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**PLANT 2/3 CONTAMINATED PERCHED WATER
REMOVAL ACTION WORK PLAN MAY 1990**

05/01/90

DOE-FMPC/USEPA

68

WORK PLAN

PLANT 2/3
CONTAMINATED PERCHED WATER

REMOVAL ACTION
WORK PLAN

MAY 1990

Prepared by:
Westinghouse Materials Company of Ohio
P.O. Box 398704
Cincinnati, Ohio 45239-8704

Prepared for:
U.S. Department of Energy
P.O. Box 398705
Cincinnati, Ohio 45239-8705

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I. INTRODUCTION

This document provides a work plan describing the actions which will be taken to address the uranium contaminated groundwater found in borings inside and adjacent to Plant 2/3 at the Feed Materials Production Center (FMPC). This removal action is a component of an on-going removal action at the FMPC addressing perched water containing elevated concentrations of hazardous substances. The work plan was prepared to satisfy a commitment in the Consent Agreement under CERCLA Section 120 and 106(a) (hereafter called the "Consent Agreement") and is consistent with the requirements of 29 CFR 1910.120. A Removal Site Evaluation and an Action Memorandum have been completed by the Department of Energy (DOE) in accordance with the requirements of the National Oil and Hazardous Substance Pollution Contingency Plan (NOHSPCP) and pertinent guidances pertaining to removal actions.

II. BACKGROUND

1.0 Summary of the Potential Threat

The Production and Additional Suspect Areas Work Plan of the Feed Materials Production Center (FMPC) Remedial Investigation and Feasibility Study (RI/FS) includes a comprehensive plan to sample and characterize the soil and perched water in the upper 20 feet of the soil under the FMPC production area. This depth is intentionally confined to the space sufficiently above the aquifer that exists under the FMPC so that penetration through the cover soil does not occur. In addition to systematic borings at 250 foot intervals across the entire production site, one phase of the RI/FS involves "focused" borings to explore suspect areas of contamination under the individual plants.

Figure 1 shows the borings installed in the vicinity of Plant 2/3 and the average uranium concentration in perched water in parts per billion (ppb) at each boring. Contour interpretations are also shown for the 100, 1,000 and 10,000 ppb total uranium levels. The DOE has identified the need to perform a recovery action in those regions exhibiting total uranium concentrations in perched water in excess of 10,000 ppb. Three localized regions of perched waters exhibiting concentrations in excess of this level have been identified in the vicinity of Plant 2/3 at the FMPC (see Figure 1).

2.0 Related Actions

A time critical removal action was approved by the DOE, U. S. Environmental Protection Agency (USEPA) and Ohio Environmental Protection Agency (OEPA) for the pumping and treating of uranium contaminated perched water from under FMPC buildings. The first action involved pumping water from under Plant 6. This action commenced on August 1, 1988 on a temporary basis and a more permanent pumping system was placed in operation on November 6,

1989. This action is a continuation of the ongoing removal action to remove perched water.

3.0 Roles of Participants

- A. The DOE is the lead agency for this removal action and will coordinate and execute this removal action. The state and local roles have been one of participation in the negotiations of the Consent Agreement and Technical Information Exchanges (TIE).
- B. USEPA and OEPA shall review, comment on the work plan, follow progress through TIE meetings and the Consent Agreement progress reports.
- C. Advanced Sciences, Inc. (ASI), as a subcontractor to DOE, is conducting the RI/FS program activities at the FMPC. ASI will perform slug test, install recovery wells and trench collector if the test data determine they are necessary.
- D. Westinghouse Materials Company of Ohio (WMO), the Maintenance and Operations Contractor at the FMPC, will coordinate, manage, implement, monitor and prepare all reports associated with the removal action.

4.0 Proposed Removal Action

Install recovery well(s) and/or trench collector(s) to remove perched water and pump the water to existing FMPC wastewater treatment facilities. This effort will be undertaken to control the potential for vertical migration into the Great Miami Aquifer by reducing the hydrostatic head of the perched water.

III. SUPPORT ACTIVITIES

Activities will be undertaken to provide planning, design, and management for the removal action.

1.0 Project Planning

Included in this activity will be the preparation of detailed task listings and delineation of responsibilities to support the schedule given in Attachment 1. Also, a training schedule will be generated to ensure that the personnel involved in the scope of work will be trained in accordance with the Occupational Safety and Health Administration (OSHA) standards found in 29 CFR 1910.120.

2.0 Collection System Design

A series of slug tests will be conducted in approximately five piezometers in the area of each pumping center. The data from the

slug tests will allow a determination of the efficiency of any recovery well design. The slug test data will allow a recommendation to be made as to whether a small well, large well, or trench collector should be employed in each of the three proposed pumping centers.

3.0 Pumping System Design

A design for a submersible pumping system with a liquid level control that is capable of removing water from the collection systems will be prepared. The pumping system will include provisions for the monitoring/metering of pump discharge, automatic start/stop control, manual override of automatic control, and a sampling port on the discharge line.

4.0 Management of Project

WMCO personnel will manage the project using FMPC-2201 Topical Manual, Project Management Procedures.

IV. FIELD ACTIONS

Actions will be taken to investigate the source of perched water, install collector systems, and install pumping systems to remove and transfer the water to existing facilities for treatment before discharge to the Great Miami River.

1.0 Perched Water Source Detection

The objective of this activity is to determine the source of contaminated water for each of the three pumping centers. Possible sources include leakage or overflow from the thirteen sumps located throughout Plant 2/3, leakage from gravity lines which discharge to the sumps or historical losses through the acid brick floor in the plant. This will include actions such as hydrostatic testing, dye testing and visual observations.

2.0 Install Collector Systems

The object of this activity is to provide collector systems (small wells, large wells, or trench collectors) at each of the three pumping centers. Based on the results obtained from the slug tests, and an evaluation of the geology of the soils found in the borings, the type of collector and/or number of wells required and where the systems should be located will be determined.

3.0 Install Pumping Systems

The objective of this activity is to install pumping systems in the collector systems. This activity will include operational checks of the systems as deemed necessary.

4.0 Pump Contaminated Water

The objective of this activity is to pump the contaminated water. This effort will be undertaken to control the potential for migration of the contamination by reducing the hydrostatic head of the perched water. The uranium contaminated water will be pumped from the new recovery systems into existing adjacent sumps. Existing facilities will transfer the water from the sumps to Plant 8 for processing in existing wastewater treatment systems.

V. **SAMPLING AND ANALYSIS PLAN**

Samples from the pumping operation will be obtained by WMCO personnel according to FMPC Standard Operating Procedure (SOP) and sent to the FMPC Laboratory for analysis of total uranium, total thorium, nitrates and pH. The analytical procedures will be in accordance with the Analytical Laboratories Quality Assurance Plan L.C.N.-QAP, October 1987. Samples from the pumping operations will be obtained weekly for the first three months and monthly thereafter.

Split samples of the pumped water will be obtained by the WMCO Environmental Monitoring Group. Samples will be taken monthly during the first quarter of the pumping operation and quarterly thereafter. The sampling will be performed according to the procedures and protocol specified in the RI/FS Work Plan. The split samples will be sent to a certified independent laboratory for correlation of the analysis performed by the FMPC laboratory. The results from the certified lab will become part of the Administrative Record File. The WMCO laboratory data will be used for process control information only.

VI. **HEALTH & SAFETY PLAN**

The work to be performed will be consistent with the Health and Safety Plan prepared for this removal action. A copy of this plan is provided as Attachment 2 of this Work Plan. The plan identifies, evaