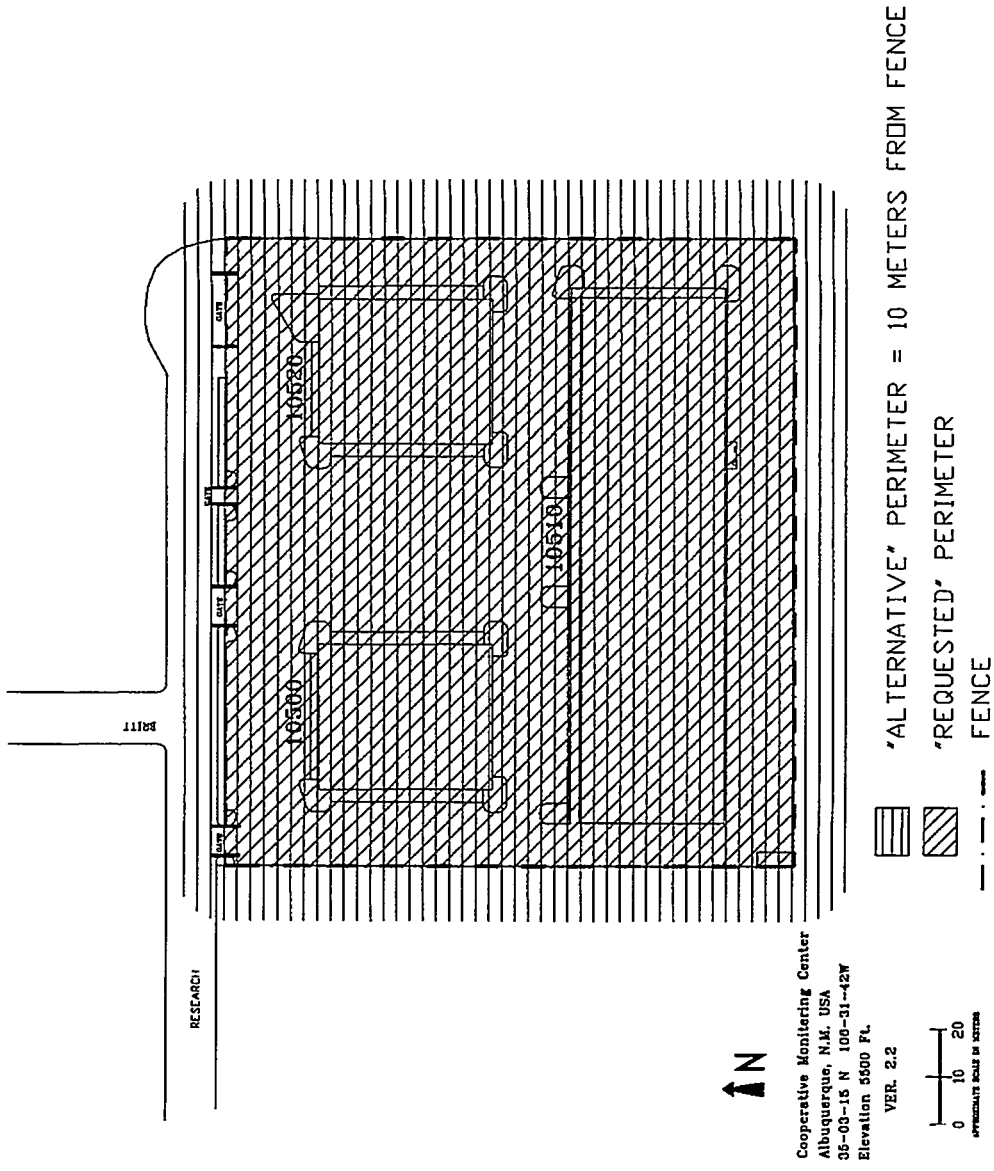
"ALTERNATIVE" PERIMETER = 10 METERS FROM FENCE
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Albuquerque, N.M. USA
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Information on Building 10500

- Part of the building contains the "Single Small-Scale Facility" which was declared under the Chemical Weapons Convention (CWC). The chemical processing equipment produces Schedule 1 chemicals for research, medical, pharmaceutical or protective purposes.

- The remainder of the building contains chemical processing equipment for the manufacture of chemicals unrelated to the CWC.

Safety Procedures for Building 10500

- In the event of a fire alarm (bell), follow your escorts to the nearest exit.
- In the event of a toxic gas alarm (horn), follow your escorts to the nearest exit and move upwind of the building.
- Safety gear:
  - Laboratory coat
  - Face shield
  - Elbow-length gloves
  - Flat, "closed-toe," leather shoes

Information on Building 10510

- The building houses the Cooperative Monitoring Center.
  - Technology demonstration rooms
  - Offices
  - Conference rooms
- The building has two large garage bay doors.
- Safety procedures:
  - In the event of a fire alarm (bell), follow your escorts to the nearest exit.
  - Safety gear: none required

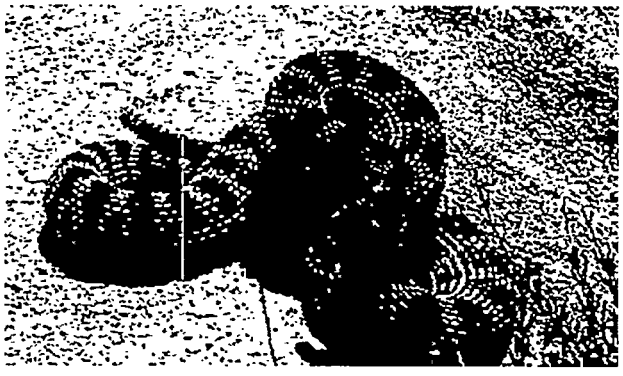
Information on Building 10520

- The building is an office building.
- The building has one large garage bay door.
- Safety procedures:
  - In the event of a fire alarm (bell), follow your escorts to the nearest exit.
  - Safety gear: none required

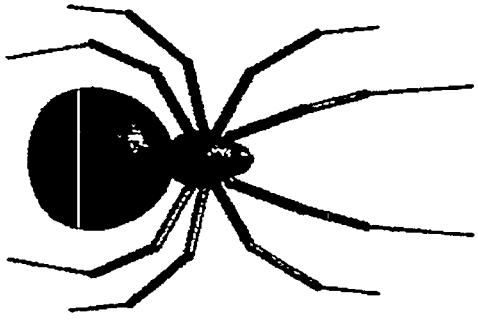
Safety Procedures for Perimeter Monitoring

Watch your step!

- The desert terrain is uneven.
- Poisonous wildlife:
  - Rattlesnakes
  - Black widow spiders
  - Brown recluse spiders



Rattlesnake



Black Widow Spider

Brown Recluse Spider

The brown recluse spider is dark brown to fawn in color,has long legs, and has a violin-shaped spot on the upper side of its head.

Summary of "Requested" Perimeter Monitoring

Day 1:	Day 2:	Day 3:
• 4 passenger cars	• 4 passenger cars	• 5 passenger cars
• 2 passenger trucks	• 3 passenger trucks	• 2 passenger trucks
• 2 vans	• 2 vans	• 2 vans
• 1 bus	• 0 bus	• 1 bus
• 3 delivery trucks	• 3 delivery trucks	• 2 delivery trucks

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Sensitive Items List

Building 10500:

Room Number	Item	Classification	Description
100	Chemical Processing Line	CWC declared chemical process line for Single-Small Scale Facility. *Note: No chemicals are being stored in 10500. No chemical weapons agent is currently in production, and this equipment is no longer connected.*	• 100 L spherical reactor vessel *(glass, jacketed)* • 50 L spherical reactor vessel *(glass, jacketed)* • 25 L spherical reactor vessel *(glass, jacketed)* • 3 reflux/distillation columns of various sizes *(glass)* • heating/cooling jackets of appropriate sizes • 30 L separation column *(glass)* • 20 L spherical receiver flask *(glass, jacketed)* • mounting frame
		Non-CWC-related equipment for new task of making high explosives on the mezzanine (room 200)	• Two 1000 L pressure reactor vessel (green) • 100 L pressure reactor vessel (polished steel) • Three 300 L trash cans for contaminated waste (red, with "explosive" label)

All "sensitive" data is hypothetical.

Building 10500 (continued):

200	Chemical Processing Line	Currently, not in use. However, it was used to make a proprietary pesticide. Presently, it is being converted for high explosive research and development. *Note: no chemicals are stored in Building 10500.*	• 300 L pressure reactor vessel with 75 hp steam-powered mixer *(blue, carbon steel)* • 1000 L pressure reactor vessel with 20 hp electric mixer *(green, carbon steel)* • 900 L jacketed reactor vessel with reflux column and related piping *(green, carbon steel)* • 1000 L jacketed chemical holding vessel *(gray, steel)* • assorted piping and insulated steam lines, water cooling lines, & vacuum hose for the portable fume hood

All "sensitive" data is hypothetical.

Building 10510:

Room Number	Item	Classification	Description
101-B	Poster Display	Classified	• 102 cm x 103 cm • Chinese Nuclear Test Site
	Computer Display	Sensitive	• 48 cm x 41 cm • Export-controlled imagery display
	Computer Display	Sensitive	• 48 cm x 41 cm • Export-controlled dispersion calculation display
	Computer Display	Sensitive	• 48 cm x 41 cm • Export-controlled environmental remediation techniques
103	1 Canister	Sensitive	• Diameter: 49 cm • Height: 50 cm • Color: Silver • Contains nuclear weapon components • Exterior is visually sensitive because of terrorist concerns
	1 Canister	Sensitive	• Diameter: 52 cm • Height: 71 cm • Color: Silver • Contains nuclear weapon components • Exterior is visually sensitive because of terrorist concerns
	1 Canister	Sensitive	• Diameter: 51 cm • Height: 75 cm • Color: Black • Contains nuclear weapon components • Exterior is visually sensitive because of terrorist concerns

All "sensitive" data is hypothetical.

	Computer Screen	Classified	• 41 cm x 37 cm • Contains images of canisters with nuclear weapon components • Exterior is visually sensitive because of terrorist concerns

	Radar on unclassified stand	Classified	• Non-conformal shroud dimensions:
			  • Height: 129 cm
			  • Width: 67 cm
			  • Length: 67 cm
			• Radar dimensions:
			  • Height: 32 cm
			  • Width: 8 cm
			  • Length: 17 cm

	Radar on unclassified stand	Classified	• Conformal shroud dimensions:
			  • Height: 129 cm
			  • Width: 67 cm
			  • Length: 67 cm
			• Radar dimensions:
			  • Height: 32 cm
			  • Width: 8 cm
			  • Length: 17 cm

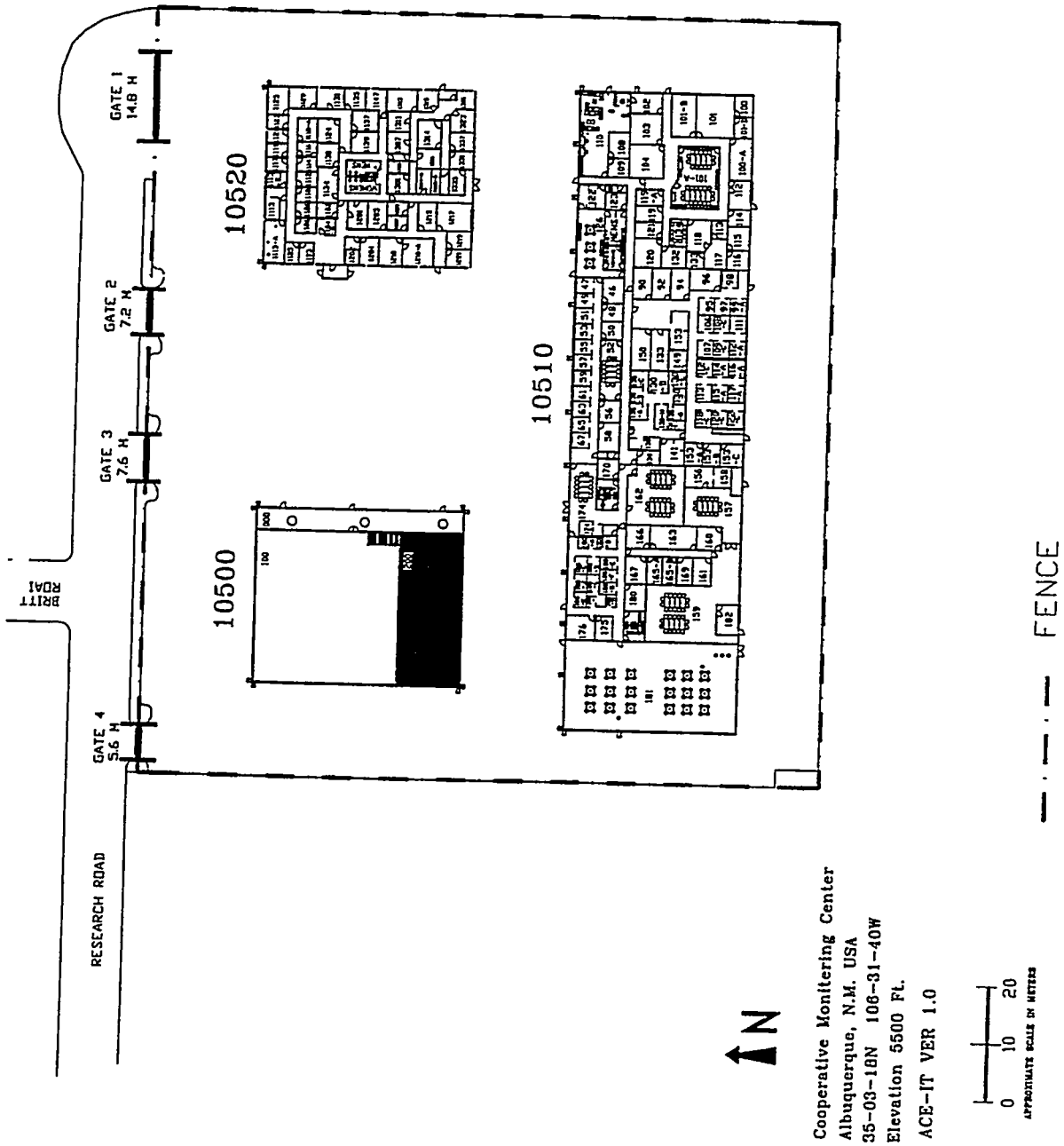
	Table with radiation detection equipment & gas chromatograph *Radiation detection equipment* *Gas chromatograph (commercially available)*	 *Classified* *Item of concern (may cause compliance questions during a CWC inspection)*	• Height: 72 cm • Width: 76 cm • Length: 152 cm • *Height: 8 cm* • *Width: 12 cm* • *Length: 20 cm* • *Height: 15 cm* • *Width: 25 cm* • *Length: 37 cm*
104	No sensitive items		
120	Keypad and geometry reader	Proprietary	• Proprietary project with the Hirsch Co. • Height: 171 cm • Width: 76 cm • Length: 247 cm
	Computer screen	Proprietary	• 29 cm x 36 cm • Hirsch alarm information
	Computer screen	Proprietary	• 28 cm x 32 cm • Hirsch alarm

All "sensitive" data is hypothetical.

			information
132	Electronic seal	Classified	• Dimensions of nonconformal shroud (box) • Height: 17 cm • Width: 26 cm • Length: 31 cm
	Hazardous waste can	Item of concern	• Diameter: 33 cm • Height: 40 cm • Color: Yellow • Wastes include Polaroid film, lead solder, and epoxies

All "sensitive" data is hypothetical.

Building 10520: no sensitive items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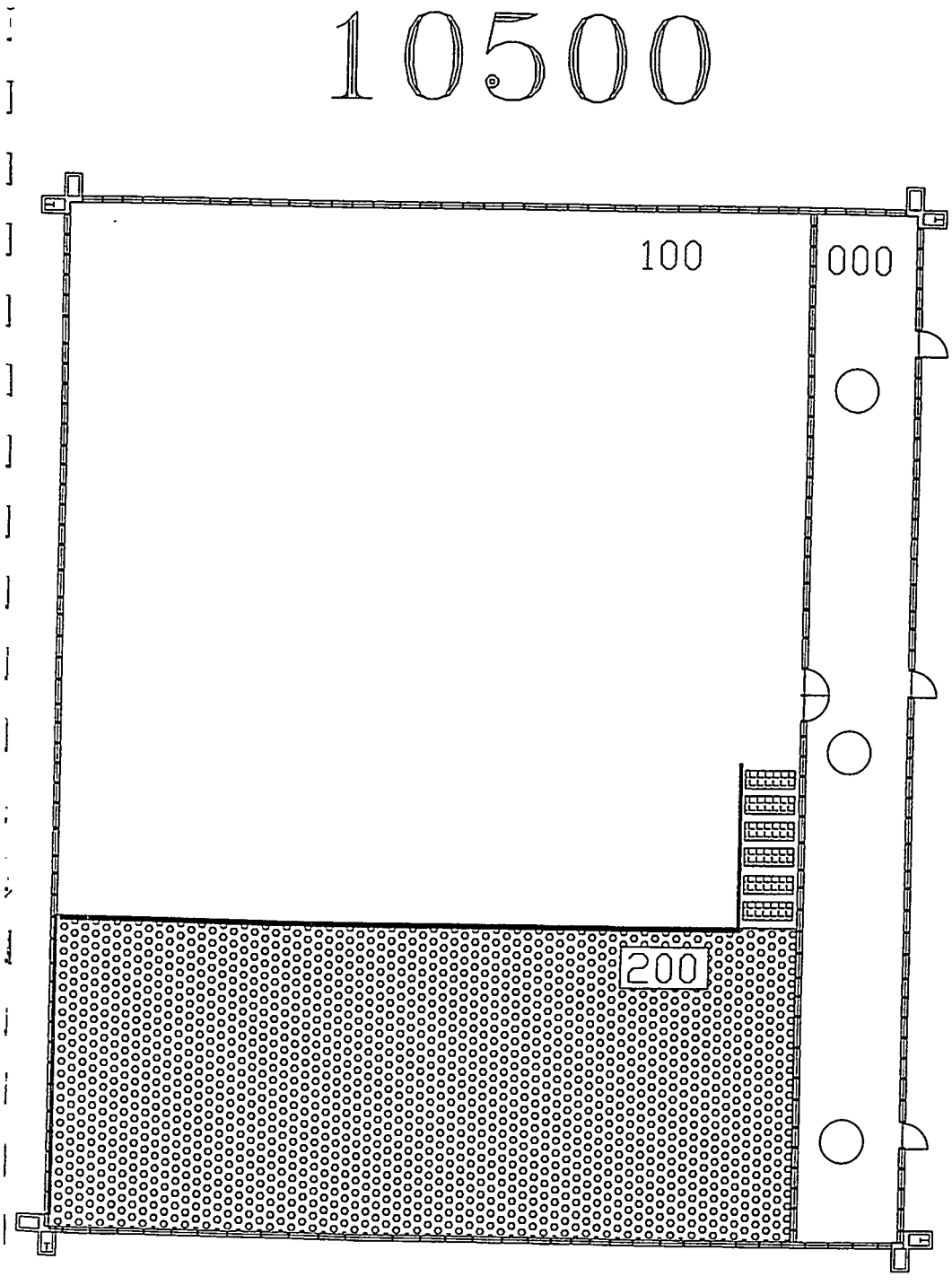
APPROXIMATE SCALE IN METERS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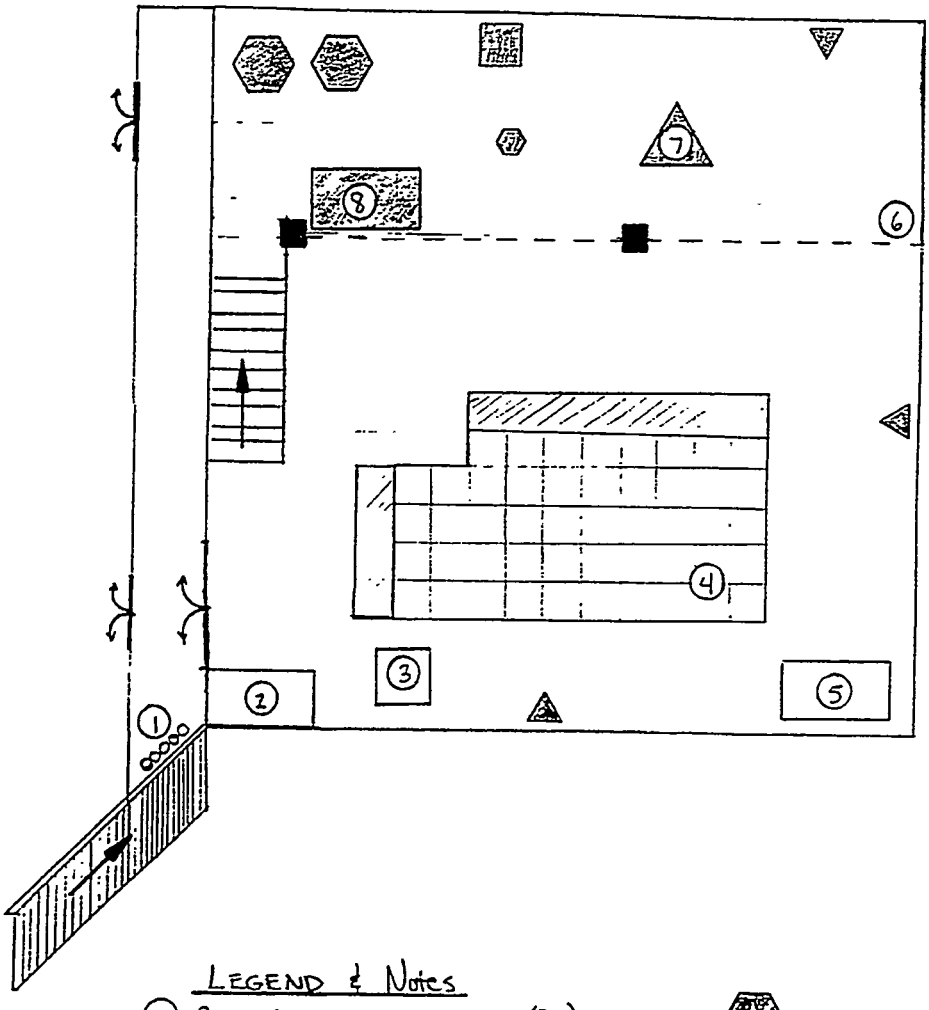
Building 10500 — Room 100 + large equipment

Main floor plan – "downstairs" only; excluding mezzanine



* Map not drawn to actual scale.

LEGEND & Notes

1. Pressurized Gas canisters (PG)
2. Sink
3. Palette with spill containment material
4. Declared process area
5. Dismantled fume hood
6. Eye wash / shower
7. Separator
8. Work Bench

△ = steam, process H_2O, and/or PG lines

⬡ = 60L, unused stell pressure reactor (not jacketed)

⬢ = 2 600L jacketed steel reactor (unused)

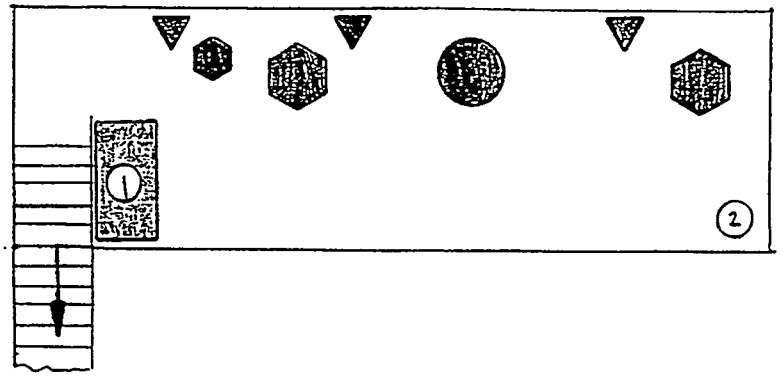
▣ = large, precision scale

⟵ = to next level up

Building 10500

Room 200 + large equipment

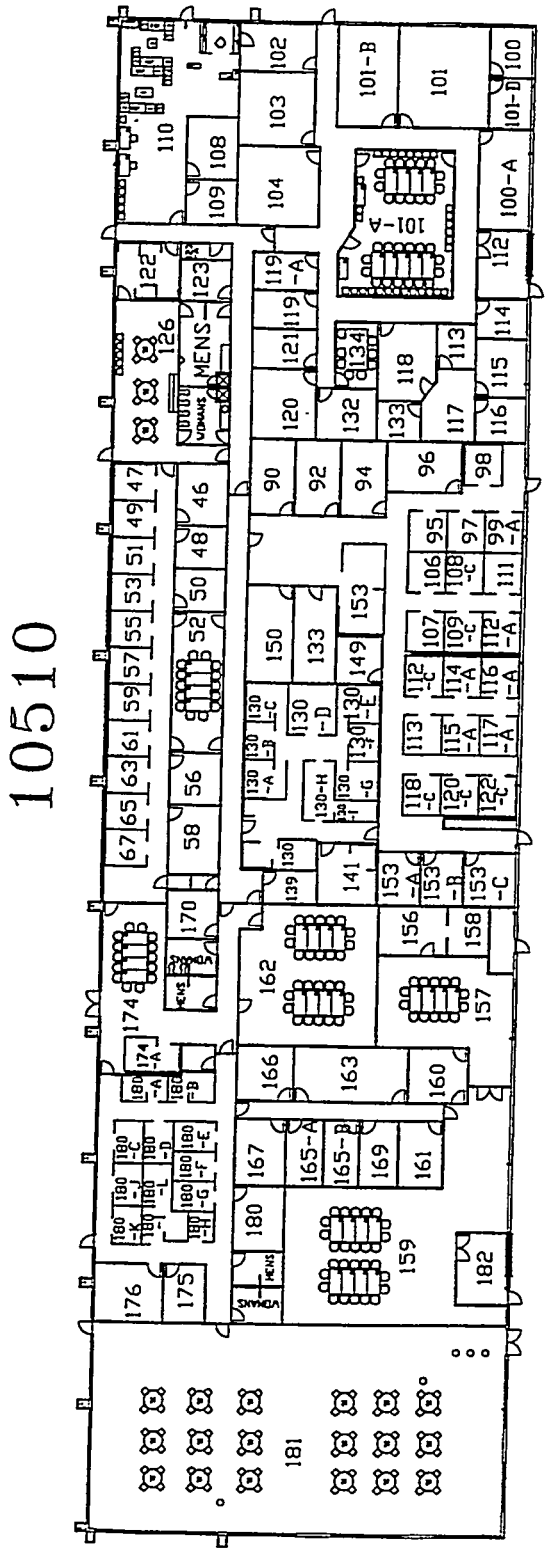
Upstairs floor plan - mezzanine only



* Not drawn to scale.

Legend & Notes

① Control Bank
② Emergency Eye Wash
▲ = Steam, process H_2O, and/or Pressurized Gas
⬢ = Mid-size reactor - jacketed, steel, pressure, incl. mixer
⬢ = Large-size reactor - jacketed, steel, pressure, mixer on one, reflux column on the other
● = Large-size, jacketed chemical holding vessel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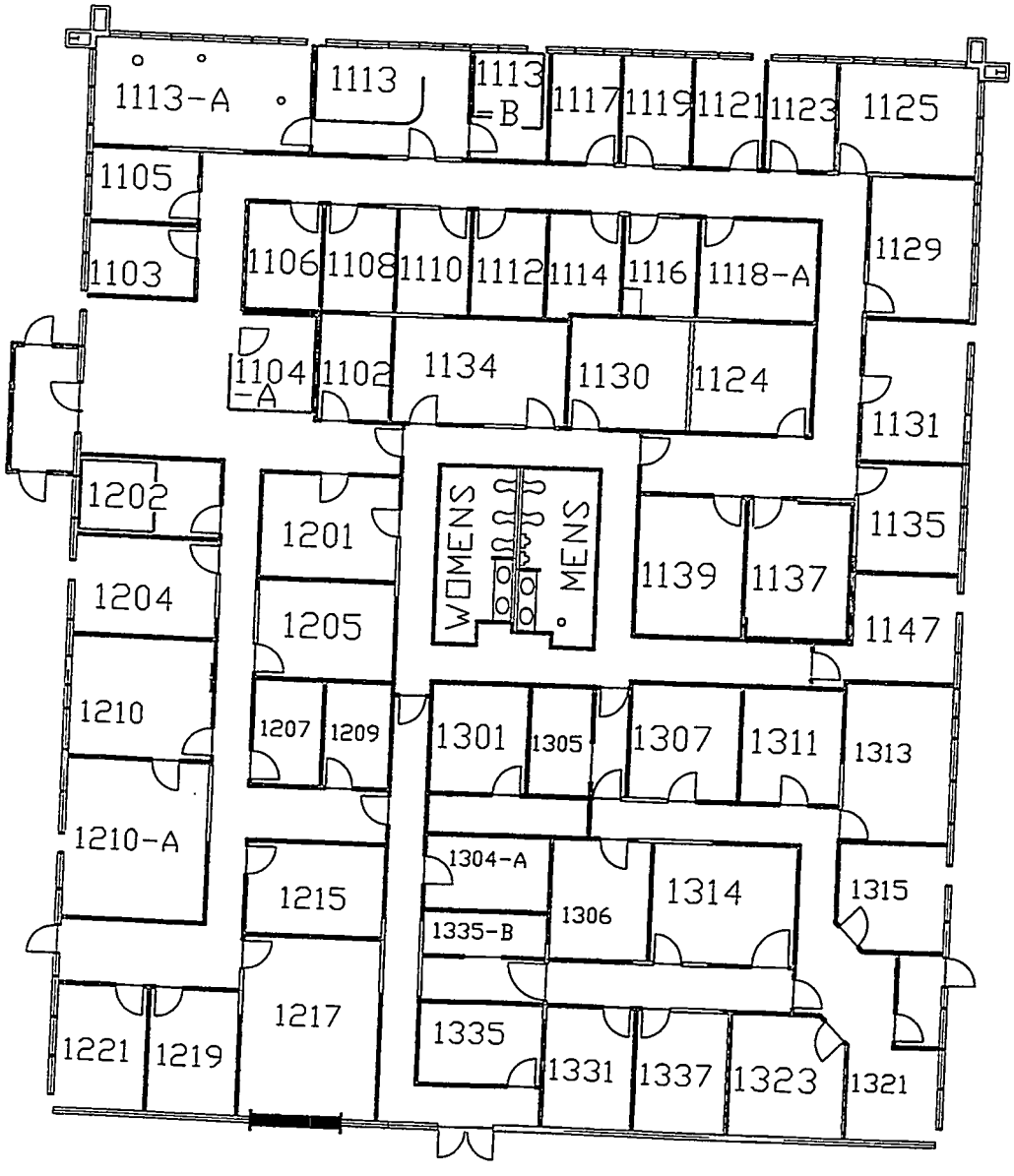
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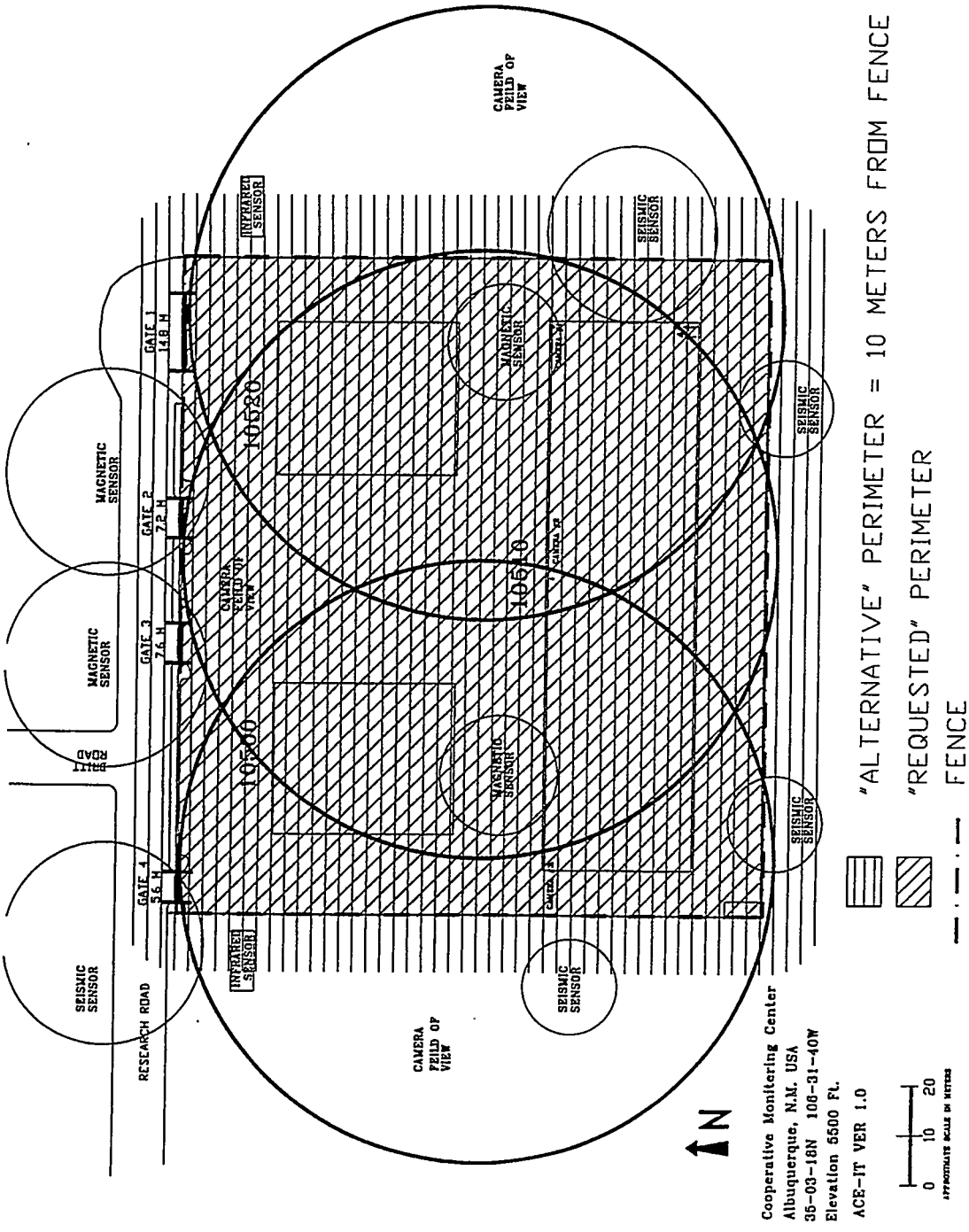
"ALTERNATIVE" PERIMETER = 10 METERS FROM FENCE
"REQUESTED" PERIMETER
FENCE
N
RESEARCH ROAD
GATE 1
14.8 M
GATE 2
7.2 M
GATE 3
7.6 M
GATE 4
5.6 M
MAGNETIC SENSOR
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INFRARED SENSOR
CAMERA FEILD OF VIEW
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Cooperative Monitoring Center
Albuquerque, N.M. USA
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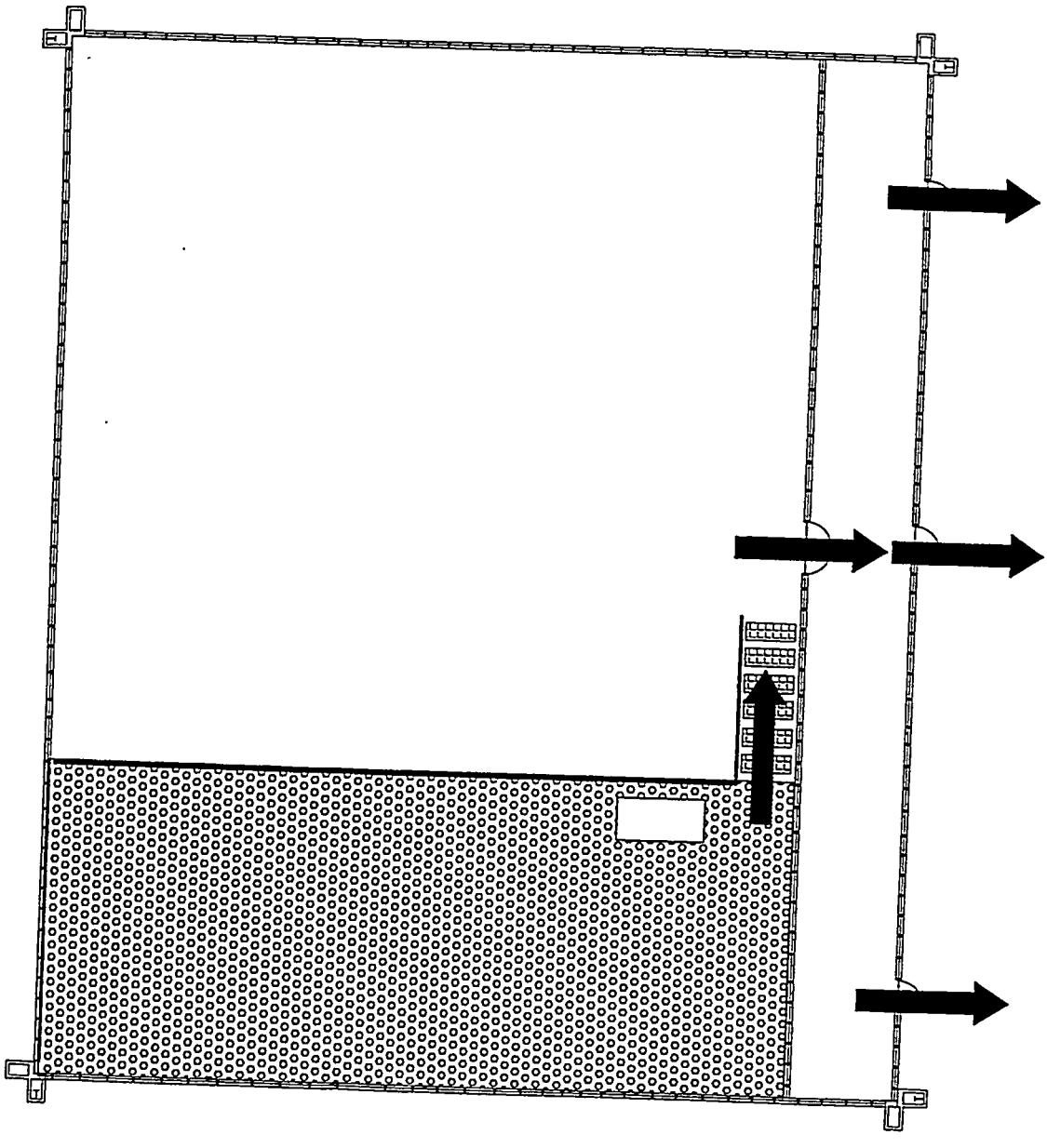
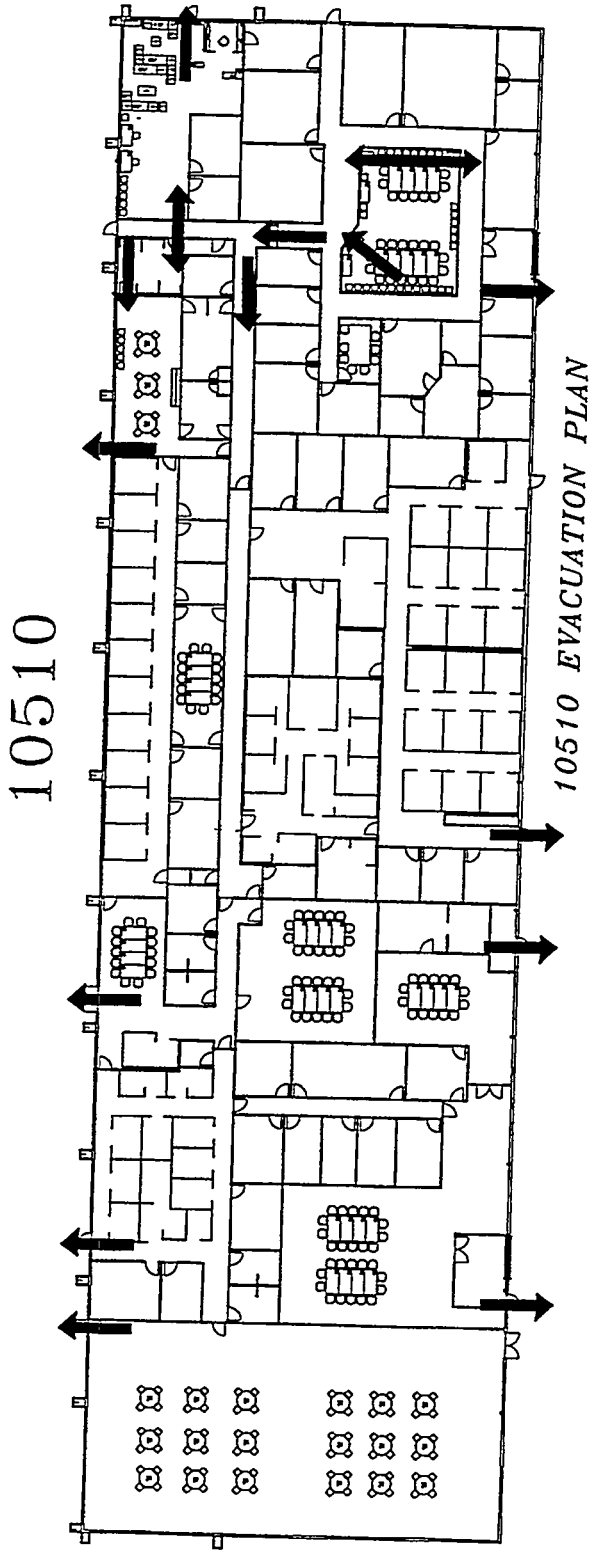
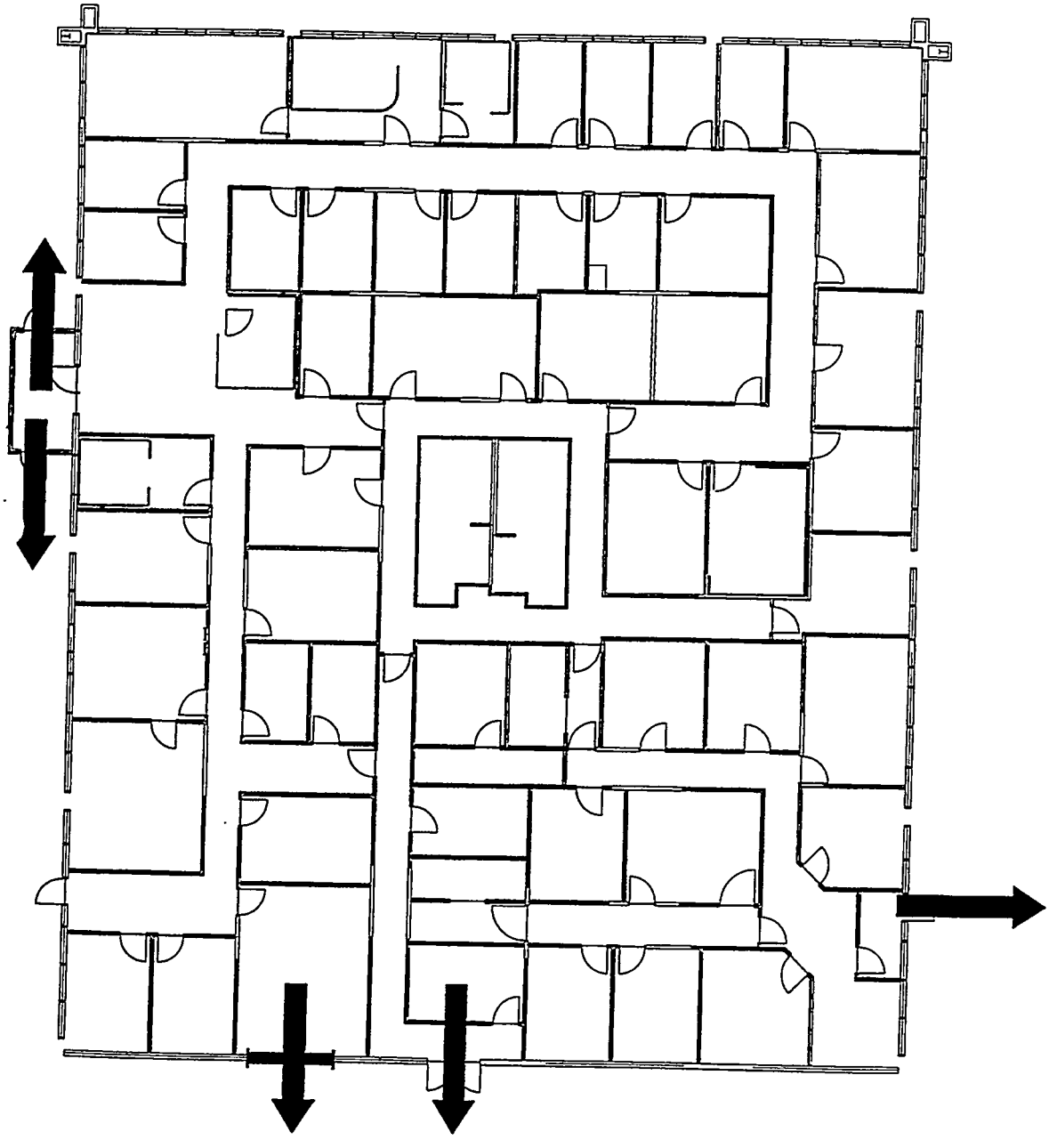
10500



10500 EVACUATION PLAN


10510
10510 EVACUATION PLAN

10520



10520 EVACUATION PLAN

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Medical Forms

Date: March 1, 1996

Name of Patient	Date of Birth	Identification Number
Erika Smith	April 12, 1956	123-45-6789

Vital Statistics:

Temperature: 100.0 F
Blood pressure: 130/90
Pulse rate: 100
Current medications: Tylenol

Symptoms:

Mucous membrane irritation.
Persistent cough.
Eye irritation
Second degree burn on right arm

Tests:

Chest X-ray.
Arterial blood gas.
White blood cell count.

Diagnosis:

Exposure to toxic chemicals.
Begin decontamination immediately -- wash skin.
Apply cortico steroid to eyes and nasal passages.
Observe patient for 6 hours:

- If patient stabilizes, send patient home.
- If patient's symptoms continue, hospitalize patient immediately.

Attending Physician: `Dr. H. Wells`

This data is hypothetical.

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Material and Safety Data Sheets

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ACC83329

Trimethyl phos

Acros Catalog #s: AC422031000 AC422035000
*** This product is for research and development purposes only. ***

Acros Organics
711 Forbes Avenue
Pittsburgh, PA 15219-4785
1-800-ACROS-01 (1-800-227-6701)
For Emergency Transportation Information call CHEMTREC: 800-424-9300

Date of Preparation: 2/6/85 Approved by U.S. Department of Labor
Modified by Fisher Scientific: 12/94

SECTION I. IDENTIFICATION
- Product Name: Trimethyl Phosphite (Pract.)
- Size(s): CAT 119 4273 - bulk; CAT 119 4281 - 100 g; CAT 119 4299 - 500 g
- Formula: (CH3O)3P
- Laboratory Chemicals Catalog Number(s): P7623
- Accession Number: 907623

SECTION II. PRODUCT AND COMPONENT HAZARD DATA

A. COMPONENT(S):	Weight Percent	TLV(R)	Accession No.	CAS Reg. No.
Trimethyl Phosphite (Pract.)	approx 100	2 ppm	907623	121-45-9

B. PRECAUTIONARY LABEL STATEMENT(S):
WARNING!
CAUSES IRRITATION
HARMFUL IF INHALED
FLAMMABLE
Avoid contact with eyes, skin, and clothing.
Do not breathe vapor.
Keep away from heat, sparks, and flame.
Keep container closed.
Use with adequate ventilation.
First Aid: In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes. If inhaled, remove to fresh air. In case of eye contact, get medical attention.

SECTION III. PHYSICAL DATA
- Appearance and Odor: Colorless liquid; unpleasant penetrating odor
- Melting Point: LT -78 C (LT -108 F)
- Boiling Point: 111 C (232 F) @ 760 mmHg
- Vapor Pressure: 21 mmHg @ 20 C
- Evaporation Rate (n-butyl acetate = 1): Not Available
- Vapor Density (Air = 1): 4.3
- Volatile Fraction by Weight: approx 100 %
- Specific Gravity (H2O = 1): 1.045

- Solubility in Water (by Weight): Negligible

R-0365.900A
82-0523

SECTION IV. FIRE AND EXPLOSION HAZARD DATA

- Flash Point: 26 C (78 F) Tag closed cup
- Flash Point: 27 C (80 F) Tag open cup
- Autoignition Temperature: 189 C (372 F)
- Extinguishing Media: Water spray; Dry chemical; CO2; Foam
- Special Fire Fighting Procedures:
  Wear self-contained breathing apparatus and protective clothing to prevent contact with skin and eyes.
- Unusual Fire and Explosion Hazards:
  Fire or excessive heat may cause production of hazardous decomposition products.

SECTION V. REACTIVITY DATA

- Stability: Stable
- Incompatibility:
  Strong oxidizers
  Hydrolyzes in water
- Hazardous Decomposition Products:
  As with any other organic material, combustion will produce carbon dioxide and probably carbon monoxide.
  Oxides of phosphorous may also be present.
- Hazardous Polymerization: Will not occur.

SECTION VI. TOXICITY AND HEALTH HAZARD DATA

A. EXPOSURE LIMITS: TLV 2 ppm 8-h TWA, ACGIH 1988-89.
OSHA PEL 2 ppm.

B. EXPOSURE EFFECTS:

General: The extremely disagreeable odor, detectable at vapor concentrations of 0.001 ppm, is sufficient to give this compound good warning properties.

Inhalation: High concentrations are irritating to the mucous membranes. Repeated exposure to high concentrations may cause corneal damage.

Skin: Prolonged or repeated contact may cause irritation.

Eyes: Liquid may cause transient irritation.

C. FIRST AID:

Inhalation: Remove to fresh air. Get medical attention if symptoms persist.

Eyes: Immediately flush eyes with plenty of water for at least 15 minutes and get medical attention if any symptoms are present after washing.

Skin: Immediately flush skin with plenty of water for at least 15 minutes and get medical attention if symptoms are present after washing.

R-0365.900A
82-0523

D. TOXICITY DATA

Test	Species	Result(1)	Classification(2)
Acute Oral LD50	Rat	1600 mg/kg	Slightly toxic
Acute Oral LD50	Mouse	3200 mg/kg	
Skin Absorption LD50	Guinea Pig	510 mL/kg	
Skin Irritation	Guinea Pig	Moderate skin irritant on prolonged closed skin contact	
Repeated Skin Application	Guinea Pig	Mild irritation with scaling	

Skin Sensitization: Did not sensitize guinea pigs.

Eye Irritation: Transitory eye irritation without permanent damage in rabbits.

Clinical signs of occular irritation occurred in animals exposed at 100 ppm or higher concentrations. Severe cataracts were observed at 600 ppm and mild cataracts at 300 ppm.(3)

SECTION VII. PERSONAL PROTECTION AND CONTROLS

A. RESPIRATORY PROTECTION:

An appropriate NIOSH-approved respirator for organic vapor should be worn if needed.

B. VENTILATION:

Local Exhaust: If needed to control vapor below the TLV.

Mechanical (General): Recommend at least ten air changes per hour for good general room ventilation.

C. SKIN AND EYE PROTECTION:

Protective gloves should be worn.
Safety glasses should be worn.

SECTION VIII. SPECIAL STORAGE AND HANDLING PRECAUTIONS

Material is classified as a flammable liquid. Keep away from heat, sparks, and flame. Keep container closed. Use with adequate ventilation.
Keep from contact with oxidizing materials.
Storage and handling of flammable liquids may be subject to state, federal and local laws.

R-0365.900A
82-0523

SECTION IX. SPILL, LEAK, AND DISPOSAL PROCEDURES

Remove all sources of ignition.
Absorb material in vermiculite or other suitable absorbent and

place in impervious container.
Dispose in an approved incinerator equipped with afterburner and scrubber or contract with licensed chemical waste disposal service.
Discharge, treatment, or disposal may be subject to federal, state, or local laws.

SECTION X. ENVIRONMENTAL EFFECTS DATA

This chemical has not been tested for environmental effects.

SECTION XI. REFERENCES

1. Toxicity results are from unpublished data, Health and Environment Laboratories, Eastman Kodak Company, Rochester, New York.

2. Hodge, H.C. and Sterner, J.H., American Industrial Hygiene Association Quarterly, 10, 93 (1949).

3. ACGIH Documentation of Threshold Limit Values, 1984 - 1985.

R-0365.900A
@119-4273*
@119-4281*
@119-4299*
@P7623*
82-0523

ACC14364

Dimethyl phosp

Acros Catalog #s: AC408530010 AC408532500
*** This product is for research and development purposes only. ***

711 Forbes Avenue
Pittsburgh, PA 15219-4785
1-800-ACROS-01 (1-800-227-6701)
For Emergency Transportation Information call CHEMTREC: 800-424-9300

Date of Preparation: 07/23/86 Accession Number: 907834
Modified by Fisher Scientific: 12/94

SECTION I. IDENTIFICATION

- Product Name: Dimethyl Phosphite
- Synonym(s): Dimethyl Hydrogen Phosphite
- Formula: C2 H7 O3 P
- CAT No(s): 119 5544; 119 5551; 119 5569
- Chem. No(s): 07834

SECTION II. PRODUCT AND COMPONENT HAZARD DATA

COMPONENT(S):	Percent	ACGIH TLV(R)	CAS Reg. No.
Dimethyl Phosphite	ca. 100	---	868-85-9

SECTION III. PHYSICAL DATA

- Appearance: Colorless liquid
- Boiling Point: 162 C (324 F)
- Vapor Pressure: 1.5 mmHg at 20 C (68 F)
- Evaporation Rate (n-butyl acetate = 1): Not Available
- Volatile Fraction by Weight: ca. 100 %
- Specific Gravity (Water = 1): 1.200
- Solubility in Water (by Weight): Appreciable

SECTION IV. FIRE AND EXPLOSION HAZARD DATA

- Flash Point: 64 C (147 F) Pensky-Martens Closed Cup
- Extinguishing Media: Water spray; Dry chemical; Carbon dioxide; Alcohol foam
- Special Fire Fighting Procedures: Wear self-contained breathing apparatus and protective clothing. Use water spray to keep fire-exposed containers cool.
- Unusual Fire and Explosion Hazards: Fire or excessive heat may produce hazardous decomposition products.

SECTION V. REACTIVITY DATA

- Stability: Stable
- Incompatibility: Strong oxidizers
- Hazardous Decomposition Products: Combustion will produce carbon

dioxide and probably carbon monoxide. Oxides of phosphorous may also be present.
- Hazardous Polymerization: Will not occur.

R-0144.600A 86-7421

SECTION VI. TOXICITY AND HEALTH HAZARD DATA

A. EXPOSURE LIMITS: Not established.

B. EXPOSURE EFFECTS:
Inhalation: Vapor exposure is irritating to upper respiratory tract.
Skin: Causes irritation.
Eye: Causes severe irritation. Possible damage on long-term exposure.

C. FIRST AID:
Inhalation: Remove to fresh air. Get medical attention if symptoms persist.
Skin: Flush with plenty of water. Get medical attention if symptoms persist.
Eye: Flush with water for 15 minutes and get medical attention immediately.

SECTION VII. VENTILATION AND PERSONAL PROTECTION

A. VENTILATION AND RESPIRATORY PROTECTION:
Good ventilation is recommended. Local exhaust may be necessary to control vapor concentration to acceptable levels.
An acid gas/organic vapor respirator should be used if necessary.

B. SKIN AND EYE PROTECTION:
Goggles or face shield recommended.

SECTION VIII. SPECIAL STORAGE AND HANDLING PRECAUTIONS

Keep from contact with oxidizing materials.
Classified as a combustible liquid. Keep away from heat and flame.

SECTION IX. SPILL, LEAK, AND DISPOSAL PROCEDURES

Remove all sources of ignition. For large spills, use water spray to dilute spill to a noncombustible mixture. Absorb material in vermiculite or other suitable absorbent and place in impervious container.
Dispose by incineration or contract with licensed chemical waste disposal agency. Discharge, treatment, or disposal may be subject to federal, state or local laws.

The information contained herein is furnished without warranty of any kind. Users should consider these data only as a supplement to other information gathered by them and must make independent determinations of the suitability and completeness of information from all sources to assure proper use and disposal of these materials and the safety and health of employees and customers.

R-0144.600A 86-7421 @907834*

ACC26524

Diethyl phosphite, 98%

Acros Catalog #s: AC114500010 AC114501000 AC114502500 AC114505000

*** This product is for research and development purposes only. ***

Acros Organics
711 Forbes Avenue
Pittsburgh, PA 15219-4785
1-800-ACROS-01 (1-800-227-6701)
For Emergency Transportation Information call CHEMTREC: 800-424-9300

Date of Preparation: 08/20/86 Accession Number: 907845
Modified by Fisher Scientific: 12/94

SECTION I. IDENTIFICATION

- Product Name: Diethyl Phosphite
- Synonym(s): Phosphorous Acid Diethyl Ester
- Formula: C4 H11 O3 P
- CAT No(s): 119 5601; 119 5619; 119 5627
- Chem. No(s): 07845

SECTION II. PRODUCT AND COMPONENT HAZARD DATA

COMPONENT(S):	Percent	ACGIH TLV(R)	CAS Reg. No.
Diethyl Phosphite	ca. 100	---	762-04-9

SECTION III. PHYSICAL DATA

- Appearance: Liquid
- Boiling Point: 138 C (280 F)
- Vapor Pressure: 0.12 mmHg at 20 C (68 F)
- Evaporation Rate (n-butyl acetate = 1): Not Available
- Volatile Fraction by Weight: ca. 100 %
- Specific Gravity (Water = 1): 1.07
- Solubility in Water (by Weight): Decomposes

SECTION IV. FIRE AND EXPLOSION HAZARD DATA

- Flash Point: 74 C (165 F) Tag closed cup
- Extinguishing Media: Water spray; Dry chemical; Carbon dioxide; Foam
- Special Fire Fighting Procedures: Wear self-contained breathing apparatus and protective clothing. Materials reacts with water. Water may be ineffective in fighting fire. Use water spray to keep fire-exposed containers cool.
- Unusual Fire and Explosion Hazards: Fire or excessive heat may produce hazardous decomposition products.

SECTION V. REACTIVITY DATA

- Stability: Stable
- Incompatibility: Strong oxidizers, water
- Hazardous Decomposition Products: Combustion will produce carbon dioxide and probably carbon monoxide. Oxides of phosphorus may also be present.
- Hazardous Polymerization: Will not occur.

R-0127.700A 86-7496

SECTION VI. TOXICITY AND HEALTH HAZARD DATA

A. EXPOSURE LIMITS: Not established.

B. EXPOSURE EFFECTS:
Inhalation: Low hazard for usual industrial handling.
Skin: Low hazard for usual industrial handling.
Eye: Causes irritation.

C. FIRST AID:
Inhalation: None should be needed.
Skin: Flush skin with plenty of water.
Eye: Immediately flush eyes with plenty of water for at least 15 minutes and get medical attention.

SECTION VII. VENTILATION AND PERSONAL PROTECTION

A. VENTILATION:
Good general room ventilation should be sufficient.

B. RESPIRATORY PROTECTION:
None should be needed.

C. SKIN AND EYE PROTECTION:
Protective gloves and clothing should be worn. Safety glasses, goggles, or a face shield should be worn.

SECTION VIII. SPECIAL STORAGE AND HANDLING PRECAUTIONS

Classified as a combustible liquid. Keep away from heat and flame.
Keep container tightly closed and away from water.
Keep from contact with oxidizing materials.

SECTION IX. SPILL, LEAK, AND DISPOSAL PROCEDURES

Absorb material in vermiculite or other suitable absorbent and place in impervious container. Dispose by incineration or contract with licensed chemical waste disposal agency. Discharge, treatment, or disposal may be subject to federal, state or local laws.

The information contained herein is furnished without warranty of any kind. Users should consider these data only as a supplement to other information gathered by them and must make independent determinations of the suitability and completeness of information from all sources to assure proper use and disposal of these materials and the safety and health of employees and customers.

R-0127.700A 86-7496 @907845*

ACC17598

****** MATERIAL SAFETY DATA SHEET ******

N-ethyldiethanolamine, 98%
000017598

****** SECTION 1 - CHEMICAL PRODUCT AND COMPANY IDENTIFICATION ******

MSDS Name: N-ethyldiethanolamine, 98%

Company Identification: Acros Organics
Janssen Pharmaceuticalaan 3
2440 Geel, Belgium
For information in North America, call: 800-ACROS-01
For information in Europe, call: 0032(0) 14575211
For emergencies in the US, call CHEMTREC: 800-424-9300
For emergencies outside the US, call: 0032(0) 14575299

****** SECTION 2 - COMPOSITION, INFORMATION ON INGREDIENTS ******

CAS#	Chemical Name	%	Einecs#
139-87-7	N-ethyldiethanolamine	98	unlisted

****** SECTION 3 - HAZARDS IDENTIFICATION ******

EMERGENCY OVERVIEW

Not available.
Target Organs: None.

Potential Health Effects
The toxicological properties of this material have not been investigated. Use appropriate procedures to prevent opportunities for direct contact with the skin or eyes and to prevent inhalation.

****** SECTION 4 - FIRST AID MEASURES ******

Eyes:
Flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower lids.
Get medical aid immediately.
Skin:
Get medical aid.
Flush skin with plenty of soap and water for at least 15 minutes while removing contaminated clothing and shoes.
Remove contaminated clothing and shoes.
Ingestion:
If victim is conscious and alert, give 2-4 cupfuls of milk or water.
Get medical aid immediately.
Inhalation:
Get medical aid immediately. Remove from exposure to fresh air

immediately. If not breathing, give artificial respiration. If breathing is difficult, give oxygen.

Notes to Physician:
Activated charcoal does not reduce ethanol absorption.

**** SECTION 5 - FIRE FIGHTING MEASURES ****

General Information:
As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear.
During a fire, irritating and highly toxic gases may be generated by thermal decomposition or combustion.

Extinguishing Media:
Use agent most appropriate to extinguish fire.

Autoignition Temperature: Not available.

Flash Point: Not available.

Explosion Limits, Lower: Not available.
Upper: Not available.

**** SECTION 6 - ACCIDENTAL RELEASE MEASURES ****

General Information: Use proper personal protective equpiment as indicated in Section 8.

Spills/Leaks:
Clean up spills immediately, observing precautions in the Protective Equipment section.

**** SECTION 7 - HANDLING and STORAGE ****

Handling:
Wash thoroughly after handling.
Remove contaminated clothing and wash before reuse.
Avoid contact with eyes, skin, and clothing.
Avoid ingestion and inhalation.

Storage:
Store in a cool, dry place.
Keep container closed when not in use.

**** SECTION 8 - EXPOSURE CONTROLS, PERSONAL PROTECTION ****

Engineering Controls:
Use process enclosure, local exhaust ventilation, or other engineering controls to control airborne levels.

Exposure Limits

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs
N-ethyldiethanolamine	none listed	none listed	none listed

OSHA Vacated PELs:
N-ethyldiethanolamine:
No OSHA Vacated PELs are listed for this chemical.

Personal Protective Equipment

Eyes:
Wear chemical goggles.

Skin:
Wear appropriate protective gloves to prevent skin

exposure.

Clothing:

Wear appropriate protective clothing to minimize contact with skin.

Respirators:

A respiratory protection program that meets OSHA's 29 CFR °1910.134 and ANSI Z88.2 requirements must be followed whenever workplace conditions warrant a respirator's use.

**** SECTION 9 - PHYSICAL AND CHEMICAL PROPERTIES ****

Physical State:	Not available.
Appearance:	Not available.
Odor:	Not available.
pH:	Not available.
Vapor Pressure:	Not available.
Vapor Density:	Not available.
Evaporation Rate:	Not available.
Viscosity:	Not available.
Boiling Point:	Not available.
Freezing/Melting Point:	Not available.
Decomposition Temperature:	Not available.
Solubility:	Not available.
Specific Gravity/Density:	Not available.
Molecular Formula:	Not available.
Molecular Weight:	Not available.

**** SECTION 10 - STABILITY AND REACTIVITY ****

Chemical Stability:
Stable under normal temperatures and pressures.
Conditions to Avoid:
Incompatible materials, strong oxidants.
Incompatibilities with Other Materials:
Not available.
Hazardous Decomposition Products:
Irritating and toxic fumes and gases.
Hazardous Polymerization: Not available.

**** SECTION 11 - TOXICOLOGICAL INFORMATION ****

RTECS#:
CAS# 139-87-7: KK9800000
LD50/LC50:
CAS# 925-93-9: Not available.
Carcinogenicity:
N-ethyldiethanolamine
Not listed by ACGIH, IARC, NIOSH, NTP, or OSHA.
No components are listed by ACGIH, IARC, NIOSH, NTP, or OSHA.

**** SECTION 12 - ECOLOGICAL INFORMATION ****

**** SECTION 13 - DISPOSAL CONSIDERATIONS ****

Dispose of in a manner consistent with federal, state, and local regulations.
RCRA D-Series Maximum Concentration of Contaminants: Not listed.
RCRA D-Series Chronic Toxicity Reference Levels: Not listed.
RCRA F-Series: Not listed.
RCRA P-Series: Not listed.
RCRA U-Series: Not listed.
Not listed as a material banned from land disposal according to RCRA.

**** SECTION 14 - TRANSPORT INFORMATION ****

US DOT
No information available
IMO
No information available.
IATA
No information available.
RID/ADR
No information available.
Canadian TDG
Shipping Name: ETHYL BENZENE
Hazard Class: 3(9.2)
UN Number: UN1175
Other Information: FLASHPOINT 15C

**** SECTION 15 - REGULATORY INFORMATION ****

A. Federal
TSCA
CAS# 139-87-7 is listed on the TSCA inventory.
Health & Safety Reporting List
None of the chemicals are on the Health & Safety Reporting List.
Chemical Test Rules
None of the chemicals in this product are under a Chemical Test Rule.
Section 12b
None of the chemicals are listed under TSCA Section 12b.
TSCA Significant New Use Rule
None of the chemicals in this material have a SNUR under TSCA.
CERCLA/SARA
Section 302 (RQ)
None of the chemicals in this material have an RQ.
Section 302 (TPQ)
None of the chemicals in this product have a TPQ.
Section 313
No chemicals are reportable under Section 313.
Clean Air Act:
This material does not contain any hazardous air pollutants.
This material does not contain any Class 1 Ozone depletors.
This material does not contain any Class 2 Ozone depletors.
Clean Water Act:
None of the chemicals in this product are listed as Hazardous Substances under the CWA.
None of the chemicals in this product are listed as Priority Pollutants under the CWA.
None of the chemicals in this product are listed as Toxic Pollutants under the CWA.
OSHA:
None of the chemicals in this product are considered highly hazardous by OSHA.
B. State
N-ethyldiethanolamine can be found on the following state right to know lists: Florida, Pennsylvania, Massachusetts.
California No Significant Risk Level:
None of the chemicals in this product are listed.
C. International
Canada
CAS# 139-87-7 is listed on Canada's DSL/NDSL List.
CAS# 139-87-7 is not listed on Canada's Ingredient Disclosure List.
European Labeling in Accordance with EC Directives
Hazard Symbols: Not available.
Risk Phrases:

Safety Phrases:

**** SECTION 16 - ADDITIONAL INFORMATION ****

Additional Information:
No additional information available.
MSDS Creation Date: February 28, 1995
The information above is believed to be accurate and represents the best information currently available to us. However, we make no warranty of merchantability or any other warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes.

ACC20146

****** MATERIAL SAFETY DATA SHEET ******

N-Methyldiethanolamine, 99+%
000020146

****** SECTION 1 - CHEMICAL PRODUCT AND COMPANY IDENTIFICATION ******

MSDS Name: N-Methyldiethanolamine, 99+%

MDEA, 2,2'-Methyliminodiethanol
Company Identification: Acros Organics
Janssen Pharmaceuticalaan 3
2440 Geel, Belgium
For information in North America, call: 800-ACROS-01
For information in Europe, call: 0032(0) 14575211
For emergencies in the US, call CHEMTREC: 800-424-9300
For emergencies outside the US, call: 0032(0) 14575299

****** SECTION 2 - COMPOSITION, INFORMATION ON INGREDIENTS ******

CAS#	Chemical Name	%	Einecs#
105-59-9	N-Methyldiethanolamine, 99+%		2033127

Hazard Symbols: XI
Risk Phrases: 36

****** SECTION 3 - HAZARDS IDENTIFICATION ******

EMERGENCY OVERVIEW

Appearance: clear colourless oily liquid.
Appearance: Clear colourless oily liquid.
Target Organs: None.

Potential Health Effects

The toxicological properties of this material have not been investigated. Use appropriate procedures to prevent opportunities for direct contact with the skin or eyes and to prevent inhalation.

****** SECTION 4 - FIRST AID MEASURES ******

Eyes:

Immediately flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower lids.

Skin:

Flush skin with plenty of soap and water for at least 15 minutes while removing contaminated clothing and shoes.

Ingestion:

DO NOT induce vomiting. Allow the victim to rinse his mouth and then to drink 2-4 cupfuls of water, and seek medical advice.

Inhalation:

Remove from exposure to fresh air immediately.

Notes to Physician:
Treat symptomatically and supportively.
No specific antidote exists.

**** SECTION 5 - FIRE FIGHTING MEASURES ****

General Information:
As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear.
During a fire, irritating and highly toxic gases may be generated by thermal decomposition or combustion.
Extinguishing Media:
In case of fire, use water, dry chemical, chemical foam, or alcohol-resistant foam.
Autoignition Temperature: 265.C (509.00.F)
Flash Point: 126.C (258.80.F)
Explosion Limits, Lower: .90
Upper: 8.40

**** SECTION 6 - ACCIDENTAL RELEASE MEASURES ****

General Information: Use proper personal protective equpiment as indicated in Section 8.
Spills/Leaks:
Absorb spill with inert material, (e.g., dry sand or earth), then place into a chemical waste container. Clean up spills immediately, observing precautions in the Protective Equipment section.

**** SECTION 7 - HANDLING and STORAGE ****

Handling:
Wash thoroughly after handling.
Remove contaminated clothing and wash before reuse.
Avoid contact with eyes, skin, and clothing.
Avoid ingestion and inhalation.
Storage:
Store in a cool, dry place.
Keep container closed when not in use.

**** SECTION 8 - EXPOSURE CONTROLS, PERSONAL PROTECTION ****

Engineering Controls:
Use adequate general or local exhaust ventilation to keep airborne concentrations below the permissible exposure limits.
Use process enclosure, local exhaust ventilation, or other engineering controls to control airborne levels.

Exposure Limits

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs
N-Methyldiethanolamine, 99+%	none listed	none listed	none listed

OSHA Vacated PELs:
N-Methyldiethanolamine, 99+%:
No OSHA Vacated PELs are listed for this chemical.

Personal Protective Equipment

Eyes:

Wear safety glasses and chemical goggles if splashing is possible.

Skin:

Wear appropriate protective gloves and clothing to prevent skin exposure.

Clothing:

Wear appropriate protective clothing to minimize contact with skin.

Respirators:

Wear a NIOSH/MSHA-approved (or equivalent) full-facepiece airline respirator in the positive pressure mode with emergency escape provisions.

**** SECTION 9 - PHYSICAL AND CHEMICAL PROPERTIES ****

Physical State:	Not available.
Appearance:	Clear colourless oily liquid
Odor:	Not available.
pH:	12.4
Vapor Pressure:	8.5 mbar @ 120
Vapor Density:	Not available.
Evaporation Rate:	Not available.
Viscosity:	101 mPa s 20 C
Boiling Point:	246.0 - 248.0 C
Freezing/Melting Point:	Not available.
Decomposition Temperature:	Not available.
Solubility:	soluble
Specific Gravity/Density:	1.0380
Molecular Formula:	C5 H13 N O2
Molecular Weight:	Not available.

**** SECTION 10 - STABILITY AND REACTIVITY ****

Chemical Stability:
Stable under normal temperatures and pressures.
Conditions to Avoid:
Incompatible materials, strong oxidants.
Incompatibilities with Other Materials:
Oxidizing agents - acids.
Hazardous Decomposition Products:
Nitrogen oxides, carbon monoxide, irritating and toxic fumes and gases, carbon dioxide, nitrogen.
Hazardous Polymerization: Has not been reported.

**** SECTION 11 - TOXICOLOGICAL INFORMATION ****

RTECS#:
CAS# 105-59-9: KL7525000
LD50/LC50:
Not available.
Carcinogenicity:
N-Methyldiethanolamine, 99+%
Not listed by ACGIH, IARC, NIOSH, NTP, or OSHA.
No components are listed by ACGIH, IARC, NIOSH, NTP, or OSHA.

**** SECTION 12 - ECOLOGICAL INFORMATION ****

Ecotoxicity:
Not available.

**** SECTION 13 - DISPOSAL CONSIDERATIONS ****

Dispose of in a manner consistent with federal, state, and local regulations.

RCRA D-Series Maximum Concentration of Contaminants: Not listed.
RCRA D-Series Chronic Toxicity Reference Levels: Not listed.
RCRA F-Series: Not listed.
RCRA P-Series: Not listed.
RCRA U-Series: Not listed.
Not listed as a material banned from land disposal according to RCRA.

**** SECTION 14 - TRANSPORT INFORMATION ****

US DOT
No information available
IMO
Not regulated as a hazardous material.
IATA
Not regulated as a hazardous material.
RID/ADR
Not regulated as a hazardous material.
Canadian TDG
Shipping Name: METHYL T-BUTYL ETHER
Hazard Class: 3
UN Number: UN2398
Other Information: FLASHPOINT -10C

**** SECTION 15 - REGULATORY INFORMATION ****

A. Federal
TSCA
CAS# 105-59-9 is listed on the TSCA inventory.
Health & Safety Reporting List
None of the chemicals are on the Health & Safety Reporting List.
Chemical Test Rules
None of the chemicals in this product are under a Chemical Test Rule.
Section 12b
None of the chemicals are listed under TSCA Section 12b.
TSCA Significant New Use Rule
None of the chemicals in this material have a SNUR under TSCA.
CERCLA/SARA
Section 302 (RQ)
None of the chemicals in this material have an RQ.
Section 302 (TPQ)
None of the chemicals in this product have a TPQ.
Section 313
No chemicals are reportable under Section 313.
Clean Air Act:
This material does not contain any hazardous air pollutants.
This material does not contain any Class 1 Ozone depletors.
This material does not contain any Class 2 Ozone depletors.
Clean Water Act:
None of the chemicals in this product are listed as Hazardous Substances under the CWA.
None of the chemicals in this product are listed as Priority Pollutants under the CWA.
None of the chemicals in this product are listed as Toxic Pollutants under the CWA.
OSHA:
None of the chemicals in this product are considered highly hazardous by OSHA.
B. State
Not present on state lists from CA, PA, MN, MA, FL, or NJ.
California No Significant Risk Level:
None of the chemicals in this product are listed.
C. International
Canada

CAS# 105-59-9 is listed on Canada's DSL/NDSL List.
CAS# 105-59-9 is not listed on Canada's Ingredient Disclosure List.
European Labeling in Accordance with EC Directives
Hazard Symbols: XI
Risk Phrases:
R 36 Irritating to eyes.
Safety Phrases:
S 24 Avoid contact with skin.

**** SECTION 16 - ADDITIONAL INFORMATION ****

Additional Information:
No additional information available.
MSDS Creation Date: November 1, 1991
The information above is believed to be accurate and represents the best information currently available to us. However, we make no warranty of merchantability or any other warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes.

ACC15791

Triethanolamine, 97%

Acros Catalog #s: AC139560010 AC139560025 AC139560200 AC139565000 AC421630010 AC421632500
*** This product is for research and development purposes only. ***

Acros Organics
711 Forbes Avenue
Pittsburgh, PA 15219-4785
1-800-ACROS-01 (1-800-227-6701)
For Emergency Transportation Information call CHEMTREC: 800-424-9300

Date of Preparation: 05/13/86 Accession Number: 901599
Modified by Fisher Scientific: 12/94

SECTION I. IDENTIFICATION

- Product Name: Triethanolamine
- Synonym(s): 2,2',2"-Nitrilotris(ethanol)
- Formula: C6 H15 N O3
- CAT No(s): 113 1309; 113 1317; 113 1325; 113 1333; 113 1341; 113 1358 113 1366; 113 9500
- Chem. No(s): 01599

SECTION II. PRODUCT AND COMPONENT HAZARD DATA

COMPONENT(S):	Percent	ACGIH TLV(R)	CAS Reg. No.
Triethanolamine	ca. 100	---	102-71-6

SECTION III. PHYSICAL DATA

- Appearance: Nearly water-white liquid
- Boiling with Decomposition: 335 C (635 F)
- Vapor Pressure: Negligible
- Evaporation Rate (n-butyl acetate = 1): Negligible
- Volatile Fraction by Weight: Negligible
- Specific Gravity (Water = 1): 1.12
- Solubility in Water (by Weight): Complete

SECTION IV. FIRE AND EXPLOSION HAZARD DATA

- Flash Point: 208 C (407 F) Pensky-Martens closed
- Extinguishing Media: Water spray; Dry chemical; Carbon dioxide
- Special Fire Fighting Procedures: Wear self-contained breathing apparatus and protective clothing.
- Unusual Fire and Explosion Hazards: Fire or excessive heat may produce hazardous decomposition products.

SECTION V. REACTIVITY DATA

- Stability: Stable, however, material can decompose above 325 C. Avoid

temperatures above 225 C.
- Incompatibility: Strong oxidizers or acids
- Hazardous Decomposition Products: Combustion will produce carbon dioxide and probably carbon monoxide. Oxides of nitrogen may also be present.
- Hazardous Polymerization: Will not occur.

R-0359.300B 86-6885

SECTION VI. TOXICITY AND HEALTH HAZARD DATA

A. EXPOSURE LIMITS: Not established.

B. EXPOSURE EFFECTS:
Inhalation: Low hazard for usual industrial handling.
Skin: Causes irritation.
Eye: Causes irritation.

C. FIRST AID:
Inhalation: None should be needed.
Skin: Immediately flush skin with plenty of water for at least 15 minutes. Get medical attention if symptoms are present after washing.
Eye: Immediately flush eyes with plenty of water for at least 15 minutes and get medical attention.

SECTION VII. VENTILATION AND PERSONAL PROTECTION

A. VENTILATION:
Good general room ventilation should be sufficient.

B. RESPIRATORY PROTECTION:
None should be needed.

C. SKIN AND EYE PROTECTION:
Protective gloves and clothing should be worn. Safety glasses or goggles should be worn.

SECTION VIII. SPECIAL STORAGE AND HANDLING PRECAUTIONS

Keep container tightly closed and away from acids.
Keep from contact with oxidizing materials.

SECTION IX. SPILL, LEAK, AND DISPOSAL PROCEDURES

Absorb material in vermiculite or other suitable absorbent and place in impervious container. Dispose by incineration or contract with licensed chemical waste disposal agency. Discharge, treatment, or disposal may be subject to federal, state or local laws.

R-0359.300B 86-6885 @901599*

J T BAKER CHEMICAL -- TRIETHANOLAMINE
MATERIAL SAFETY DATA SHEET
FSC: 6810
NIIN: 00F000903
Manufacturer's CAGE: 70829
Part No. Indicator: A
Part Number/Trade Name: TRIETHANOLAMINE

General Information

Company's Name: J. T. BAKER CHEMICAL CO.
Company's Emerg Ph #: (201) 859-2151
Record No. For Safety Entry: 001
Tot Safety Entries This Stk#: 001
Date MSDS Prepared: 01JAN85
Safety Data Review Date: 25JAN85
MSDS Serial Number: BBHLG
Report for NIIN: 00F000903

Ingredients/Identity Information

Proprietary: YES
Ingredient: PROPRIETARY
Ingredient Sequence Number: 01

Physical/Chemical Characteristics

Appearance And Odor: WATER-WHITE, VISCOUS, LIQUID, STRONG AMMONIACAL
Boiling Point: 335.4C
Vapor Pressure (MM Hg/70 F): 0.0
Vapor Density (Air=1): 5.3
Specific Gravity: 1.1258
Evaporation Rate And Ref: BUTYL ACE. <0.01
Solubility In Water: COMPLETE
Percent Volatiles By Volume: NIL

Fire and Explosion Hazard Data

Flash Point:
Flash Point Method: N/P
Lower Explosive Limit: 1.3
Upper Explosive Limit: 8.5
Extinguishing Media: USE CARBON DIOXIDE, DRY CHEMICAL FOR SMALL FIRES.
Special Fire Fighting Proc: WATER SPRAY WILL REDUCE FLAMES. BURNING LIQ. CAUSE FROTHING
Unusual Fire And Expl Hazrds: AIR SUPPLIED RESPIRATOR SHOULD BE AVAILABLE TO FIREFIGHTERS. OXIDES OR NITROGEN CAN EVOLVE.
Report for NIIN: 00F000903

Reactivity Data

Stability: YES
Cond To Avoid (Stability): AIR AND LIGHT
Materials To Avoid: STRONG MINERAL ACIDS & OXIDIZING AGENTS SUCH AS NITRIC ACID
Hazardous Decomp Products: THERMAL DECOMP. MAY PRODUCE NITROGEN OXIDES & CBN MONOXIDE.
Hazardous Poly Occur: NO

Health Hazard Data

Route Of Entry - Inhalation: N/P
Route Of Entry - Skin: N/P

Route Of Entry - Ingestion: N/P
Carcinogenicity - NTP: N/P
Carcinogenicity - IARC: N/P
Carcinogenicity - OSHA: N/P
Signs/Symptoms Of Overexp: CONTACT WITH SKIN AND EYES MAY BE IRRITATING.
Emergency/First Aid Proc: IN CASE OF CONTACT WITH EYE OR SKIN, IMMEDIATELY FLUSH WITH COPIOUS AMOUNTS OF WATER. FOR EYES, CONSULT A PHYSICIAN. WASH CLOTHING BEFORE REUSE.

Precautions for Safe Handling and Use

Steps If Matl Released/Spill: ELIMINATE ALL SOURCES OF IGNITION. ABSORB ON SAND, EARTH OR VERMICULITE. CAREFULLY SEP UP & REMOVE. FLUSH SPILL AREA WITH WATER. ALTERNATIVELY USE THE J. T.AKER SOLUSORB SPILL CLEANUP KIT.
Waste Disposal Method: INCINERATE IN A FURNACE PROVIDING ENVIRONMENTAL REGULATIONS PERMIT.
Precautions-Handling/Storing: KEEP CONTAINER TIGHTLY CLOSED. WASH THOROUGHLY AFTER HANDLING.
Other Precautions: AVOID CONTACT WITH EYES, SKIN, AND CLOTHING. MAY SEGREGATE OR FREEZE BELOW 60F.

Control Measures

Respiratory Protection: AIR SUPPLIED MASK WHERE HIGH CONCENTRATIONS EXIST.
Ventilation: MECHANICAL: ACCEPTABLE
Protective Gloves: RUBBER GLOVES
Eye Protection: GLASSES
Other Protective Equipment: APPROVED WORKING AFTER HANDLING.
Suppl. Safety & Health Data: 222 RED SCHOOL LANE/PHILLIPSBURG, N.J. 08865.
Report for NIIN: 00F000903

Transportation Data

Disposal Data

Disposal Data Review Date: 88028
Rec # For This Disp Entry: 01
Tot Disp Entries Per NSN: 001
Landfill Ban Item: YES
Disposal Supplemental Data: 222 RED SCHOOL LANE/PHILLIPSBURG, N.J. 08865. RECOMMEND TESTING FOR PH TO VERIFY IF THE WASTE MEETS CORROSIVITY CRITERIA (40 CFR 261.22).
1st EPA Haz Wst Name New: NOT REGULATED
1st EPA Haz Wst Char New: NOT REGULATED BY RCRA
Report for NIIN: 00F000903
1st EPA Acute Hazard New: NO

Label Data

Label Required: YES
Label Status: G
Common Name: TRIETHANOLAMINE
Chronic Hazard: N/P
Special Hazard Precautions: CONTACT WITH SKIN AND EYES MAY BE IRRITATING.
Label Name: J. T. BAKER CHEMICAL CO.
Label Emergency Number: (201) 859-2151

ACC19477

Thionyl chloride, 99.5+%

Acros Catalog #s: AC169490010 AC169490250 AC169491000 AC169495000

*** This product is for research and development purposes only. ***

711 Forbes Avenue
Pittsburgh, PA 15219-4785
1-800-ACROS-01 (1-800-227-6701)
For Emergency Transportation Information call CHEMTREC: 800-424-9300

Date of Preparation: 11/14/86 Accession Number: 900246
Modified by Fisher Scientific: 12/94

SECTION I. IDENTIFICATION

- Product Name: Thionyl Chloride
- Synonym(s): Sulfinyl Chloride; Sulfurous Oxychloride
- Formula: Cl2 OS
- CAT No(s): 103 9668; 103 9700; 103 9726; 103 9734; 176 8969
- Chem. No(s): 00246

SECTION II. PRODUCT AND COMPONENT HAZARD DATA

COMPONENT(S):	Percent	ACGIH TLV(R)	CAS Reg. No.
Thionyl Chloride	ca. 100	1 ppm (Ceiling)	7719-09-7

SECTION III. PHYSICAL DATA

- Appearance and Odor: Colorless fuming liquid; pungent odor
- Boiling Point: 79 C (174 F)
- Vapor Pressure: 96.6 mmHg at 20 C (68 F)
- Evaporation Rate (n-butyl acetate = 1): Not Available
- Volatile Fraction by Weight: ca. 100 %
- Specific Gravity (Water = 1): 1.64
- Solubility in Water (by Weight): Decomposes

SECTION IV. FIRE AND EXPLOSION HAZARD DATA

- Flash Point: Noncombustible
- Extinguishing Media: Use appropriate agent for surrounding fire.
- Special Fire Fighting Procedures: Wear self-contained breathing apparatus and protective clothing. USE WATER WITH CAUTION AND IN FLOODING AMOUNTS. Material reacts with water.
- Unusual Fire and Explosion Hazards: Fire or excessive heat may produce hazardous decomposition products. Reacts with water (see Special Fire-Fighting Procedures).

SECTION V. REACTIVITY DATA

- Stability: Stable
- Incompatibility: Strong oxidizers, water, concentrated ammonia, diethyl ether, chloryl perchlorate, DMSO, DMF
- Hazardous Decomposition Products: Thermal decomposition may produce hydrogen chloride gas and oxides of sulfur.
- Hazardous Polymerization: Will not occur.

R-0346.500D 86-7926

SECTION VI. TOXICITY AND HEALTH HAZARD DATA

A. EXPOSURE LIMITS: TLV 1 ppm (ceiling), ACGIH 1988-89.
OSHA PEL 1 ppm (ceiling).

B. EXPOSURE EFFECTS:
Inhalation: Poison. May be fatal if inhaled. Vapor extremely irritating to eyes, mucosal surfaces and respiatory tract.
Skin: Causes severe burns. Harmful if absorbed through the skin.
Eye: Causes severe burns.
Ingestion: Harmful if swallowed.

C. FIRST AID:
Inhalation: Remove to fresh air. Treat symptomatically. Call a physician immediately.
Skin: Immediately flush skin with plenty of water for at least 15 minutes. Get medical attention promptly.
Eye: Immediately flush eyes with plenty of water for at least 15 minutes. Call a physician immediately.
Ingestion: Drink 1-2 glasses of milk or water; do not induce vomiting. Call a physician immediately.

SECTION VII. VENTILATION AND PERSONAL PROTECTION

A. VENTILATION:
Good general room ventilation should be used. Local exhaust ventilation or an enclosed handling system may be necessary to control vapor concentration below the TLV.

B. RESPIRATORY PROTECTION:
A NIOSH-approved full-face organic vapor/acid gas or air-supplied respirator should be worn if needed.

C. SKIN AND EYE PROTECTION:
Protective gloves and clothing should be worn. Goggles or a face shield should be worn.

SECTION VIII. SPECIAL STORAGE AND HANDLING PRECAUTIONS

Keep from contact with oxidizing materials. Keep container tightly closed and away from any contact with water, concentrated ammonia, DMSO, DMF, chloryl perchlorate, or diethyl ether.
Do not add water to a closed container since the reaction may result in violent rupture of the container.
Since empty container retains product residue, follow label warnings even after container is empty. Store in a dry place.

R-0346.500D 86-7926

SECTION IX. SPILL, LEAK, AND DISPOSAL PROCEDURES

Absorb material in vermiculite or other suitable absorbent and place in impervious container. Dispose by incineration or contract with licensed chemical waste disposal agency. Discharge, treatment, or disposal may be subject to federal, state or local laws.

R-0346.500D 86-7926 @900246*

MATERIAL SAFETY DATA SHEET OHS11490

OCCUPATIONAL HEALTH SERVICES, INC.
450 SEVENTH AVENUE, SUITE 2407
NEW YORK, NEW YORK 10123
(800) 445-MSDS (212) 967-1100

EMERGENCY CONTACT:
JOHN S. BRANSFORD, JR. (615) 292-1180

SUBSTANCE IDENTIFICATION

CAS-NUMBER 7439-89-6
RTEC-NUMBER NO4565500

SUBSTANCE: IRON

TRADE NAMES/SYNONYMS:
FERRIUM: IRON DUST: ARMCO IRON: LOHA: CARBONYL IRON: I-60, I-61, I-62, I-185, I-57: FE: OHS11490

CHEMICAL FAMILY:
METAL

MOLECULAR FORMULA: FE MOLECULAR WEIGHT: 55.85

CERCLA RATINGS (SCALE 0-3): HEALTH=3 FIRE=3 REACTIVITY=0 PERSISTENCE=3
NFPA RATINGS (SCALE 0-4): HEALTH=3 FIRE=3 REACTIVITY=0

COMPONENTS AND CONTAMINANTS

COMPONENT: IRON PERCENT: 100.0

OTHER CONTAMINANTS: NONE

EXPOSURE LIMIT:
IRON OXIDE (FUME):
10 MG/M3 OSHA TWA
5 MG/M3 ACGIH TWA

PHYSICAL DATA

DESCRIPTION: SILVER-WHITE OR GRAY, SOFT, MALLEABLE METAL.

BOILING POINT: 4982 F (2750 C) MELTING POINT: 2795 F (1535 C)

SPECIFIC GRAVITY: 7.86 SOLUBILITY IN WATER: INSOLUBLE

VAPOR PRESSURE: 1 MMHG @ 1787 C

OTHER SOLVENTS (SOLVENT - SOLUBILITY):
SOLUBLE IN ACIDS; INSOLUBLE IN ALKALIES, ALCOHOL, ETHER.

OTHER PHYSICAL DATA
BRINELL HARDNESS: 60
AUTOIGNITION TEMPERATURE: 428-968 F (220-520 C) (LAYER)
878-1436 F (470-780 C) (CLOUD)

FIRE AND EXPLOSION DATA

FIRE AND EXPLOSION HAZARD
NEGLIGIBLE FIRE HAZARD IN METALLIC FORM; HOWEVER, DUST, POWDER, OR FUMES ARE FLAMMABLE OR EXPLOSIVE WHEN EXPOSED TO HEAT OR FLAMES.

FIREFIGHTING MEDIA:
USE DRY SAND, DOLOMITE, GRAPHITE, SODIUM CHLORIDE, SODA ASH, OR APPROPRIATE METAL-EXTINGUISHING POWDER. DO NOT APPLY WATER TO BURNING MATERIAL (NFPA FIRE PROTECTION HANDBOOK, 16TH EDITION).

FIREFISHTING:
MOVE CONTAINER FROM FIRE AREA IF POSSIBLE. COOL CONTAINERS EXPOSED TO FLAME WITH WATER FROM SIDE UNTIL WELL AFTER FIRE IS OUT. STAY AWAY FROM STORAGE TANK ENDS. FOR MASSIVE FIRE IN CARGO AREA, USE UNMANNED HOSE HOLDER OR MONITOR NOZZLES; ELSE WITHDRAW AND LET FIRE BURN (1987 EMERGENCY RESPONSE GUIDEBOOK, DOT P 5800.4, GUIDE PAGE 32).

EXTINGUISH USING AGENT FOR TYPE OF FIRE. AVOID BREATHING FUMES FROM BURNING MATERIAL.

TRANSPORTATION

DEPARTMENT OF TRANSPORTATION HAZARD CLASSIFICATION 49CFR172.101:
*FLAMMABLE SOLID

DEPARTMENT OF TRANSPORTATION LABELING REQUIREMENTS 49CFR172.101 AND SUBPART E:
*FLAMMABLE SOLID

*HAZARD CLASSIFICATION AND LABEL APPLY TO DUST AND POWDER FORM ONLY.

DEPARTMENT OF TRANSPORTATION PACKAGING REQUIREMENTS: 49CFR173.154
EXCEPTIONS: 49CFR173.153

TOXICITY

IRON:
20 MG/KG INTRAPERITONEAL-RABBIT LDLO; TUMORIGENIC DATA (RTECS).
CARCINOGEN STATUS: NONE. IRON AND STEEL FOUNDING: HUMAN SUFFICIENT EVIDENCE (IARC CLASS-1). THE CONSISTENCY OF THE EXCESS IN STUDIES FROM AROUND THE WORLD SHOWS THAT CERTAIN EXPOSURES IN IRON AND STEEL FOUNDING CAN CAUSE LUNG CANCER IN HUMANS. OTHER CANCER EXCESSES REPORTED HAVE INCLUDED LEUKEMIA, AND GENITAL AND DIGESTIVE SYSTEM CANCERS.
IRON MAY BE IRRITATING TO EYES AND MUCOUS MEMBRANES. POISONING MAY AFFECT THE GASTROINTESTINAL, RESPIRATORY, NERVOUS AND HEMATOPOIETIC SYSTEMS AND THE LIVER.

HEALTH EFFECTS AND FIRST AID

INHALATION:
IRON:
ACUTE EXPOSURE- DUST MAY CAUSE MUCOUS MEMBRANE AND RESPIRATORY IRRITATION DUE TO MECHANICAL ACTION. METAL FUME FEVER, AN INFLUENZA-LIKE ILLNESS, MAY OCCUR DUE TO THE INHALATION OF FRESHLY FORMED IRON OXIDE PARTICLES SIZED BELOW 1.5 MICRONS AND USUALLY BETWEEN 0.02-0.05 MICRONS. SYMPTOMS MAY BE DELAYED 4-12 HOURS AND BEGIN WITH A SUDDEN ONSET OF THIRST, AND A SWEET, METALLIC OR FOUL TASTE IN THE MOUTH. OTHER SYMPTOMS MAY INCLUDE UPPER RESPIRATORY TRACT IRRITATION ACCOMPANIED BY COUGHING AND A DRYNESS OF THE MUCOUS MEMBRANES. LASSITUDE AND A GENERALIZED FEELING OF MALAISE. FEVER, CHILLS, MUSCULAR PAIN, MILD TO SEVERE HEADACHE, NAUSEA, OCCASIONAL VOMITING, EXAGGERATED MENTAL ACTIVITY, PROFUSE SWEATING, EXCESSIVE URINATION, DIARRHEA AND PROSTRATION MAY ALSO OCCUR. TOLERANCE TO FUMES DEVELOPS RAPIDLY, BUT IS QUICKLY LOST. ALL SYMPTOMS USUALLY SUBSIDE WITHIN 24-36 HOURS.
CHRONIC EXPOSURE- PROLONGED OR REPEATED EXPOSURE MAY CAUSE A MOTTLING OF THE LUNGS, A CONDITION CALLED SIDEROSIS WHICH IS CONSIDERED TO BE A BENIGN PNEUMOCONIOSIS THAT DOES NOT CAUSE SIGNIFICANT PHYSIOLOGIC IMPAIRMENT. SYMPTOMS MAY INCLUDE CHRONIC BRONCHITIS, EMPHYSEMA, AND DYSPNEA ON EXERTION.

FIRST AID- REMOVE FROM EXPOSURE AREA TO FRESH AIR IMMEDIATELY. IF BREATHING HAS STOPPED, PERFORM ARTIFICIAL RESPIRATION. KEEP PERSON WARM AND AT REST. TREAT SYMPTOMATICALLY AND SUPPORTIVELY. GET MEDICAL ATTENTION IMMEDIATELY.

SKIN CONTACT:
IRON:
ACUTE EXPOSURE- DUST MAY CAUSE IRRITATION. PENETRATION OF IRON PARTICLES IN THE SKIN MAY CAUSE AN EXOGENOUS SIDEROSIS WHICH MAY BE CHARACTERIZED BY ... . A RED-BROWN PIGMENTATION OF THE AFFECTED AREA.
CHRONIC EXPOSURE- NO DATA AVAILABLE.

FIRST AID- REMOVE CONTAMINATED CLOTHING AND SHOES IMMEDIATELY. WASH AFFECTED AREA WITH SOAP OR MILD DETERGENT AND LARGE AMOUNTS OF WATER UNTIL NO EVIDENCE OF CHEMICAL REMAINS (APPROXIMATELY 15-20 MINUTES). GET MEDICAL ATTENTION IMMEDIATELY.

EYE CONTACT:
IRON:
ACUTE EXPOSURE- MAY CAUSE IRRITATION DUE TO MECHANICAL ACTION. IRON PARTICLES IMBEDDED IN THE EYE MAY CAUSE OCULAR SIDEROSIS. EFFECTS MAY INCLUDE DISCOLORATION OF THE CORNEA AND IRIS, AND PUPILLARY EFFECTS INCLUDING POOR REACTION TO LIGHT, ACCOMODATION, AND ATROPINE. IF A PARTICLE ENTERS THE LENS THERE MAY BE CATARACT FORMATION. GLAUCOMA OCCURS RARELY IN SOME CASES OF OCULAR SIDEROSIS.
CHRONIC EXPOSURE- REPEATED AND PROLONGED CONTACT MAY CAUSE CONJUNCTIVITIS.

FIRST AID- WASH EYES IMMEDIATELY WITH LARGE AMOUNTS OF WATER OR NORMAL SALINE, OCCASIONALLY LIFTING UPPER AND LOWER LIDS, UNTIL NO EVIDENCE OF CHEMICAL REMAINS (APPROXIMATELY 15-20 MINUTES). GET MEDICAL ATTENTION IMMEDIATELY.

INGESTION:
IRON:
ACUTE EXPOSURE- THERE ARE NO REPORTS AVAILABLE ON POISONING FROM METALLIC IRON. THE PRINCIPAL MANIFESTATIONS OF POISONING WITH IRON COMPOUNDS ARE VOMITING, DIARRHEA, AND CIRCULATORY COLLAPSE.

CHRONIC EXPOSURE- REPEATED OR PROLONGED EXPOSURE MAY CAUSE HEMOSIDEROSIS, OR HEMOCHROMATOSIS.

FIRST AID- TREAT SYMPTOMATICALLY AND SUPPORTIVELY. GET MEDICAL ATTENTION IMMEDIATELY. IF VOMITING OCCURS, KEEP HEAD LOWER THAN HIPS TO PREVENT ASPIRATION.

ANTIDOTE:
NO SPECIFIC ANTIDOTE. TREAT SYMPTOMATICALLY AND SUPPORTIVELY.

REACTIVITY SECTION

REACTIVITY:
STABLE UNDER NORMAL TEMPERATURES AND PRESSURES.

INCOMPATIBILITIES:
IRON:
- ACETALDEHYDE: POLYMERIZES READILY.
- AMMONIUM NITRATE: VIOLENT OR EXPLOSIVE REACTION.
- AMMONIUM PEROXODISULFATE: VIOLENT REACTION.
- BROMINE PENTAFLUORIDE: VIOLENT REACTION AND POSSIBLE IGNITION.
- CHLORIC ACID: FORMS EXPLOSIVE COMPOUND.
- CHLORINE (GAS): IGNITES.
- CHLORINE TRIFLUORIDE: VIOLENT REACTION AND POSSIBLE IGNITION.
- CHLOROFORMAMIDINIUM NITRATE: EXPLOSIVE IGNITION.
- DINITROGEN TETRAOXIDE: IGNITES.
- FLUORINE: IGNITES.
- HYDROGEN PEROXIDE: VIOLENT DECOMPOSITION.
- NITROGEN DIOXIDE: INCANDESCENT REACTION.
- NITRYL FLUORIDE: INCANDESCES WHEN HEATED.
- PHOSPHORUS: INCANDESCES WHEN HEATED.
- POLYSTYRENE BEADS: POSSIBLE STATIC IGNITION.
- POTASSIUM DICHROMATE: IGNITES ON CONTACT.
- POTASSIUM PERCHLORATE + MANGANESE DIOXIDE: IGNITES.
- SODIUM ACETYLIDE: POSSIBLE VIOLENT REACTION.
- SODIUM PEROXIDE: IGNITES UNDER FRICTION @ 240 C.
- SULFURIC ACID: POSSIBLE EXPLOSION HAZARD.

DECOMPOSITION:
THERMAL DECOMPOSITION PRODUCTS MAY INCLUDE TOXIC OXIDES OF IRON AND IRON FUMES.

POLYMERIZATION:
HAZARDOUS POLYMERIZATION HAS NOT BEEN REPORTED TO OCCUR UNDER NORMAL TEMPERATURES AND PRESSURES.

STORAGE-DISPOSAL

OBSERVE ALL FEDERAL, STATE AND LOCAL REGULATIONS WHEN STORING OR DISPOSING OF THIS SUBSTANCE. FOR ASSISTANCE, CONTACT THE DISTRICT DIRECTOR OF THE ENVIRONMENTAL PROTECTION AGENCY.

STORAGE

STORE AWAY FROM INCOMPATIBLE SUBSTANCES.

CONDITIONS TO AVOID

AVOID DISPERSION OF DUST IN AIR. FINELY DIVIDED PARTICLES, DUST, OR FUMES MAY BE FLAMMABLE OR EXPLOSIVE. KEEP AWAY FROM SPARKS OR IGNITION SOURCES.

SPILLS AND LEAKS

OCCUPATIONAL-SPILL:
FOR LARGE SPILLS, SWEEP UP WITH A MINIMUM OF DUSTING AND PLACE INTO SUITABLE CLEAN, DRY CONTAINERS FOR RECLAMATION OR LATER DISPOSAL.

RESIDUE SHOULD BE CLEANED UP USING A HIGH-EFFICIENCY PARTICULATE FILTER VACUUM.

PROTECTIVE EQUIPMENT SECTION

VENTILATION:
PROVIDE LOCAL EXHAUST OR PROCESS ENCLOSURE VENTILATION TO MEET THE PUBLISHED EXPOSURE LIMITS. VENTILATION EQUIPMENT MUST BE EXPLOSION-PROOF.

RESPIRATOR:
THE FOLLOWING RESPIRATORS ARE RECOMMENDED BASED ON INFORMATION FOUND IN THE PHYSICAL DATA, TOXICITY AND HEALTH EFFECTS SECTIONS. THEY ARE RANKED IN ORDER FROM MINIMUM TO MAXIMUM RESPIRATORY PROTECTION.
THE SPECIFIC RESPIRATOR SELECTED MUST BE BASED ON CONTAMINATION LEVELS FOUND IN THE WORK PLACE, MUST NOT EXCEED THE WORKING LIMITS OF THE RESPIRATOR AND BE JOINTLY APPROVED BY THE NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH AND THE MINE SAFETY AND HEALTH ADMINISTRATION (NIOSH-MSHA).

DUST, MIST, AND FUME RESPIRATOR.

POWERED AIR-PURIFYING RESPIRATOR WITH A DUST, MIST, AND FUME FILTER.

TYPE 'C' SUPPLIED-AIR RESPIRATOR WITH A FULL FACEPIECE OPERATED IN PRESSURE-DEMAND OR OTHER POSITIVE PRESSURE MODE OR WITH A FULL FACEPIECE, HELMET OR HOOD OPERATED IN CONTINUOUS-FLOW MODE.

SELF-CONTAINED BREATHING APPARATUS WITH A FULL FACE PIECE OPERATED IN PRESSURE-DEMAND OR OTHER POSITIVE PRESSURE MODE.

FOR FIREFIGHTING AND OTHER IMMEDIATELY DANGEROUS TO LIFE OR HEALTH CONDITIONS:

SELF-CONTAINED BREATHING APPARATUS WITH FULL FACEPIECE OPERATED IN PRESSURE DEMAND OR OTHER POSITIVE PRESSURE MODE.

SUPPLIED-AIR RESPIRATOR WITH FULL FACEPIECE AND OPERATED IN PRESSURE-DEMAND OR OTHER POSITIVE PRESSURE MODE IN COMBINATION WITH AN AUXILIARY

SELF-CONTAINED BREATHING APPARATUS OPERATED IN PRESSURE-DEMAND OR OTHER POSITIVE PRESSURE MODE.

/ THING:
EMPLOYEE MUST WEAR APPROPRIATE PROTECTIVE (IMPERVIOUS) CLOTHING AND EQUIPMENT TO PREVENT REPEATED OR PROLONGED SKIN CONTACT WITH THIS SUBSTANCE.

GLOVES:
EMPLOYEE MUST WEAR APPROPRIATE PROTECTIVE GLOVES TO PREVENT CONTACT WITH THIS SUBSTANCE.

EYE PROTECTION:
EMPLOYEE MUST WEAR SPLASH-PROOF OR DUST-RESISTANT SAFETY GOGGLES TO PREVENT EYE CONTACT WITH THIS SUBSTANCE. CONTACT LENSES SHOULD NOT BE WORN.

AUTHORIZED BY- OCCUPATIONAL HEALTH SERVICES, INC.

CREATION DATE: 12/11/84 REVISION DATE: 06/27/89

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MATERIAL SAFETY DATA SHEET

Ebecryl® 3700-20T

; ·alth- 3 Fire- 1 Reactivity- 2
, d: 09/06/90 Supersedes: 07/08/90

Radcure Specialties, Inc.
9800 Bluegrass Parkway
Louisville, Kentucky 40299
Emergency Phone Numbers:
(502) 499-4112 (if no answer, (502) 499-4119)
CHEMTREC (800) 424-9300

ENTIFICATION & PHYSICAL DATA

duct Name: Ebecryl 3700-20T

duct Class: Acrylated Epoxy

ıufacturer's I.D. : 022L012

.T. Hazard Class: Not Regulated
.T. Shipping Name: Not Applicable
.T. UN Number: Not Applicable

poration Rate: Slower than Butyl Acetate

Percent Volatile by Volume: <0.5 **VOC:** None

Boiling Range: >200 F

Vapor Density: Heavier than air

Weight Per Gallon: 9.8 lb.

Vapor Pressure at 20 C: <0.01 mm Hg

Solubility in Water: Practically Insoluble

ıearance and Odor: Clear green to brown viscous liquid with charac teristic acrylate odor

AZARDOUS INGREDIENTS	CAS #	\ ⁻ %	OSHA TWA ppm	OSHA STEL ppm	ACGIH TWA ppm	ACGIH STEL ppm
ıte ester of Bisphenol-A based epoxy	55818-57-0	80	---	---	---	---
thylolpropane triacrylate (TMPTA)	15625-89-5	20	---	---	---	---
ıquinone	123-31-9	<0.1	2 mg/M3	---	2 mg/M3	---

Not established

FIRE & EXPLOSION DATA

Flashpoint: >200 F Setaflash **LEL:** No data

nguishing Media:

carbon dioxide or dry chemical for small fires; aqueous foam or water for large fires.

sual Fire & Explosion Hazards:

ı temperatures and fire conditions may cause rapid and uncontrolled polymerization which can result in explosions and the violent rupture torage vessels or containers. Avoid the use of a stream of water to control fires since frothing can occur.

cial Fire Fighting Procedures:

ıove all ignition sources. Wear self-contained breathing apparatus and complete personal protective equipment when entering confined ıs where potential for exposure to vapors or products of combustion exists.

REACTIVITY DATA

Stability: Unstable **Hazardous Polymerization:** May occur

ditions to Avoid:

'age above 100 F, exposure to light, loss of dissolved air, loss of polymerization inhibitor, contamination with incompatible materials.

erials to Avoid:

merization initiators including peroxides, strong oxidizing agents, copper, copper alloys, carbon steel, iron, rust, and strong bases.

ardous Decomposition Products:

ıes produced when heated to decomposition may include: carbon monoxide, carbon dioxide.

HEALTH HAZARD DATA

Effects of Overexposure:

Ingestion: No specific information available.
Contains materials that may be practically nontoxic.

Inhalation: No specific information available.
Volatility makes vapor inhalation unlikely. Aerosol can be irritating.

Skin Absorption: No specific information available.
Contains materials that may be slightly toxic.

Skin Contact: No specific information available.
Contains materials that are essentially nonirritating, but contact may cause slight transient irritation and/or sensitization. Prolonged contact may cause blister formation (burns). Since irritation may not occur immediately, contact can go unnoticed.

Eye Contact: No specific information available.
Contains materials that may cause severe eye injury — damage reversible.

Chronic Effects of Overexposure: No specific information available.
Trimethylolpropane triacrylate has shown limited evidence of mutagenicity (in vitro).

Emergency & First Aid Procedures:

Eye Contact:
Flush with plenty of water for at least 15 minutes and seek medical attention.

Skin Contact:
Remove contaminated clothing and wash contact area with soap and water for 15 minutes. Particular attention should be paid to hair, nose, ears, and other areas not easily cleaned. See section VIII. Note to physician: Effects can be delayed 24 to 48 hrs.

Ingestion:
If appreciable quantities are swallowed, seek medical attention.

Inhalation:
In case of exposure to a high concentration of vapor or mist, remove person to fresh air. If breathing has stopped, administer artificial respiration and seek medical attention.

SPILL OR LEAK PROCEDURES

Steps to Be Taken in Case Material Is Released or Spilled:

Spontaneous polymerization can occur. Eliminate ignition sources. Use eye and skin protection. Place leaking containers in a well ventilated area. Absorb with inert material and dispose. Flush area with water; prevent washings from entering waterways.
Spills may be reportable to the National Response Center (800–424–8802).

Waste Disposal Method:

Incinerate or use biological treatment in accordance with federal, state, and local regulations.

SPECIAL PROTECTION INFORMATION

Respiratory Protection:

When exposed to aerosols or vapors, use full face organic vapor cartridge respirator with particulate pre-filter. In emergency situations, or when used in confined spaces, use self-contained breathing apparatus or other air supplied full face respirator.

Ventilation:

Local Exhaust – Recommended to control exposure which may result from operations generating aerosols and hot operations generating vapors.
Mechanical – Not recommended to control exposure for operations generating aerosols or vapors.

Protective Gloves: Impervious gloves (Neoprene). A combination of barrier cream, applied before exposure, and gloves is recommended. Do not apply cream after exposure.

Eye Protection: Chemical splash goggles.

Other Protective Equipment: For operations where contact can occur, use a face shield, impervious body covering, and boots. A safety shower and eye wash facility should be available. For routine laboratory operations, an impervious apron and gloves are recommended.

VIII. SPECIAL PRECAUTIONS

Avoid contact with skin and eyes. Avoid breathing vapor. Keep container closed when not in use. Avoid prolonged exposure to light. Store at temperatures below 100 F. Remove all contaminated clothing, shoes, belts, and other leather goods immediately. Incinerate leather goods (including shoes). Wash contaminated clothing thoroughly before reuse. Wash skin thoroughly with soap and water after handling. Solvents should not be used to clean skin because of increased penetration potential.

IX. STATE R-T-K COMPOSITION INFORMATION

Component	CAS #	WT %	PENNSYLVANIA	MASSACHUSETTS	CANADA
Hydroquinone	123-31-9	<0.1	NO	YES	YES

X. SARA Title III Section 313 Information

Component	CAS #	WT %
Hydroquinone	123-31-9	<0.1

XI. California Proposition 65 Information

This product does not contain any California Proposition 65 designated chemicals.

XII. Other Information

All components of this product are listed on the TSCA registry.

1,1,1-TRICHLOROETHANE
1.1.1-TRICHLOROETHANE
1,1,1-TRICHLOROETHANE

MATERIAL SAFETY DATA SHEET

FISHER SCIENTIFIC
CHEMICAL DIVISION
1 REAGENT LANE
FAIR LAWN NJ 07410
(201) 796-7100

EMERGENCY NUMBER: (201) 796-7100
CHEMTREC ASSISTANCE: (800) 424-9300

SUBSTANCE IDENTIFICATION

CAS-NUMBER 71-55-6

SUBSTANCE: **1,1,1-TRICHLOROETHANE**

TRADE NAMES/SYNONYMS:
ALPHA-TRICHLOROETHANE; CHLOROTHENE; AEROTHENE TT; ETHYLIDINE CHLORIDE; METHYLTRICHLOROMETHANE; METHYLCHLOROFORM; TRICHLOROMETHYLMETHANE; TRICHLOROETHANE; T-391; T-398; RCRA U226; UN 2831; STCC 4941176; C2H3CL3;

CHEMICAL FAMILY:
Halogen compound, aliphatic

MOLECULAR FORMULA: C2-H3-CL3

MOLECULAR WEIGHT: 133.40

CERCLA RATINGS (SCALE 0-3): HEALTH=3 FIRE=1 REACTIVITY=0 PERSISTENCE=3
NFPA RATINGS (SCALE 0-4): HEALTH=2 FIRE=1 REACTIVITY=0

COMPONENTS AND CONTAMINANTS

COMPONENT: 1,1,1-TRICHLOROETHANE — PERCENT: 96.50
CAS# 71-55-6

COMPONENT: 1,4-DIOXANE — PERCENT: 2.5
CAS# 123-91-1

COMPONENT: 1,2-BUTYLENE OXIDE — PERCENT: 0.47
CAS# 106-88-7

COMPONENT: NITROMETHANE — PERCENT: 0.34
CAS# 75-52-5

OTHER CONTAMINANTS: NONE.

EXPOSURE LIMITS:
METHYL CHLOROFORM (1,1,1-TRICHLOROETHANE):
350 ppm (1910 mg/m3) OSHA TWA; 450 ppm (2460 mg/m3) OSHA STEL
350 ppm (1910 mg/m3) ACGIH TWA; 450 ppm (2460 mg/m3) ACGIH STEL
350 ppm (1910 mg/m3) NIOSH recommended 15 minute ceiling

200 ppm (1080 mg/m3) DFG MAK TWA:
1000 ppm (5400 mg/m3) DFG MAK 30 minute peak. average value. 2 times/shift

Measurement method: Charcoal tube; carbon disulfide; gas chromatography with flame ionization detection; (NIOSH Vol. III # 1003, Halogenated Hydrocarbons).

1000 pounds CERCLA Section 103 Reportable Quantity
Subject to SARA Section 313 Annual Toxic Chemical Release Reporting

1,4-DIOXANE:
25 ppm (90 mg/m3) OSHA TWA (skin)
25 ppm (90 mg/m3) ACGIH TWA (skin)
1 ppm (3.6 mg/m3) NIOSH recommended 30 minute ceiling
50 ppm (180 mg/m3) DFG MAK TWA (skin);
100 ppm (360 mg/m3) DFG MAK 30 minute peak. average value. 4 times/shift

Measurement method: Charcoal tube: carbon disulfide: gas chromatography with flame ionization detection; (NIOSH Vol. III # 1602).

100 pound CERCLA Section 103 Reportable Quantity
Subject to SARA Section 313 Annual Toxic Chemical Release Reporting
Subject to California Proposition 65 cancer and/or reproductive toxicity warning and release requirements- (January 1, 1988)

*WARNING: This product contains a chemical(S) known to the state of California to cause cancer, or birth defects or other reproductive harm.

OSHA revoked the final rule limits of January 19, 1989 in response to the 11th Circuit Court of Appeals decision (AFL-CIO v. OSHA) effective June 30, 1992. See 29 CFR 1910.1000 (58 FR 35338)

PHYSICAL DATA

DESCRIPTION: Colorless liquid with a mild chloroform-like odor.

BOILING POINT: 165 F (74 C) MELTING POINT: -36 F (-32 C)

SPECIFIC GRAVITY: 1.32 VAPOR PRESSURE: 100 mmHg @ 20 C

EVAPORATION RATE: (carbon tetrachloride=1) 1 SOLUBILITY IN WATER: 0.09%

ODOR THRESHOLD: 100 ppm VAPOR DENSITY: 4.55

SOLVENT SOLUBILITY: Acetone. benzene. methanol. ether. carbon tetrachloride carbon disulfide, N-heptane, ethanol, chloroform

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FIRE AND EXPLOSION DATA

FIRE AND EXPLOSION HAZARD:
Slight fire hazard when exposed to heat or flame.

This material is nearly nonflammable. High energy, such as an electric arc. is needed for ignition, and the flame tends to go out when the ignition source is removed.

FLASH POINT: not available UPPER EXPLOSIVE LIMIT: 12.5%

LOWER EXPLOSIVE LIMIT: 7.5% AUTOIGNITION TEMP.: 932 F (500 C)

.REFIGHTING MEDIA:
Dry chemical or carbon dioxide
(1990 Emergency Response Guidebook, DOT P 5800.5).

For larger fires, use water spray, fog or regular foam
(1990 Emergency Response Guidebook, DOT P 5800.5).

FIREFIGHTING:
Apply cooling water to sides of containers that are exposed to flames until well after fire is out. Stay away from ends of tanks. Isolate for 1/2 mile in all directions if tank, rail car or tank truck is involved in fire (1990 Emergency Response Guidebook, DOT P 5800.5, Guide Page 74).

Extinguish using agents for surrounding fire. Cool fire-exposed containers with flooding amounts of water applied from as far a distance as possible. Do not allow run-off water into sewers and water sources. Avoid breathing vapors.

TRANSPORTATION DATA

DEPARTMENT OF TRANSPORTATION HAZARD CLASSIFICATION 49-CFR 172.101:
ORM-A

Department of Transportation labeling requirements 49-CFR 172.101 and SUBPART E:
None

DEPARTMENT OF TRANSPORTATION PACKAGING REQUIREMENTS: 49-CFR 173.605
EXCEPTIONS: 49-CFR 173.505

...Final rule on hazardous materials regulations (HMR, 49 CFR parts 171-180), docket numbers HM-181, HM-181a, HM-181b, HM-181c, HM-181d and HM-204. Effective date October 1, 1991. However, compliance with the regulations is authorized on and after January 1, 1991. (55 FR 52402, 12/21/90)

Except for explosives, inhalation hazards, and infectious substances, the effective date for hazard communication requirements is extended to October 1, 1993. (56 FR 47158, 09/18/91)

U.S. DEPARTMENT OF TRANSPORTATION SHIPPING NAME-ID NUMBER, 49 CFR 172.101:
1,1,1-trichloroethane-UN 2831

U.S. DEPARTMENT OF TRANSPORTATION HAZARD CLASS OR DIVISION, 49 CFR 172.101:
6.1 - Poisonous materials

U.S. DEPARTMENT OF TRANSPORTATION PACKING GROUP, 49 CFR 172.101:
PG III

U.S. DEPARTMENT OF TRANSPORTATION LABELING REQUIREMENTS, 49 CFR 172.101 AND SUBPART E:
Keep away from food

. DEPARTMENT OF TRANSPORTATION PACKAGING AUTHORIZATIONS:

EXCEPTIONS: 49 CFR 173.153
NON-BULK PACKAGING: 49 CFR 173.203
BULK PACKAGING: 49 CFR 173.241

U.S. DEPARTMENT OF TRANSPORTATION QUANTITY LIMITATIONS 49 CFR 172.101:
PASSENGER AIRCRAFT OR RAILCAR: 60 l
CARGO AIRCRAFT ONLY: 220 l

TOXICITY

METHYL CHLOROFORM (1,1,1-TRICHLOROETHANE):
IRRITATION DATA: 450 ppm/8 hours eye-man: 5 gm/12 days intermittent skin-rabbit mild: 20 mg/24 hours skin-rabbit moderate; 100 mg eye-rabbit mild: 2 mg/24 hours eye-rabbit severe.
TOXICITY DATA: 350 ppm inhalation-man TCLo; 200 ppm/4 hours inhalation-man TCLo: 920 ppm/70 minutes inhalation-human TCLo: 18000 ppm/4 hours inhalation-rat LC50; 10000 ppm/1 hour/13 weeks intermittent inhalation-rat TCLo: 3911 ppm/2 hours inhalation-mouse LC50: 1000 ppm/1 hour/13 weeks intermittent inhalation-guinea pig; 24400 mg/m3 inhalation-cat LC50; 15800 mg/kg skin-rabbit LD50 (EPA-600/8-82-003f. 1084): >5 gm/kg skin-rabbit LD50; 670 mg/kg oral-human TDLo; 10300 mg/kg oral-rat LD50; 11240 mg/kg oral-mouse LD50: 5660 mg/kg oral-rabbit LD50: 9470 mg/kg oral-guinea pig LD50; 750 mg/kg oral-dog LD50; 16 gm/kg subcutaneous-mouse LD50: 500 mg/kg subcutaneous-rabbit LDLo; 95 mg/kg intravenous-dog LDLo; 3593 mg/kg intraperitoneal-rat LD50: 3636 mg/kg intraperitoneal-mouse LD50: 3100 mg/kg intraperitoneal-dog LD50; mutagenic data (RTECS); reproductive effects data (RTECS).
CARCINOGEN STATUS: Animal Inadequate Evidence (IARC Group-3).
LOCAL EFFECTS: Irritant- inhalation, skin, eye.
ACUTE TOXICITY LEVEL: Slightly toxic by inhalation. dermal absorption and ingestion.
TARGET EFFECTS: Central nervous system depressant. Poisoning may also affect the heart, liver and kidneys.
AT INCREASED RISK FROM EXPOSURE: Persons with pre-existing skin disorders or liver, kidney, or cardiovascular disease.
ADDITIONAL DATA: Alcohol may enhance the toxic effects. Stimulants such as epinephrine may induce ventricular fibrillation.

1,4-DIOXANE:
IRRITATION DATA: 515 mg open skin-rabbit mild: 300 ppm/15 minutes eye-human: 100 mg eye-rabbit severe; 100 mg/24 hours eye-rabbit moderate; 10 mg eye-guinea pig moderate.
TOXICITY DATA: 470 ppm inhalation-human TCLo; 5500 ppm/1 minute inhalation-human TCLo: 470 ppm/3 days inhalation-human LCLo: 46 gm/m3/2 hours inhalation-rat LC50; 37 gm/m3/2 hours inhalation-mouse LC50; 44 gm/m3/7 hours inhalation-cat LCLo: 20500 mg/m3 inhalation-mammal LC50: 6000 ppm/4 hours/2 weeks-intermittent inhalation-rat TCLo: 7600 mg/kg skin-rabbit LD50; 2 gm/kg oral-rabbit LD50; 5700 mg/kg oral-mouse LD50; 2 gm/kg oral-cat LD50: 3150 mg/kg oral-guinea pig LD50: 1500 mg/kg intravenous-rabbit LDLo; 1500 mg/kg intravenous-cat LDLo; 790 mg/kg intraperitoneal-mouse LD50: 799 mg/kg intraperitoneal-rat LD50: mutagenic data (RTECS); reproductive effects data (RTECS); tumorigenic data (RTECS).
CARCINOGEN STATUS: Anticipated Human Carcinogen (NTP): Human Inadequate Evidence, Animal Sufficient Evidence (IARC Group-2B). Oral administration produced adenomas and carcinomas in the liver and carcinomas of the nasal cavity in rats and hematomas and carcinomas of the gall bladder in guinea pigs.

LOCAL EFFECTS: Irritant- inhalation, skin, eyes.
ACUTE TOXICITY LEVEL: Moderately toxic by inhalation: slightly toxic by dermal absorption and ingestion.
TARGET EFFECTS: Hepatotoxin: central nervous system depressant: nephrotoxin. Poisoning may affect the brain.
AT INCREASED RISK FROM EXPOSURE: Persons with pre-existing liver, kidney, pulmonary or skin disorders.
ADDITIONAL DATA: Alcohol may enhance the toxic effects.

HEALTH EFFECTS AND FIRST AID

INHALATION:
METHYL CHLOROFORM (1,1,1-TRICHLOROETHANE):
IRRITANT/NARCOTIC. 1000 ppm Immediately Dangerous to Life or Health.
ACUTE EXPOSURE- Exposure to 500 ppm for 60 minutes should cause no effect except for a distinctive odor while 900-1000 ppm for 20 minutes may cause mild respiratory tract irritation and prompt but minimal impairment of equilibrium which may be accompanied by headache, lassitude and ataxia. Impaired performance of behavioral tests was also reported at 1000 ppm. Higher levels of 2000-5000 ppm may cause incoordination, anesthesia, euphoria, loss of consciousness, coma and death due to central nervous system depression, respiratory arrest, or cardiac arrythmia. Cardiac sensitization may be a contributing factor. Other effects may include nausea, vomiting, diarrhea, drowsiness, convulsions, fall of blood pressure, liver and kidney damage, bradycardia and blood clotting changes.
CHRONIC EXPOSURE- No adverse effects related to exposure were reported in volunteers exposed to 500 ppm for 7 hours a day for 5 days, or in workers exposed to 200 ppm for several months to 6 years. There is some evidence from human case reports that repeated exposure to high concentrations may cause lasting damage to the heart. Exposure of animals for 3 months at concentrations from 1000 to 10,000 ppm caused symptoms of central nervous system depression and some pathological changes in the livers and lungs of some species. Reproductive effects have been reported in animals.

1,4-DIOXANE:
IRRITANT/NARCOTIC/HEPATOTOXIN/NEPHROTOXIN.
ACUTE EXPOSURE- May be irritating to the nose, throat and respiratory tract at 220 ppm. This compound has poor warning properties and can be inhaled in amounts that may cause serious systemic injury. Symptoms of systemic toxicity may include headache, vertigo, drowsiness, dyspnea, nausea, and vomiting. Inhalation caused increased salivation, lacrimation, narcosis, behavioral changes, and death in animals. Autopsy revealed lung, liver and kidney damage, congestion and edema of the lungs, and increased blood counts.
CHRONIC EXPOSURE- Repeated exposure caused mucous membrane irritation, dyspnea, headache, vertigo, loss of appetite, nausea and vomiting, pain and tenderness in the abdomen and lumbar region, drowsiness, malaise, liver enlargement and damage, oliguria, anuria, uremia, coma, and death from acute renal failure. Autopsies revealed lung and brain congestion, central nervous system damage, liver necrosis, hemorrhagic nephritis and necrosis, leukocytosis, and bronchopneumonia.

FIRST AID- Remove from exposure area to fresh air immediately. If breathing has stopped, perform artificial respiration. Keep person warm and at rest. Do not give epinephrine or other stimulants that may cause ventricular arrhythmias. (Dreisbach, Handbook of Poisoning, 11th Ed.). Get medical

attention immediately.

SKIN CONTACT:
METHYL CHLOROFORM (1,1,1-TRICHLOROETHANE):
IRRITANT.
ACUTE EXPOSURE- Direct contact may cause irritation and redness. Vapors are poorly absorbed, but the liquid, especially if confined under an impermeable barrier may be absorbed to some extent. This alone is unlikely to result in toxic effects, but may add to the effects of inhalation exposure.
CHRONIC EXPOSURE- Repeated skin contact may produce a dry, scaly, fissured dermatitis due to the defatting properties of the liquid, and possibly burns.

1,4-DIOXANE:
IRRITANT/NARCOTIC/HEPATOTOXIN/NEPHROTOXIN.
ACUTE EXPOSURE- May cause irritation with redness and pain. Allergic contact dermatitis has been reported. Skin absorption may occur and cause headache, nausea and vomiting. Skin absorption produced signs of unsteadiness, incoordination, narcosis, erythema, and liver and kidney damage in animals.
CHRONIC EXPOSURE- Prolonged or repeated contact may cause drying and cracking of the skin, dermatitis, and eczema. Skin absorption may have contributed to the death of a worker following skin and inhalation exposure for one week. Animal studies indicate repeated skin application may result in liver and kidney damage. Tumor promoter activity has been reported in mice.

FIRST AID- Remove contaminated clothing and shoes immediately. Wash affected area with soap or mild detergent and large amounts of water until no evidence of chemical remains (approximately 15-20 minutes). Get medical attention immediately.

EYE CONTACT:
METHYL CHLOROFORM (1,1,1-TRICHLOROETHANE):
IRRITANT.
ACUTE EXPOSURE- Exposure to 500 ppm may cause irritation and redness. Direct contact with the liquid may cause temporary injury with complete recovery expected in 48 hours. Direct application to the eyes of rabbits has caused conjunctival irritation, but no corneal damage.
CHRONIC EXPOSURE- Repeated or prolonged contact may cause conjunctivitis.

1,4-DIOXANE:
IRRITANT.
ACUTE EXPOSURE- Vapors may cause irritation at concentrations above 220 ppm. No serious disturbances have been reported by external contact. Direct application to rabbit eyes caused transient corneal injury.
CHRONIC EXPOSURE- Repeated or prolonged exposure may result in conjunctivitis.

FIRST AID- Wash eyes immediately with large amounts of water or normal saline, occasionally lifting upper and lower lids, until no evidence of chemical remains (approximately 15-20 minutes). Get medical attention immediately.

INGESTION:
METHYL CHLOROFORM (1,1,1-TRICHLOROETHANE):
NARCOTIC.

ACUTE EXPOSURE- May cause nausea, vomiting, diarrhea, gastrointestinal disturbances and abdominal pain followed by central nervous system depression with headache, dizziness, weakness, incoordination, mental confusion and unconsciousness. Death may occur from chronic respiratory failure. Other symptoms as described in acute inhalation may also occur. Myocardial sensitization to epinephrine and subsequent death due to cardiac arrest may occur. Aspiration may result in pulmonary edema or chemical pneumonitis.
CHRONIC EXPOSURE- Reproductive effects have been reported in animals.

1,4-DIOXANE:
NARCOTIC/HEPATOTOXIN/NEPHROTOXIN/CARCINOGEN.
ACUTE EXPOSURE- May cause light burning sensation on contact with oral mucous membranes. Large doses resulted in weakness, incoordination, depression, coma and death in animals. Autopsy revealed hemorrhagic areas in the pyloric region of the stomach, bladders distended with urine, slight proteinuria and enlarged kidneys. Aspiration may result in pneumonia.
CHRONIC EXPOSURE- In animal feeding studies, this compound produced liver and kidney degeneration and necrosis, ulceration of the stomach, hepatomas, carcinoma of the nasal cavity, carcinoma of the kidney pelvis, leukemia, lymphosarcoma, cholangiomas, gall bladder carcinomas, and tumors of the lung. Reproductive effects have been reported in animals.

FIRST AID- Treat symptomatically and supportively. Get medical attention and advice on whether to use gastric lavage. Extreme care must be taken to prevent aspiration. A cuffed endotracheal tube used by qualified medical personnel might be advisable. Keep head lower than hips to prevent aspiration should vomiting occur.

ANTIDOTE:
No specific antidote. Treat symptomatically and supportively.

REACTIVITY

REACTIVITY:
Slowly decomposes over time yielding hydrogen chloride. An inhibitor may be added to scavenge the acid that is formed and prevent corrosion to metals. Water may react with the inhibitor and allow the natural decomposition to occur.

INCOMPATIBILITIES:
METHYL CHLOROFORM (1,1,1-TRICHLOROETHANE):
ACETONE: Exothermic reaction.
ALKALI (STRONG): Possible violent reaction.
ALUMINUM AND ALLOYS: May decompose violently.
BARIUM: Fire and explosion hazard.
MAGNESIUM: Violent decomposition with evolution of hydrogen chloride.
METALS (POWDERED): Fire and explosion hazard.
NITROGEN TETROXIDE: Forms explosive mixture.
OXIDIZERS (STRONG): Possible violent reaction.
OXYGEN (GAS): Possible explosion when heated @ 100 C.
OXYGEN (LIQUID): Possible violent explosion.
POTASH: Forms flammable or explosive product.
POTASSIUM AND ALLOYS: Forms shock-sensitive mixture.
POTASSIUM HYDROXIDE: Formation of spontaneously flammable product.

RUBBER, PLASTICS, COATINGS: May be attacked.
SODIUM AND ALLOYS: Fire and explosion hazard.
SODIUM HYDROXIDE: Forms spontaneously flammable product.
SODIUM-POTASSIUM ALLOY: Possible explosion.
TIN AND ALLOYS: Incompatible.
ZINC AND ALLOYS: Incompatible.

1,4-DIOXANE:
DECABORANE: Forms shock-sensitive mixture.
NICKEL (RANEY CATALYST): Possible explosive reaction above 210 C.
NITRIC ACID + PERCHLORIC ACID: Possible explosive reaction.
OXIDIZERS (STRONG): Fire and explosion hazard.
SILVER PERCHLORATE: May form explosive compound.
SULFUR TRIOXIDE: Violent decomposition on storage.
TRIETHYNYLALUMINUM: May explode when heated.
See also ethers.

ETHERS:
BORON TRIIODIDE: Vigorous reaction.

DECOMPOSITION:
Thermal decomposition products may include toxic and corrosive fumes of chlorides, toxic fumes of phosgene and chloroacetylenes, and oxides of carbon.

POLYMERIZATION:
Hazardous polymerization has not been reported to occur under normal temperatures and pressures.

STORAGE AND DISPOSAL

Observe all federal, state and local regulations when storing or disposing of this substance.

Storage

Store in a cool, dry, well-ventilated location (NFPA 49, hazardous chemicals data, 1991).

Store away from incompatible substances.

Disposal

Disposal must be in accordance with standards applicable to generators of hazardous waste, 40CFR 262. EPA Hazardous Waste Number U226.

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CONDITIONS TO AVOID

May burn but does not ignite readily. Avoid contact with strong oxidizers, excessive heat, sparks, or open flame.

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SPILL AND LEAK PROCEDURES

SOIL SPILL:
Dig a pit, pond, lagoon or holding area to contain liquid or solid material. Dike surface flow using soil, sandbags, foamed polyurethane or foamed concrete. Absorb bulk liquid with fly ash or cement powder.

WATER SPILL:
Natural barriers or oil spill control booms should be used to limit spill travel.
Natural deep water pockets, excavated lagoons, or sand bag barriers should be used to trap material at bottom.
Suction hoses should be used to remove trapped material.

The California Safe Drinking Water and Toxic Enforcement Act of 1986 (Proposition 65) prohibits contaminating any known source of drinking water with substances known to cause cancer and/or reproductive toxicity.

OCCUPATIONAL SPILL:
Shut off ignition sources. Stop leak if you can do it without risk. For small liquid spills, take up with sand, earth or other absorbent material. For larger spills, dike far ahead of spill for later disposal. No smoking, flames or flares in hazard area! Keep unnecessary people away.

Repartable Quantity (RQ): 1000 pounds
The Superfund Amendments and Reauthorization Act (SARA) Section 304 requires that a release equal to or greater than the reportable quantity for this substance be immediately reported to the local emergency planning committee and the state emergency response commission (40 CFR 355.40). If the release of this substance is reportable under CERCLA Section 103, the National Response Center must be notified immediately at (800) 424-8802 or (202) 426-2675 in the metropolitan Washington, D.C. area (40 CFR 302.6).

PROTECTIVE EQUIPMENT

VENTILATION:
Provide local exhaust or process enclosure ventilation to meet the published exposure limits. Ventilation equipment should be explosion-proof if explosive concentrations of dust, vapor or fume are present.

RESPIRATOR:
The following respirators and maximum use concentrations are recommendations by the U.S. Department of Health and Human Services, NIOSH Pocket Guide to Chemical Hazards: NIOSH criteria documents or by the U.S. Department of Labor, 29 CFR 1910 Subpart Z.
The specific respirator selected must be based on contamination levels found in the work place, must not exceed the working limits of the respirator and be jointly approved by the National Institute for Occupational Safety and Health and the Mine Safety and Health Administration (NIOSH-MSHA).

METHYL CHLOROFORM (1,1,1-TRICHLOROETHANE):

1000 ppm- Any supplied-air respirator.
Any self-contained breathing apparatus.

Escape- Any air-purifying, full-facepiece respirator (gas mask) with a

chin-style, front or back-mounted organic vapor canister.
Any appropriate escape-type, self-contained breathing apparatus.

FG. FIREFIGHTING AND OTHER IMMEDIATELY DANGEROUS TO LIFE OR HEALTH CONDITIONS:

Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode.

Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained breathing apparatus operated in pressure-demand or other positive-pressure mode.

CLOTHING:
Employee must wear appropriate protective (impervious) clothing and equipment to prevent repeated or prolonged skin contact with this substance.

GLOVES:
Employee must wear appropriate protective gloves to prevent contact with this substance.

EYE PROTECTION:
Employee must wear splash-proof or dust-resistant safety goggles to prevent eye contact with this substance.

Emergency eye wash: Where there is any possibility that an employee's eyes may be exposed to this substance, the employer should provide an eye wash fountain within the immediate work area for emergency use.

AUTHORIZED - FISHER SCIENTIFIC, INC.
CREATION DATE: 10/25/84 REVISION DATE: 12/23/93

-ADDITIONAL INFORMATION-

THIS INFORMATION IS BELIEVED TO BE ACCURATE AND REPRESENTS THE BEST INFORMATION CURRENTLY AVAILABLE TO US. HOWEVER, WE MAKE NO WARRANTY OF MERCHANTABILITY OR ANY OTHER WARRANTY, EXPRESS OR IMPLIED, WITH RESPECT TO SUCH INFORMATION, AND WE ASSUME NO LIABILITY RESULTING FROM ITS USE. USERS SHOULD MAKE THEIR OWN INVESTIGATIONS TO DETERMINE THE SUITABILITY OF THE INFORMATION FOR THEIR PARTICULAR PURPOSES.

MATERIAL SAFETY DATA SHEET

CIBA-GEIGY CORPORATION ADDITIVES DIVISION SEVEN SKYLINE DRIVE HAWTHORNE, NEW YORK 10532 (914) 785-2000	EMERGENCY PHONE NUMBER: (800) 888-8372

SECTION I-IDENTITY INFORMATION

IDENTITY (TRADENAME): IRGACURE 500

FAMILY/CHEMICAL NAME:
BENZOPHENONE, CAS REG. NO. 119-61-9
1-HYDROXYCYCLOHEXYL PHENYL KETONE (IRGACURE 184),
CAS REG. NO. 947-19-3, 1:1 BLEND

PRODUCT TYPE:
PHOTOCURING AGENT

IMPORTANT:

* *
* THIS MATERIAL IS NOT INTENDED FOR USE IN PRODUCTS FOR WHICH PROLONGED CONTACT WITH MUCOUS MEMBRANES OR ABRADED SKIN, OR IMPLANTATION WITHIN THE HUMAN BODY, IS SPECIFICALLY INTENDED, UNLESS THE FINISHED PRODUCT HAS BEEN TESTED IN ACCORDANCE WITH THE FOOD AND DRUG ADMINISTRATION AND/OR OTHER APPLICABLE SAFETY TESTING REQUIREMENTS. BECAUSE OF THE WIDE RANGE OF SUCH POTENTIAL USES, CIBA-GEIGY CORPORATION IS NOT ABLE TO RECOMMEND THIS MATERIAL AS SAFE AND EFFECTIVE FOR SUCH USES AND ASSUMES NO LIABILITY FOR ANY SUCH USES. *
* *

THE ABOVE DISCLAIMER HAS BEEN REVISED.

HAZARD STATEMENT :

* *
* THIS MATERIAL SAFETY DATA SHEET (MSDS) HAS BEEN PREPARED IN COMPLIANCE WITH THE FEDERAL OSHA HAZARD COMMUNICATION STANDARD 29 CFR 1910.1200.
THIS PRODUCT IS NOT CONSIDERED TO BE A HAZARDOUS CHEMICAL UNDER THAT STANDARD. *
* *

SECTION II-HAZARDOUS INGREDIENTS

NONE KNOWN

SECTION III-PHYSICAL DATA

APPEARANCE:
AMBER LIQUID.
ODOR:
NO DISCERNABLE ODOR.
BOILING POINT:
NOT DETERMINED.
MELTING POINT:
<0C
DECOMPOSITION TEMPERATURE:
>300C
EVAPORATION RATE:
NOT APPLICABLE.
PERCENT VOLATILE:
NEGLIGIBLE
VAPOR DENSITY:
NOT APPLICABLE.
VAPOR PRESSURE:
NOT DETERMINED.
SOLUBILITY IN WATER:
AT 20C, INSOLUBLE
PH:
NOT APPLICABLE.
SPECIFIC GRAVITY:
1.111 (H2O = 1)
VISCOSITY:
90 MPA.S AT 20C

SECTION IV-FIRE AND EXPLOSION HAZARD DATA

FLASH POINT:
320F (MARCUSSON)
FLAMMABLE LIMITS IN AIR-LOWER:
NOT DETERMINED.
FLAMMABLE LIMITS IN AIR-UPPER:
NOT DETERMINED.
NFPA CODE:
NONE.
EXTINGUISHING MEDIA:
CARBON DIOXIDE, FOAM, DRY CHEMICAL, WATER SPRAY.
FIRE FIGHTING PROCEDURES-SPECIAL:
USE SELF-CONTAINED BREATHING APPARATUS.
UNUSUAL FIRE AND EXPLOSION HAZARDS:
DECOMPOSITION AND COMBUSTION PRODUCTS MAY BE TOXIC.

SECTION V-REACTIVITY DATA

STABILITY:
STABLE.
CONDITIONS TO AVOID:
EXPOSURE TO UV LIGHT AND HEAT; STABLE UPON NORMAL DARK STORAGE.
INCOMPATIBILITY:
NONE KNOWN.
HAZARDOUS DECOMPOSITION PRODUCTS:
THERMAL DECOMPOSITION AND BURNING MAY PRODUCE CARBON MONOXIDE AND CARBON DIOXIDE.
HAZARDOUS POLYMERIZATION:
PRODUCT WILL NOT SELF-POLYMERIZE BUT AS A PHOTO-INITIATOR IT CAN INITIATE RAPID POLYMERIZATION OF ORGANIC MONOMERS AND OLIGOMERS UPON EXPOSURE TO LIGHT OR HEAT.

SECTION VI-HEALTH HAZARD DATA

PRIMARY ROUTES OF EXPOSURE:
DERMAL.
THRESHOLD LIMIT VALUE:
NONE ESTABLISHED.
ORAL LD50:
(RATS) 2360 MG/KG FOR IRGACURE 500.
DERMAL LD50:
(RATS) >5000 MG/KG FOR IRGACURE 184
SKIN IRRITATION:
(RABBITS) SLIGHT IRRITATION, WITH A DRAIZE SCORE OF 0.92/8.0 FOR IRGACURE 500.
THE BENZOPHENONE COMPONENT WAS FOUND TO BE NON-IRRITATING.
EYE IRRITATION:
(RABBITS) SLIGHT CONJUNCTIVAL IRRITATION FOR IRGACURE 500.
THE BENZOPHENONE COMPONENT WAS FOUND TO BE NON-IRRITATING.
SENSITIZATION:
IRGACURE 184 NOT A SENSITIZER IN THE MAXIMIZATION TEST
INHALATION LC50:
(RATS) >1.0 MG/L AIR FOR A 4-HOUR AEROSOL EXPOSURE AND A 14-DAY OBSERVATION PERIOD, WITH CA. 78% OF PARTICLES LESS THAN 7 MICRONS. NO ANIMALS DIED AT THIS CONCENTRATION (IRGACURE 184).
SIGNS AND SYMPTOMS OF EXPOSURE-ACUTE:
NO IDENTIFIED HEALTH EFFECTS.
SIGNS AND SYMPTOMS OF EXPOSURE-CHRONIC:
NO IDENTIFIED HEALTH EFFECTS.
MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE:
NONE KNOWN.
EMERGENCY AND FIRST AID PROCEDURES-EYES:
FLUSH EYES WITH WATER FOR AT LEAST 15 MINUTES.
GET MEDICAL ATTENTION.
EMERGENCY AND FIRST AID PROCEDURES-SKIN:
BLOT EXCESS WITH PAPER TOWELS OR A CLEAN CLOTH AND THEN

WASH WITH MILD SOAP AND WATER.
EMERGENCY AND FIRST AID PROCEDURES-INGESTION:
IF CONSCIOUS, GIVE LARGE QUANTITIES OF WATER. GET MEDICAL ATTENTION.
EMERGENCY AND FIRST AID PROCEDURES-INHALATION:
REMOVE TO FRESH AIR.
EMERGENCY AND FIRST AID PROCEDURES-OTHER:
WASH CONTAMINATED CLOTHING PRIOR TO REUSE.

SECTION VII-SPILL OR LEAK PROCEDURES

SPILL PROCEDURES:
ABSORB ONTO SAND OR OTHER ABSORBENT MATERIAL. SHOVEL INTO CLOSABLE CONTAINER FOR DISPOSAL. WEAR PROTECTIVE EQUIPMENT SPECIFIED BELOW. FLUSH RESIDUE WELL WITH DETERGENT SOLUTION.
WASTE DISPOSAL METHODS:
INCINERATE IN A CHEMICAL INCINERATOR EQUIPPED WITH AN AFTER-BURNER AND SCRUBBER. FOLLOW ALL FEDERAL, STATE AND LOCAL REGULATIONS.

SECTION VIII-SPECIAL PROTECTION INFORMATION

VENTILATION:
WORK IN WELL VENTILATED AREAS.
PROTECTIVE GLOVES:
WEAR IMPERVIOUS GLOVES AS A STANDARD HANDLING PROCEDURE.
EYE PROTECTION:
IN CASES WHERE THERE IS LIKELIHOOD OF EYE CONTACT, WEAR SPLASHPROOF GOGGLES.
RESPIRATORY PROTECTION:
NONE REQUIRED FOR NORMAL CONDITIONS.
OTHER PROTECTIVE EQUIPMENT:
WEAR COVERALLS.

SECTION IX-SPECIAL PRECAUTIONS

HMIS CODE:
HEALTH : 1 FIRE : 1 REACTIVITY : 0
HANDLING PRECAUTIONS:
IN ACCORDANCE WITH GOOD INDUSTRIAL PRACTICE, HANDLE WITH CARE AND AVOID UNNECESSARY PERSONAL CONTACT. AVOID CONTACT WITH EYES AND PROLONGED OR REPEATED SKIN CONTACT. AVOID CONTINUOUS OR REPETITIVE BREATHING OF MISTS OR VAPORS. USE ONLY WITH ADEQUATE VENTILATION. FOR INDUSTRIAL USE ONLY.
SHIPPING AND STORING PRECAUTIONS:
KEEP CONTAINER TIGHTLY CLOSED WHEN NOT IN USE AND DURING TRANSPORT.
PERSONAL HYGIENE:
WASH THOROUGHLY AFTER HANDLING.

SECTION X- REGULATORY INFORMATION

DOT PROPER SHIPPING NAME:
NOT REGULATED AS A HAZARDOUS MATERIAL BY THE U.S. DEPT. OF TRANSPORTATION (DOT) 49 CFR 172.101 HAZARDOUS MATERIALS TABLE.
DOT CLASS:
NONE.
DOT NUMBER:
NONE.
RCRA STATUS:
NOT A HAZARDOUS WASTE UNDER RCRA (40 CFR 261).
CERCLA STATUS:
NOT LISTED.
SARA/TITLE III - TOXIC CHEMICALS LIST:
THIS PRODUCT DOES NOT CONTAIN A TOXIC CHEMICAL FOR ROUTINE ANNUAL 'TOXIC CHEMICAL RELEASE REPORTING' UNDER SEC. 313 (40 CFR 372).
TSCA INVENTORY STATUS:
CHEMICAL COMPONENTS LISTED ON TSCA INVENTORY.
CALIFORNIA PROPOSITION 65:
THIS PRODUCT DOES NOT CONTAIN ANY CHEMICALS CURRENTLY ON THE CALIFORNIA LIST OF KNOWN CARCINOGENS AND REPRODUCTIVE TOXINS.
NEW JERSEY RIGHT-TO-KNOW LABELING INFORMATION:
THIS PRODUCT CONTAINS THE FOLLOWING :

CHEMICAL NAME : BENZOPHENONE
CAS NUMBER : 119-61-9

* * *

CHEMICAL NAME : 1-HYDROXYCYCLOHEXYL PHENYL KETONE
CAS NUMBER : 947-19-3

* * *

PENNSYLVANIA RIGHT-TO-KNOW ACT:
THE FOLLOWING IS REQUIRED COMPOSITION INFORMATION.

CHEMICAL NAME : METHANONE, DIPHENYL-
CAS NUMBER : 119-61-9
COMMON NAME : BENZOPHENONE; PHENYL KETONE; BENZOYLBENZENE
COMMENTS : NOT ON PENNSYLVANIA HAZARDOUS SUBSTANCE LIST.

* * *

CHEMICAL NAME : METHANONE, (1-HYDROXYCYCLOHEXYL)PHENYL-
CAS NUMBER : 947-19-3
COMMON NAME : 1-HYDROXYCYCLOHEXYL PHENYL KETONE; 1-BENZOYL-1-HYDROXYCYCLOHEXANE; 1-BENZOYL-1-CYCLOHEXANOL; IRGACURE 184
COMMENTS : NOT ON PENNSYLVANIA HAZARDOUS SUBSTANCE LIST.

* * *

ISSUE DATE: 07/30/91 REVISION: 12C
FOR FURTHER INFORMATION, PLEASE CONTACT: BRUCE SCHWEMMER

THE INFORMATION AND RECOMMENDATIONS CONTAINED HEREIN ARE BASED UPON DATA BELIEVED TO BE CORRECT. HOWEVER, NO GUARANTEE OR WARRANTY OF ANY KIND EXPRESSED OR IMPLIED IS MADE WITH RESPECT TO THE INFORMATION CONTAINED HEREIN.

ISP TECHNOLOGIES INC.

Telephone 201 628 4000
1361 Alps Road
Wayne, NJ 07470

Emergency Medical Information: 1 800 228 5635 Ext. 016
612 221 3999 Ext. 016
Transportation Emergency: CHEMTREC 1 800 424 9300

MATERIAL SAFETY DATA SHEET

GAFGARD 233

SECTION 01 - CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

DOMESTIC TRADE NAME: GAFGARD 233
EXPORT TRADE NAME: GAFGARD 233

CAS REGISTRY NO.: MIXTURE - -
CAS REGISTRY NAME: PENTAERYTHRITOL TRIACRYLATE [3524-68-3]/VINYLPYRROLIDONE [88-12-0]
SYNONYM: MIXTURE OF VINYLPYRROLIDONE AND PETA MONOMERS

SECTION 02 - COMPOSITION/INFORMATION ON HAZARDOUS INGREDIENTS

CAS REGISTRY NUMBER: 00000088-12-0
CAS REGISTRY NAME: 2-PYRROLIDINONE, 1-ETHENYL-
COMMON NAME: VINYLPYRROLIDONE
HAZARD%: 17.00 - 20.00
HAZARD REFERENCE:
ISP RECOMMENDED EXPOSURE LIMIT: 0.1 PPM (VAPOR).
HARMFUL BY ABSORPTION AND INHALATION;
SEVERE EYE IRRITANT. CAUSES CANCER IN
LABORATORY RATS (SEE SECTION 03).

SECTION 03 - HAZARDS IDENTIFICATION

-ACUTE TOXICITY-

ORAL TOXICITY:
RAT LD50: 1500 MG/KG (TESTING RUN ON VINYLPYRROLIDONE).

DERMAL TOXICITY:
RABBIT LD50: 560 MG/KG (TESTING RUN ON VINYLPYRROLIDONE).

INHALATION TOXICITY:
RAT LC50: 3.2 MG/L (TESTING RUN ON VINYLPYRROLIDONE).

SKIN IRRITATION:
RABBIT; MINIMAL IRRITANT (TESTING RUN ON VINYLPYRROLIDONE).

EYE IRRITATION:
RABBIT; SEVERE IRRITANT (TESTING RUN ON VINYLPYRROLIDONE).

SECTION 03 - HAZARDS IDENTIFICATION (CONT.)

SENSITIZER:
SENSITIZATION MAY OCCUR.

DOT CORROSIVE:
NO DATA FOUND

PRIMARY ROUTE(S) OF ENTRY: INHALATION /ABSORPTION / CONTACT

-SIGNS AND SYMPTOMS OF EXPOSURE-

SYMPTOMS OF INGESTION:
NO EFFECTS OF EXPOSURE EXPECTED.

SYMPTOMS OF INHALATION:
CAUSES IRRITATION OF MUCOUS MEMBRANES, NOSE, EYES AND THROAT.
COUGHING, DIFFICULTY IN BREATHING.

SYMPTOMS OF SKIN CONTACT:
CONTACT WILL CAUSE MODERATE TO SEVERE REDNESS AND SWELLING. ITCHING, TINGLING SENSATION, PAINFUL BURNING. ABSORPTION WILL CAUSE NAUSEA AND VOMITING, POSSIBLY LEADING TO CONVULSIONS.

SYMPTOMS OF EYE CONTACT:
CAUSES PAINFUL STINGING OR BURNING OF EYES AND LIDS, WATERING OF EYES, CONJUNCTIVITIS, OPAQUENESS OF CORNEA, POSSIBLY LEADING TO LOSS OF SIGHT.

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE:
NO DATA FOUND

-OTHER TOXICITY-

OTHER ACUTE TOXICITY:
PERORAL - RAT; IRRITANT TO MUCOUS MEMBRANE OF UPPER RESPIRATORY TRACT; NARCOTIC EFFECT; 100% DEATH IN 1-2 DAYS (TESTING RUN ON VINYLPYRROLIDONE).

SUB CHRONIC ORAL TOXICITY:
RAT; 13-WEEK GAVAGE; INCREASED LIVER WEIGHT AT 40 MG/KG (FEMALES) AND 60 MG/KG (MALES); LIVER DAMAGE AT 100 MG/KG IN BOTH SEXES (VINYLPYRROLIDONE).

SUB CHRONIC INHALATION TOXICITY:
SUBACUTE INHALATION CAUSED LIVER DAMAGE IN RATS AT 15 PPM (TESTING RUN ON VINYLPYRROLIDONE).

SUB CHRONIC MISCELLANEOUS TOXICITY:
NO DATA FOUND

AQUATIC TOXICITY:
NO DATA FOUND

SECTION 03 - HAZARDS IDENTIFICATION (CONT.)

TUMORIGENICITY:
RAT; 2-YEAR INHALATION; BENIGN AND MALIGNANT TUMORS OBSERVED IN NASAL MUCOSA OF BOTH SEXES AT 20 PPM AND IN MALES AT 10 PPM ; ONLY BENIGN WERE SEEN AT 10 PPM IN FEMALES AND 5 PPM IN BOTH SEXES; LIVER TUMORS AT 20 PPM AND LIVER DAMAGE AT 5 PPM IN BOTH SEXES (VINYLPYRROLIDONE).

MUTAGENICITY:
THE FOLLOWING TEST RESULTS BASED ON VINYLPYRROLIDONE:
PRIMARY RAT HEPATOCYTE UNSCHEDULED DNA SYNTHESIS ASSAY; 0.284-9.09 MICROLITER/ML; NEGATIVE.
IN VITRO TRANSFORMATION OF BALB/3T3 CELLS ASSAY; 0.5 MICROLITER/ML - 0.1 NANOLITER/ML; NEGATIVE.
MOUSE LYMPHOMA FORWARD MUTATION ASSAY; UP TO 5.0 MICROLITER/ML; NEGATIVE.
AMES ASSAY; NEGATIVE (ACTIVE & INACTIVE).

REPRODUCTIVE TOXICITY:
NO DATA FOUND

MISCELLANEOUS TOXICITY:
NO DATA FOUND

SECTION 04 - FIRST AID MEASURES

FIRST AID FOR INGESTION:
GENERAL PRECAUTIONARY MEASURES SUGGEST INDUCING VOMITING IMMEDIATELY BY GIVING TWO GLASSES OF WATER AND STICKING FINGER DOWN THROAT. NEVER GIVE ANYTHING BY MOUTH TO AN UNCONSCIOUS PERSON. CALL A PHYSICIAN.

FIRST AID FOR INHALATION:
REMOVE TO FRESH AIR. IF NOT BREATHING, GIVE ARTIFICIAL RESPIRATION, PREFERABLY MOUTH-TO-MOUTH. IF BREATHING IS DIFFICULT, GIVE OXYGEN. CALL A PHYSICIAN.

FIRST AID FOR SKIN CONTACT:
IMMEDIATELY FLUSH SKIN WITH PLENTY OF WATER FOR AT LEAST 15 MINUTES WHILE REMOVING CONTAMINATED CLOTHING AND SHOES. CALL A PHYSICIAN. WASH CLOTHING BEFORE REUSE. THOROUGHLY CLEAN SHOES BEFORE REUSE.

FIRST AID FOR EYE CONTACT:
IMMEDIATELY FLUSH EYES WITH PLENTY OF WATER FOR AT LEAST 15 MINUTES. CALL A PHYSICIAN.

SECTION 05 - FIREFIGHTING MEASURES

FLASH POINT: >200.00 DEG F (CC)
AUTOIGNITION TEMP: NO DATA FOUND
FLAMMABLE LIMITS: NO DATA FOUND
FIRE FIGHTING MEDIA: WATER SPRAY / FOAM / DRY CHEMICAL / CARBON DIOXIDE
SPECIAL FIRE FIGHTING PROCEDURES:
FIREFIGHTERS SHOULD WEAR SELF-CONTAINED BREATHING APPARATUS.
FIRE/EXPLOSION HAZARDS:
SMOKE MAY CONTAIN IRRITATING MONOMERS. MATERIALS IN CLOSED CONTAINERS MAY VIOLENTLY POLYMERIZE WHEN HOT. COOL EXPOSED CONTAINERS WITH WATER STREAM.
NFPA HAZARD CODES - HEALTH/FLAMMABILITY/REACTIVITY 3 1 1

HMIS HAZARD CODES - HEALTH/FLAMMABILITY/REACTIVITY 3 1 1

SECTION 06 - ACCIDENTAL RELEASE MEASURES

SPILL/LEAK CLEAN-UP PROCEDURES:
ABSORB WITH EARTH, SAND OR SIMILAR INERT MATERIAL AND DISPOSE OF WITH SOLID WASTE ACCORDING TO FEDERAL, STATE AND LOCAL REGULATIONS. FLUSH SPILL AREA WITH WATER.

EPA HAZARDOUS SUBSTANCE REPORTABLE QUANTITY: NOT LISTED

SECTION 07 - HANDLING AND STORAGE

PRECAUTIONARY MEASURES:
DO NOT GET IN EYES. AVOID CONTACT WITH SKIN AND CLOTHING.
WASH THOROUGHLY AFTER HANDLING. AVOID BREATHING VAPOR.
USE WITH ADEQUATE VENTILATION. KEEP CONTAINER CLOSED.

DISPOSAL METHOD:
DISPOSE OF WITH LIQUID WASTE ACCORDING TO FEDERAL, STATE AND LOCAL REGULATIONS.

RCRA CLASS: NOT REGULATED

SECTION 08 - EXPOSURE CONTROLS/PERSONAL PROTECTION

VENTILATION:
USE WITH ADEQUATE VENTILATION.

SECTION 08 - EXPOSURE CONTROLS/PERSONAL PROTECTION (CONT.)

RESPIRATORY PROTECTION:
NIOSH-APPROVED RESPIRATOR FOR ORGANIC VAPOR WHEN EXCESS VAPOR IS LIKELY IN BREATHING ZONE.

EYE PROTECTION:
CHEMICAL GOGGLES.

SKIN PROTECTION:
IMPERVIOUS GLOVES, RUBBER APRON, LONG-SLEEVED SHIRT.

PERSONAL HYGIENE:
WASH THOROUGHLY AFTER HANDLING.

PROTECTIVE MEASURES DURING REPAIR/MAINTENANCE OF EQUIPMENT:
WASH EQUIPMENT THOROUGHLY WITH STEAM OR WARM WATER UNTIL CLEAN. CHECK FOR FLAMMABLES WITH AN 'EXPLOSION METER' AND ALSO CHECK THE OXYGEN LEVEL WITH AN OXYGEN METER. IN ALL CASES, FOLLOW GOOD INDUSTRIAL SAFETY PRACTICES BEFORE ENTERING EQUIPMENT.

EXPOSURE LIMITS:
SEE SECTION 02 FOR COMPOSITION/INFORMATION ON HAZARDOUS INGREDIENTS.

SECTION 09 - PHYSICAL AND CHEMICAL PROPERTIES

BOILING POINT: >149.00 DEG C
VAPOR PRESSURE: NO DATA FOUND
VAPOR DENSITY (AIR=1): 1 GREATER THAN
WATER SOLUBILITY: PARTIALLY SOLUBLE
MELTING/FREEZING POINT: NO DATA FOUND
APPEARANCE: CLEAR AMBER LIQUID
SPECIFIC GRAV. (WATER=1): 1.15
PERCENTAGE VOLATILES: .06 % LESS THAN
EVAPORATION RATE: <1.00 (BUTYL ACETATE = 1)
pH OF SOLUTION: NO DATA FOUND
ODOR: IRRITATING ODOR

SECTION 10 - STABILITY AND REACTIVITY

STABILITY: UNSTABLE
HAZARDOUS POLYMERIZATION: MAY OCCUR
CONDITIONS TO AVOID:
TEMPERATURES ABOVE 85 DEG. F; EXPOSURE TO LIGHT, MOISTURE, OXIDIZING AGENTS, FREE RADICAL INITIATORS AND RUST.

SECTION 10 - STABILITY AND REACTIVITY (CONT.)

INCOMPATIBLE MATERIALS:
SUNLIGHT, MOISTURE, IRON, RUST, FREE RADICAL INITIATORS, STRONG BASES, OXIDIZING AGENTS.

HAZARDOUS DECOMPOSITION PRODUCTS:
CARBON MONOXIDE, CARBON DIOXIDE AND TOXIC FUMES OF NOx EMITTED WHEN HEATED TO DECOMPOSITION.

SECTION 11 - TRANSPORT INFORMATION

-DOMESTIC DATA-
DOT SHIPPING NAME: NOT REGULATED
DOT HAZARD CLASS: NOT REGULATED
HAZARDOUS INGREDIENT(S): NONE
UN NUMBER: NONE

-EXPORT DATA-
EXPORT SHIPPING NAME: NOT REGULATED
EXPORT HAZARD CLASS: NOT REGULATED
HAZARDOUS INGREDIENT(S): NONE
UN NUMBER: NONE

LIQUID AIR -- HYDROGEN CYANIDE
MATERIAL SAFETY DATA SHEET
FSC: 6810
NIIN: 00F002688
Manufacturer's CAGE: 18260
Part No. Indicator: A
Part Number/Trade Name: HYDROGEN CYANIDE

General Information

Company's Name: LIQUID AIR CORPORATION
Company's Emerg Ph #: (800) 231-1366
Record No. For Safety Entry: 001
Tot Safety Entries This Stk#: 001
Date MSDS Prepared: 01JAN87
Safety Data Review Date: 07MAR86
MSDS Serial Number: BBLMT

Ingredients/Identity Information

Proprietary: YES
Ingredient: PROPRIETARY
Ingredient Sequence Number: 01

Physical/Chemical Characteristics

Appearance And Odor: COLORLESS LIQUID W/A BITTER ALMOND ODOR.
Boiling Point: 78.3
Vapor Pressure (MM Hg/70 F): 12.
Vapor Density (Air=1): .071
Specific Gravity: .95
Solubility In Water: 224

Fire and Explosion Hazard Data

Flash Point: 0.4F CLOSED CUP
Lower Explosive Limit: 5.6%
Upper Explosive Limit: 40%
Extinguishing Media: WATER, CO2

Reactivity Data

Stability: YES
Cond To Avoid (Stability): PURE HCN SLOWLY POLYMERIZES TO AMMONIA.
Materials To Avoid: MOISTURE, CYANIDES, POTASSIUM OR BASES
Hazardous Decomp Products: AMMONIA
Hazardous Poly Occur: NO
Conditions To Avoid (Poly): ACIDS ADDED TO PURE HCN TO RETARD EXOTHERMIC
POLYMERIZATION.

Health Hazard Data

Signs/Symptoms Of Overexp: INHALATION: IRRITATION, CONFUSION, BREATHING.
Emergency/First Aid Proc: IF THE VICTIM IS UNCONSCIOUS, ASSISTED RESPIRATION SHOULD BE STARTED IMMEDIATELY ON CLEARING THE CONTAMINATED AREA.

Precautions for Safe Handling and Use

Steps If Matl Released/Spill: EVACUATE ALL PERSONNEL FROM AFFECTED AREA.
USE APPROPRIATE PROTECTIVE EQUIPMENT. IF AK IS IN USER'S EQUIPMENT, BE CERTAIN TO PURGE PIPING WITH AN INERT GAS IOR TO ATTEMPTING REPAIRS.
Waste Disposal Method: DON'T ATTEMPT TO DISPOSE OF RESIDUAL OR UNUSED QUANTITIES. RETURN IN THE SHIPPING CONTAINER PROPERLY LABELED, WITH ANY

VALVE OUTLET PLUGS OR CAPS SECURED AND VALVE PROTECTION CAP IN PLACE T
O
LIQUID AIR CORPORATION FOR PROPER DISPOSAL.
Precautions-Handling/Storing: PROTECT CYLINDERS FROM PHYSICAL DAMAGE.
STORE IN COOL, DRY, WELL-VENTILATED AREA OF NON-COMBUSBLE CONSTRUCTION
.
DON'T STORE ABOVE 130F.
Other Precautions: USE ONLY IN WELL-VENTILATED AREAS. VALVE PROTECTION
CAPS MUST REMAIN IN PLACE UNLESS CONTAINER IS SECURED WITH VALVE OUTLE
T
PED
TO USE POINT.

Control Measures

Respiratory Protection: POSITIVE PRESSURE AIR LINE WITH MASK/SCBA FOR
EMERGENCY USE.
Ventilation: HOOD WITH FORCED VENTILATION
Protective Gloves: RUBBER
Eye Protection: SAFETY GOGGLES OR GLASSES
)ther Protective Equipment: SAFETY SHOES/SHOWER.
Suppl. Safety & Health Data: ONE CALIFORNIA PLAZA, SUITE 350/2121 N.
CALIFORNIA BLVD/WALNUT CREEK, CALIFORNIA 94596. MOLECULAR WEIGHT: 27.0
18

Transportation Data

Disposal Data

Disposal Data Review Date: 88319
Rec # For This Disp Entry: 01
Tot Disp Entries Per NSN: 001
Landfill Ban Item: YES
Disposal Supplemental Data: ONE CALIFORNIA PLAZA, SUITE 350/2121 N.
CALIFORNIA BLVD/WALNUT CREEK, CALIFORNIA 94596. MOLECULAR WEIGHT: 27.0

18
IN
CASE OF ACCIDENTAL EXPOSURE OR DISCHARGE, CONSULT HEALTH AND SAFETY FI
LE
FOR PRECAUTIONS.
1st EPA Haz Wst Code New: P063
1st EPA Haz Wst Name New: HYDROGEN CYANIDE; HYDROCYANIC ACID
1st EPA Haz Wst Char New: ACUTELY TOXIC (H)
1st EPA Acute Hazard New: YES
2nd EPA Haz Wst Code New: D001
2nd EPA Haz Wst Name New: IGNITIBLE
2nd EPA Haz Wst Char New: IGNITABILITY
2nd EPA Acute Hazard New: NO

Label Data

Label Required: YES
Label Status: G
Common Name: HYDROGEN CYANIDE
Special Hazard Precautions: INHALATION: IRRITATION, CONFUSION, BREATHI
IG.
Label Name: LIQUID AIR CORPORATION
Label Emergency Number: (800) 231-1366

URL for this msds http://hazard.com. If you wish to change, add to, o
r
delete information in this archive please sent updates to dan@hazard.c
om.

MSDS for PHOSPHORUS TRICHLORIDE Page 1

1 - PRODUCT IDENTIFICATION

PRODUCT NAME: PHOSPHORUS TRICHLORIDE
FORMULA: PCL3
FORMULA WT: 137.33
CAS NO.: 07719-12-2
NIOSH/RTECS NO.: TH3675000
COMMON SYNONYMS: PHOSPHORUS(III)CHLORIDE; CHLORIDE OF PHOSPHORUS; P
IC-L
PRODUCT CODES: 9386,5407
EFFECTIVE: 10/24/86
REVISION #03

PRECAUTIONARY LABELLING

BAKER SAF-T-DATA(TM) SYSTEM

HEALTH	-	2	MODERATE
FLAMMABILITY	-	0	NONE
REACTIVITY	-	3	SEVERE (WATER REACTIVE)
CONTACT	-	3	SEVERE (CORROSIVE)

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

LABORATORY PROTECTIVE EQUIPMENT

GOGGLES & SHIELD; LAB COAT & APRON; VENT HOOD; PROPER GLOVES

PRECAUTIONARY LABEL STATEMENTS

DANGER
VAPOR EXTREMELY IRRITATING
HARMFUL IF SWALLOWED OR INHALED
CONTACT WITH WATER MAY CAUSE FIRE.
CAUSES BURNS - IRREVERSIBLE TISSUE DESTRUCTION TO EYES INCLUDIN
G
BLINDNESS.
KEEP FROM CONTACT WITH CLOTHING AND OTHER COMBUSTIBLE MATERIALS. DO N
OT
STORE NEAR COMBUSTIBLE MATERIALS. DO NOT GET IN EYES, ON SKIN, ON CLO

THING.
DO NOT BREATHE VAPOR. KEEP IN TIGHTLY CLOSED CONTAINER. USE WITH ADEQUATE VENTILATION. WASH THOROUGHLY AFTER HANDLING. DO NOT ADD WATER TO CONTENTS WHILE IN CONTAINER BECAUSE OF VIOLENT REACTION. IN CASE OF SPILL, SOAK UP WITH DRY SAND OR EARTH. DO NOT USE WATER.

SAF-T-DATA(TM) STORAGE COLOR CODE: WHITE STRIPE (STORE SEPARATELY)

---

2 - HAZARDOUS COMPONENTS

NO.	COMPONENT	%	CAS
12-2	PHOSPHORUS TRICHLORIDE	90-100	7719-

---

3 - PHYSICAL DATA

BOILING POINT: 76 C (169 F) VAPOR PRESSURE(MM HG): 100

MELTING POINT: -112 C (-170 F) VAPOR DENSITY(AIR=1): 4.75

SPECIFIC GRAVITY: 1.57 (H2O=1) EVAPORATION RATE: 1 (BUTYL ACETATE=1)

SOLUBILITY(H2O): DECOMPOSES % VOLATILES BY VOLUME: 100

APPEARANCE & ODOR: COLORLESS, CLEAR, FUMING LIQUID WITH PUNGENT ODOR.

---

4 - FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (OPEN CUP N/A NFPA 704M RATING: 3-0-2 W

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

FIRE EXTINGUISHING MEDIA
USE DRY CHEMICAL OR CARBON DIOXIDE. DO NOT USE WATER.

SPECIAL FIRE-FIGHTING PROCEDURES
FIREFIGHTERS SHOULD WEAR PROPER PROTECTIVE EQUIPMENT AND SELF-CONTAINED BREATHING APPARATUS WITH FULL FACEPIECE OPERATED IN POSITIVE PRESSURE MODE.
MOVE EXPOSED CONTAINERS FROM FIRE AREA, IF IT CAN BE DONE WITHOUT RISK.
DO NOT GET WATER INSIDE CONTAINERS.

UNUSUAL FIRE & EXPLOSION HAZARDS
A VIOLENT EXOTHERMIC REACTION OCCURS WITH WATER. SUFFICIENT HEAT MAY BE PRODUCED TO IGNITE COMBUSTIBLE MATERIALS.
CAN BE AN EXPLOSION HAZARD, ESPECIALLY WHEN HEATED.

TOXIC GASES PRODUCED
HYDROGEN CHLORIDE, PHOSPHORUS OXIDE

5 - HEALTH HAZARD DATA

THRESHOLD LIMIT VALUE (TLV/TWA): 1.5 MG/M3 (0.2 PPM)

SHORT-TERM EXPOSURE LIMIT (STEL): 3 MG/M3 (0.5 PPM)

PERMISSIBLE EXPOSURE LIMIT (PEL): 3 MG/M3 (0.5 PPM)

TOXICITY: LD50 (ORAL-RAT) (MG/KG) - 550
LC50 (INHL-RAT-4H) (PPM) - 104

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

EFFECTS OF OVEREXPOSURE
VAPORS MAY BE IRRITATING TO SKIN, EYES, AND MUCOUS MEMBRANES.
INHALATION OF VAPORS MAY CAUSE COUGHING AND DIFFICULT BREATHING.
□

INHALATION OF VAPORS MAY CAUSE PULMONARY EDEMA.
LIQUID MAY CAUSE BURNS TO SKIN AND EYES INCLUDING IRREVERSIBLE TISSUE
DESTRUCTION TO EYES INCLUDING BLINDNESS.
INGESTION MAY RESULT IN SEVERE INTESTINAL IRRITATION WITH BURNS TO MOUTH.

TARGET ORGANS
RESPIRATORY SYSTEM, EYES, SKIN

MEDICAL CONDITIONS GENERALLY AGGRAVATED BY EXPOSURE
NONE IDENTIFIED

ROUTES OF ENTRY
INHALATION, INGESTION, EYE CONTACT, SKIN CONTACT

EMERGENCY AND FIRST AID PROCEDURES
CALL A PHYSICIAN.
IF SWALLOWED, DO NOT INDUCE VOMITING; IF CONSCIOUS, GIVE LARGE AMOUNTS OF
WATER.
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 OR SKIN WITH PLENTY OF WATER FOR
AT LEAST 15 MINUTES WHILE REMOVING CONTAMINATED CLOTHING AND SHOES.
WASH CLOTHING BEFORE RE-USE.

---

6 - REACTIVITY DATA

STABILITY: STABLE HAZARDOUS POLYMERIZATION: WILL NOT OCCUR

CONDITIONS TO AVOID: MOISTURE

INCOMPATIBLES: WATER, STRONG ACIDS, ALKALI METALS, ORGANIC MATERIALS, FLUORINE, ALCOHOLS, CHEMICALLY ACTIVE METALS

DECOMPOSITION PRODUCTS: HYDROGEN CHLORIDE, OXIDES OF PHOSPHORUS

---

7 - SPILL AND DISPOSAL PROCEDURES

STEPS TO BE TAKEN IN THE EVENT OF A SPILL OR DISCHARGE
WEAR SELF-CONTAINED BREATHING APPARATUS AND FULL PROTECTIVE CLOTHING

STOP LEAK IF YOU CAN DO SO WITHOUT RISK. DO NOT USE WATER.
TAKE UP WITH SAND OR OTHER NON-COMBUSTIBLE ABSORBENT MATERIAL AND PLACE IN CONTAINER FOR LATER DISPOSAL. DO NOT FLUSH WITH WATER.

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

EPA HAZARDOUS WASTE NUMBER: D002, D003 (CORROSIVE, REACTIVE WASTE)

---

8 - 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 25 PPM, A CHEMICAL CARTRIDGE RESPIRATOR WITH AMMONIA/AMINE CARTRIDGE IS RECOMMENDED. ABOV

E

TUS

THIS LEVEL, A SELF-CONTAINED BREATHING APPARA

IS ADVISED.

EYE/SKIN PROTECTION: SAFETY GOGGLES AND FACE SHIELD, UNIFORM, PROTECTIVE SUIT, NEOPRENE GLOVES ARE RECOMMEN

DED.

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9 - STORAGE AND HANDLING PRECAUTIONS

SAF-T-DATA(TM) STORAGE COLOR CODE: WHITE STRIPE (STORE SEPARATELY)

SPECIAL PRECAUTIONS
KEEP CONTAINER TIGHTLY CLOSED. STORE AWAY FROM WATER OR LOCATIONS W
HERE
WATER MAY BE USED TO EXTINGUISH FIRE.
ISOLATE FROM INCOMPATIBLE MATERIALS.

---

10 - TRANSPORTATION DATA AND ADDITIONAL INFORMATION

DOMESTIC (D.O.T.)

PROPER SHIPPING NAME	PHOSPHORUS TRICHLORIDE, "POISON - INHALATION HAZARD"
HAZARD CLASS	CORROSIVE MATERIAL (LIQUID)
UN/NA	UN1809
LABELS	CORROSIVE, POISON
REPORTABLE QUANTITY	1000 LBS.

INTERNATIONAL (I.M.O.)

PROPER SHIPPING NAME	PHOSPHORUS TRICHLORIDE
HAZARD CLASS	8
UN/NA	UN1809
LABELS	CORROSIVE

MSDS for PHOSPHORUS PENTACHLORIDE Page 1

1 - PRODUCT IDENTIFICATION

PRODUCT NAME: PHOSPHORUS PENTACHLORIDE
FORMULA: PCL5
FORMULA WT: 208.24
CAS NO.: 10026-13-8
NIOSH/RTECS NO.: TB6125000
COMMON SYNONYMS: PHOSPHOROUS(V)CHLORIDE; PENTACHLOROPHOSPHORANE; PHOSPHOROUS
PERCHLORIDE
PRODUCT CODES: 9369
EFFECTIVE: 09/03/86
REVISION #02

PRECAUTIONARY LABELLING

BAKER SAF-T-DATA(TM) SYSTEM

HEALTH	-	2	MODERATE
FLAMMABILITY	-	1	SLIGHT
REACTIVITY	-	2	MODERATE
CONTACT	-	3	SEVERE (CORROSIVE)

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

LABORATORY PROTECTIVE EQUIPMENT

GOGGLES; LAB COAT; VENT HOOD; PROPER GLOVES

PRECAUTIONARY LABEL STATEMENTS

POISON DANGER
CAUSES BURNS
MAY BE FATAL IF SWALLOWED OR INHALED
CONTACT WITH WATER OR MOIST AIR LIBERATES TOXIC AND CORROSIVE FUMES.
DO NOT GET IN EYES, ON SKIN, ON CLOTHING.

DO NOT BREATHE DUST. KEEP IN TIGHTLY CLOSED CONTAINER. USE WITH ADEQUATE VENTILATION. WASH THOROUGHLY AFTER HANDLING. IN CASE OF FIR E,
DO NOT USE WATER. USE DRY SAND, EARTH OR SODA ASH. IN CASE OF SPILL, SWEEP UP AND CAREFULLY REMOVE.

SAF-T-DATA(TM) STORAGE COLOR CODE: WHITE STRIPE (STORE SEPARATELY)

---

2 - HAZARDOUS COMPONENTS

COMPONENT	%	CAS NO.
PHOSPHORUS PENTACHLORIDE	90-100	10026-13-8

---

3 - PHYSICAL DATA

BOILING POINT: N/A

VAPOR PRESSURE(MM HG): N/A

□

MELTING POINT: 162 C (324 F)

VAPOR DENSITY(AIR=1): 7.2

SPECIFIC GRAVITY: 3.60

(H2O=1)

EVAPORATION RATE: N/A

(BUTYL ACETATE=1)

SOLUBILITY(H2O): DECOMPOSES % VOLATILES BY VOLUME: N/A

APPEARANCE & ODOR: PALE YELLOW SOLID WITH AN ODOR LIKE HYDROCHLORIC ACID.

---

4 - FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (OPEN CUP N/A NFPA 704M RATING: 3-0-2

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

FIRE EXTINGUISHING MEDIA
USE DRY CHEMICAL OR CARBON DIOXIDE. DO NOT USE WATER.

SPECIAL FIRE-FIGHTING PROCEDURES
FIREFIGHTERS SHOULD WEAR PROPER PROTECTIVE EQUIPMENT AND SELF-CONTAIED
BREATHING APPARATUS WITH FULL FACEPIECE OPERATED IN POSITIVE PRESSURE
MODE.

UNUSUAL FIRE & EXPLOSION HAZARDS
A VIOLENT EXOTHERMIC REACTION OCCURS WITH WATER. SUFFICIENT HEAT MAY BE PRODUCED TO IGNITE COMBUSTIBLE MATERIALS.
SUBLIMES AT MELTING POINT.

TOXIC GASES PRODUCED
HYDROGEN CHLORIDE, PHOSPHORUS OXIDE

---

5 - HEALTH HAZARD DATA

THRESHOLD LIMIT VALUE (TLV/TWA): 1.0 MG/M3 (0.1 PPM)

PERMISSIBLE EXPOSURE LIMIT (PEL): 1 MG/M3 (PPM)

TOXICITY: LD50 (ORAL-RAT) (MG/KG) - 660
LC50 (INHAL-RAT) (MG/M3) - 205

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

EFFECTS OF OVEREXPOSURE
INHALATION AND INGESTION ARE HARMFUL AND MAY BE FATAL.
INHALATION OF DUST MAY CAUSE HEADACHE, COUGHING, DIFFICULTY IN BREATHING,
CHEST PAIN, SEVERE LUNG IRRITATION, OR PULMONARY EDEMA.
CONTACT WITH SKIN OR EYES MAY CAUSE SEVERE IRRITATION OR BURNS.
INGESTION MAY CAUSE NAUSEA, VOMITING, GASTROINTESTINAL IRRITATION, AND
BURNS TO MOUTH AND THROAT.

TARGET ORGANS
RESPIRATORY SYSTEM, EYES, SKIN
□

MEDICAL CONDITIONS GENERALLY AGGRAVATED BY EXPOSURE
NONE IDENTIFIED

ROUTES OF ENTRY
INHALATION, INGESTION, EYE CONTACT, SKIN CONTACT

EMERGENCY AND FIRST AID PROCEDURES
CALL A PHYSICIAN.
IF SWALLOWED, DO NOT INDUCE VOMITING; IF CONSCIOUS, GIVE WATER, MILK, OR
MILK OF MAGNESIA.
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 OR SKIN WITH PLENTY OF WATER FOR
AT LEAST 15 MINUTES.

---

6 - REACTIVITY DATA

STABILITY: STABLE HAZARDOUS POLYMERIZATION: WILL NOT OCCUR

CONDITIONS TO AVOID: MOISTURE, HEAT

INCOMPATIBLES: WATER, CHEMICALLY ACTIVE METALS, SODIUM METAL, POTASSIUM METAL, ALUMINUM, ALKALIES, FLUORINE, MAGNESIUM OXIDE, HYDROXYLAMINE, CHLORINE DIOXIDE, PHOSPHORUS OXIDES

DECOMPOSITION PRODUCTS: HYDROGEN CHLORIDE, OXIDES OF PHOSPHORUS

---

7 - SPILL AND DISPOSAL PROCEDURES

STEPS TO BE TAKEN IN THE EVENT OF A SPILL OR DISCHARGE
WEAR SELF-CONTAINED BREATHING APPARATUS AND FULL PROTECTIVE CLOTHING

WITH CLEAN SHOVEL, CAREFULLY PLACE MATERIAL INTO CLEAN, DRY CONTAINER AND
COVER; REMOVE FROM AREA. FLUSH SPILL AREA WITH WATER.
DO NOT GET WATER INSIDE CONTAINER.

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

EPA HAZARDOUS WASTE NUMBER: D002, D003 (CORROSIVE, REACTIVE WASTE)

---

8 - PROTECTIVE EQUIPMENT

VENTILATION: USE GENERAL OR LOCAL EXHAUST VENTILATION TO M
EET
TLV REQUIREMENTS.

□

RESPIRATORY PROTECTION: NONE REQUIRED WHERE ADEQUATE VENTILATION CONDITIONS EXIST. IF AIRBORNE CONCENTRATION EXCEEDS TLV, A SELF-CONTAINED BREATHING
APPARATUS
IS ADVISED.

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

---

9 - STORAGE AND HANDLING PRECAUTIONS

SAF-T-DATA(TM) STORAGE COLOR CODE: WHITE STRIPE (STORE SEPARATELY)

SPECIAL PRECAUTIONS
KEEP CONTAINER TIGHTLY CLOSED. STORE AWAY FROM WATER OR LOCATIONS
WHERE
WATER MAY BE USED TO EXTINGUISH FIRE.

---

10 - TRANSPORTATION DATA AND ADDITIONAL INFORMATION

DOMESTIC (D.O.T.)

PROPER SHIPPING NAME	PHOSPHOROUS PENTACHLORIDE, SOLID
HAZARD CLASS	CORROSIVE MATERIAL (SOLID)
UN/NA	UN1806
LABELS	CORROSIVE

INTERNATIONAL (I.M.O.)

PROPER SHIPPING NAME	PHOSPHORUS PENTACHLORIDE
HAZARD CLASS	8
UN/NA	UN1806
LABELS	CORROSIVE

Shipping and Receiving Records

SHIPPER

SF ?051-AE(1-83)

Sandia National Laboratories

1 [X] New Mexico [ ] California [ ] Other

TO: Typed or neatly printed

Tooele, UT

Gate Exit Time & Date 3	Highest Material Security Class. 4	Page 1 Of 1

Date to be Returned 5	Document No.	Shipping Code 6	Shipment Register No 7
[X] No Return	A 04750		

Due at Destination 8: 10-14-96 (Date) — [X] Firm (Premium transportation authorized) [ ] Flex (Most economical transportation)

Originator of Form 9	Org.	Phone	Date Prepared 10
Dwayne Smith	1000	4-9889	10-9-96

FROM:

Site 11	Bldg.	Room	Org.	Requester's E No. 12	Requester's Name (Write "Same" if also originator)	Org.	Phone	Case No. 13
10500	500	100	5302	5561	Same			9811-177

Material Billing 14	Freight Billing 15	Reason for Shipment 16	Authority for Shipment 17
[X] Charge [ ] No Charge	[X] Prepaid [ ] Collect *If collect, carrier & acct no. (if known)*	Project Needs	

Item No. 18	Sec. Class. 19	Quantity 20	Unit 21	Haz. Mat'l. 22	Property Tag No. And/Or MID No. 23	Description 24	Unit Value 25	$ Total 26
1	C	4	L	Yes	565110Z	Chemicals	10,000	40,000

HAZARDOUS MATERIAL MUST BE ... BY ...

Grand Total 27 $ 40,000

DOE Transportation Safeguards Div. Courier Required? 28 [X] YES [ ] NO

Service Clerk 29	Property Mgmt. Rep. 30

Date Shipped or Handcarried 31	Routing 32	B/L No. 33	No. of Boxes 34	Weight 35	Total Cubic Feet/Dimension 36

Authorizing Signature 37

Signature of manager above typed or printed name and Org.

I certify that the material being offered for shipment is nonhazardous unless noted as hazardous in block 22 and required information is being provided.

Special Approval 38 — Name / Org.

Special Approval — Name / Org.

39 Bearer's Signature

40 Receipt Acknowledged — Recipient's Signature/Company — Date

Contract or PEL/MEL Rep. 41 [ ] External Loan — Name / Org.

Ply 1:
Corporate File - Retained by the Traffic Organization after shipper is complete and items are ready for shipment.

The listed material and accompanying information has been examined and the hazardous material designations and all preparations for shipment are certified correct.
42 Hazardous Material Consultant

43 Packed by

1 [X] New Mexico
[ ] California
[ ] Other

SHIPPER

Sandia National Laboratories

SF 1951-AE(1-93)

TO: *Typed or neatly printed*

Toeele, UT

Gate Exit Time & Date 3	Highest Material Security Class. 4	Page 1 Of 1		
Date to be Returned 5 [X] No Return	Document No. A 57402	Shipping Code 6	Shipment Register No. 7	

Due at Destination 8 10-24-96 Date
[X] Firm (Premium transportation authorized)
[ ] Flex (Most economical transportation)

Originator of Form 9	Org.	Phone	Date Prepared 10
Dwayne Smith	1000	4-9889	10/18/96

FROM: Site	Bldg.	Room	Org.	Requester's E No. 12	Requester's Name (Write "Same" if also originator)	Org.	Phone	Case No. 13
10500	500	100	5302	5561	Same			9811-177

Material Billing 14: [X] Charge [ ] No Charge
Freight Billing 15: [X] Prepaid [ ] Collect *If collect, carrier & acct no. (if known)*
Reason for Shipment 16: Project Needs
Authority for Shipment 17:

Item 18	Sec. Class. 19	Quantity 20	Unit 21	Haz. Mat'l. 22	Property Tag No. And/Or MID No. 23	Description 24	Unit Value 25	$ Total 26
	C	1	L	Yes	SR77019	Chemicals	10,000	10,000

HAZARDOUS MATERIAL MUST BE ROUTED BY TRAFFIC

Grand Total 27 $ 10,000

Transportation Safeguards Div. Courier Required? [X] YES [ ] NO

Service Clerk 29	Property Mgmt. Rep. 30

Shipped or Hand carried	Routing 32	B/L No. 33	No. of Boxes 34	Weight 35	Total Cubic Feet/Dimensions 36

Authorizing Signature

Signature of manager above typed or printed name and Org.

I certify that the material being offered for shipment is nonhazardous unless indicated as hazardous in block 22 and required information is being provided.

Special Approval 38 — Name / Org.

Special Approval — Name / Org.

Bearer's Signature

40 Receipt Acknowledged — Recipient's Signature/Company / Date

Contract or PEL/MEL Rep. 41 [ ] External Loan — Name / Org.

Corporate File - Retained by the Traffic Organization after shipper is complete and items are ready for shipment.

The listed material and accompanying information has been examined and the hazardous material designations and all preparations for shipment are certified correct.

42 Bob Haffy III — Hazardous Material Consultant

43 — Packed by

SHIPPER

3961-AE (8-93)

Sandia National Laboratories

1 ☐ New Mexico ☐ California ☐ Other

SHIP TO: *Typed or neatly printed* Larry North		Gate Exit Time & Date 3	Highest Material Security Class. 4	Page Of
	Date to be Returned 5 ☒ No Return	Document No. A 3912	Shipping Code 6	Shipment Register No. 7
	Due at Destination 8 3 12 95 Date	☐ Firm (Premium transportation authorized) ☒ Flex (Most economical transportation)		

Vendor/Suplr. Code	Bldg.	Room	Org.	Emp. No.	Originator of Form 9	Org.	Phone	Date Prepared 10
10510	510	110	5312	22180	Sarah Jones	1317	5 3046	3 4 96

FROM: Site 11	Bldg.	Room	Org.	Requester's E No. 12	Requester's Name (Write "Same" if also originator)	Org.	Phone	Case No. 13
SNL 1	802	203	1912	33410	Same			17011 170

Material Billing 14	Freight Billing 15	Reason for Shipment 16	Authority for Shipment 17
☐ Charge ☐ No Charge	☒ Prepaid ☐ Collect *If collect, carrier & acct no. (if known)*	Transfer of Location	SB

Item No. 18	Sec. Class. 19	Quantity 20	Unit 21	Haz. Mat'l. 22	Property Tag No. And/Or MID No. 23	Description 24	Unit Value 25	$ Total 26
1	U	1	ea	No	5131412	photo copier — last —	$10k	$10k

Grand Total 27 $

Reason for Shipment

☐ External Loan to Contractor
☐ Other, Explain

DOE Transportation Safeguards Div. Courier Required? 28 ☐ YES ☒ NO	Service Clerk 29	Property Mgmt. Rep. 30

Date Shipped or Handcarried 31	Routing 32	B/L No. 33	No. of Boxes 34	Weight 35	Total Cubic Feet/Dimensions 36
3 10 96	Normal	70510	1	600 lbs	6' x 5'

Authorizing Signature 37 Joe Blow Signature of manager above typed or printed name and Org. *I certify that the material being offered for shipment is nonhazardous unless noted as hazardous in block 22 and required information is being provided.*	Special Approval 38 Al Zolicott 9212 Name Org.	Special Approval Name Org.
39 Bearer's Signature	40 Receipt Acknowledged Pat Dickens Recipient's Signature/Company Date	Contracting or PEL/MEL Rep. 41 ☐ External Loan Name Org.

COPY
Corporate File - Retained by the Traffic Organization after shipper is complete and items are ready for shipment.

The listed material and accompanying information has been examined and the hazardous material designations and all preparations for shipment are certified correct.
42
Hazardous Material Consultant

43
Packed by

HIPPER

951-AE (8-93)

Sandia National Laboratories

1 ☐ New Mexico ☐ California ☐ Other

IP TO: *Typed or neatly printed*

Patricia Dickens
10510 Research Park

Gate Exit Time & Date 3	Highest Material Security Class. 4	Page Of

Date to be Returned 5 ☐ No Return	Document No. A 3915	Shipping Code 6	Shipment Register No. 7

Due at Destination 8 2 3 96 (Date) ☐ Firm (Premium transportation authorized) ☐ Flex (Most economical transportation)

/Suplr. Code	Bldg.	Room	Org.	Emp. No.	Originator of Form 9	Org.	Phone	Date Prepared 10
10510	510	103	9214	14839	P Goldsby	1340	4 1246	2 2 96

Site	Bldg.	Room	Org.	Requester's E No. 12	Requester's Name (Write "Same" if also originator)	Org.	Phone	Case No. 13
IOM: SNL 4	890	121	7000	12382	Same			

terial Billing 14	Freight Billing 15	Reason for Shipment 16	Authority for Shipment 17
] Charge] No Charge	☑ Prepaid ☐ Collect *If collect, carrier & acct no. (if known)*	DOMO at RMC	Training

n Sec. Class. 19	Quantity 20	Unit 21	Haz. Mat'l. 22	Property Tag No. And/Or MID No. 23	Description 24	Unit Value 25	$ Total 26
UN	13	EA	NO	N/A	MAGNETIC SENSORS — LAST —	300	3,900

Grand Total 27 $

Reason for Shipment

☐ External Loan to Contractor ☑ Other, Explain DOMO

E Transportation Safeguards Div. Courier Required?	Service Clerk 29	Property Mgmt. Rep. 30
☐ YES ☑ NO	JSO	

te Shipped or ndcarried	Routing 32	B/L No. 33	No. of Boxes 34	Weight 35	Total Cubic Feet/Dimensions 36
2 3 96	Regular	10510	1	315	24

thorizing Signature

Signature of manager above typed or printed name and Org.

ertify that the material being offered for shipment is nonhazardous unless ted as hazardous in block 22 and required information is being provided.

Special Approval 38 — Name — Org.

Special Approval — Name — Org.

Bill Cooks
Bearer's Signature

40 Receipt Acknowledged
Recipient's Signature/Company — Date

Contracting or PEL/MEL Rep. 41 ☐ External Loan
Name — Org.

1:
porate File - Retained by the Traffic
anization after shipper is complete
l items are ready for shipment.

The listed material and accompanying information has been examined and the hazardous material designations and all preparations for shipment are certified correct.

42
Hazardous Material Consultant

43
Packed by

SHIPPER

SF 6951-AE (8-93)

Sandia National Laboratories

1 ☐ New Mexico ☐ California ☐ Other

SHIP TO: *Typed or neatly printed*

George Gobel
10510 Research Park
Alby NM

Gate Exit Time & Date 3	Highest Material Security Class. 4	Page Of
Date to be Returned 5 ☐ No Return	Document No. A 3904	Shipping Code 6 / Shipment Register No. 7

Due at Destination 8 _____ *Date*
☐ Firm (Premium transportation authorized)
☐ Flex (Most economical transportation)

Ce/Suplr. Code	Bldg.	Room	Org.	Emp. No.	Originator of Form 9	Org.	Phone	Date Prepared 10
10510	510	94	5302	138 Sc	Joan A-K	1000	4 9227	1 8 96

FROM: Site	Bldg.	Room	Org.	Requester's E No. 12	Requester's Name (Write "Same" if also originator)	Org.	Phone	Case No. 13
1 SNL	859	106	9243	47871	Same			4432 182

Material Billing 14 ☐ Charge ☐ No Charge
Freight Billing 15 ☒ Prepaid ☐ Collect *If collect, carrier & acct no. (if known)*
Reason for Shipment 16: Project needs
Authority for Shipment 17

Item No. 18	Sec. Class. 19	Quantity 20	Unit 21	Haz. Mat'l. 22	Property Tag No. And/Or MID No. 23	Description 24	Unit Value 25	$ Total 26
1	UN	3	EA	NO	513145 514533 592830	computer monitors 21" display → LAST	2000	6000

Grand Total 27 $ 6K

Reason for Shipment
☒ External Loan to Contractor
☐ Other, Explain

DOE Transportation Safeguards Div. Courier Required? 28 ☐ YES ☒ NO

Service Clerk 29 | Property Mgmt. Rep. 30

Date Shipped or Handcarried 31	Routing 32	B/L No. 33	No. of Boxes 34	Weight 35	Total Cubic Feet/Dimensions 36
1 10 96	NORMAL	10510	3	90 lbs	

Authorizing Signature 37
Signature of manager above typed or printed name and Org.
I certify that the material being offered for shipment is nonhazardous unless noted as hazardous in block 22 and required information is being provided.

Special Approval 38 _____ Name Org.

Special Approval _____ Name Org.

39 _____ Bearer's Signature

40 Receipt Acknowledged _____ Recipient's Signature/Company Date

Contracting or PEL/MEL Rep. 41 ☐ External Loan _____ Name Org.

The listed material and accompanying information has been examined and the hazardous material designations and all preparations for shipment are certified correct.
42 _____ Hazardous Material Consultant

43 BARN Packed by

...ite File - Retained by the Traffic Organization after shipper is complete and items are ready for shipment.

Problems That May Occur

1. A large truck, capable of handling hazardous materials, exits the gate.

2. A sample from the perimeter was analyzed. The sample contains Schedule 2 material (from earlier pesticide production).

3. A sample from the interior of Building 10510 or 10520 was analyzed. The sample contains Schedule 1 material (HN1).

4. In room #103, a sensitive item was not shrouded -- the poster display has an image of the sensitive canisters.

5. One medical record shows personnel exposure to a toxic chemical.

6. One Inspection Team member enters room #120 without permission.

7. One Inspection Team member unshrouds 1 canister in room #103.

8. The door to room #104 is locked.

9. The Inspection Team member becomes ill.

This data is hypothetical.

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List of Findings

Building with ambiguities:

1. 10500 Yes/No If yes, please explain.

2. 10510 Yes/No If yes, please explain.

3. 10520 Yes/No If yes, please explain.

Rooms in Building 10510 with ambiguities:

What is the ambiguity?

- *Object measurement*
- *Object shrouded*
- *Sampling/vents*
- *Insufficient alternate information*

1. Room #101-B Yes/No If yes, please explain.

2. Room #103 Yes/No If yes, please explain.

3. Room #104 Yes/No If yes, please explain.

4. Room #120 Yes/No If yes, please explain.

This data is hypothetical.

5.	Room #132	Yes/No	If yes, please explain.
6.	Room #181	Yes/No	If yes, please explain.
7.	Other rooms	Yes/No	If yes, please explain.

Recommendation to CWC Governing Body:

_____ The site is in compliance with the CWC.

_____ The site may not be in compliance with the CWC. Please explain suggested future actions.

_____	_____	_____	_____
Chief of Inspection Team	Date	Chief of Inspected Party	Date

This data is hypothetical.

Glossary

ACE-IT:	augmented computer exercise for inspection training
Aerial overflight:	inspection using aircraft or helicopters
Alternate information:	may include proprietary; equipment; hazardous waste; medical records; environmental, safety & health; general public relations; & shipping/receiving information
Alternative perimeter:	the boundary of the area that the Inspected Party suggests that the Inspection Team inspect
Ambiguity:	uncertainty as to whether an item or activity is in compliance with the agreement
AVI:	video format for PC/Windows
Baseline inspections:	initial inspections to check the accuracy of declarations
Challenge inspections:	short-notice inspections of declared and undeclared sites
CMC:	Cooperative Monitoring Center
CWC:	Chemical Weapons Convention
Continuously monitored facility:	inspection where information is collected by the Inspection Team for a continuous period of time
Declared site:	site identified in the agreement
Elimination inspections:	inspections to view the elimination of items or the elimination of facilities; controlled by the Inspected Party; & notification from Inspected Party

Final perimeter:	the boundary of the area that the Inspection Team inspects -- as agreed by both the Inspected Party and the Inspection Team
GIS:	geographic information system
Inspected Party:	escorts or hosts
Inspection Team:	inspectors
Inviolable:	secure from assault or trespass
Invited inspections:	inspections (briefings and tours) controlled by the host country.
Managed access:	controlling the access to a facility, building, or room -- for example, the host of the inspection may (1) provide alternative information, (2) allow the room to be viewed from a distance, or (3) allow only some of the inspectors into the room.
Mock inspection:	"practice" inspection conducted at a facility -- addresses escorting, logistics, transportation, badging, and supply concerns
Morphing:	changing form
No right of refusal:	inspectors must be allowed to inspect the facility, building, or room
Perimeter:	exterior boundary of a building or site
Random selected access:	allowing the inspection of a randomly selected percentage of a site, building, or room
Requested perimeter:	the boundary of the area that the Inspection Team wishes to inspect
Schedule 1 chemicals:	a list of toxic chemicals and their precursors used to identify the most sensitive chemicals under the CWC. Possession of Schedule 1

	chemicals does not mean that chemical weapons exist.
Schedule 2 chemicals:	a list of toxic chemicals and their precursors used to identify the sensitive chemicals under the CWC. Possession of Schedule 2 chemicals does not mean that chemical weapons exist.
Schedule 3 chemicals:	a list of toxic chemicals and their precursors used to identify the least sensitive chemicals under the CWC. Possession of Schedule 3 chemicals does not mean that chemical weapons exist.
Scheduled inspections:	routine, periodic inspections of declared sites
Shrouding:	covering an item
Single small-scale facility:	produces Schedule 1 chemicals for research, medical, pharmaceutical or protective purposes (less than 10 kg per year)
SNL:	Sandia National Laboratories
Table-top inspection:	a discussion scenario during which those individuals who would likely be affected by a visit gather to "talk through" how the visit might proceed, how individual operations might be affected, and who is responsible for what
Technical measurement inspections:	inspections to test equipment; controlled by Inspected Party
Transparency measure visits:	visits controlled by the Inspected Party and notification from Inspected Party
Undeclared site:	site not identified in the agreement
Unshrouding:	uncovering an item

Distribution

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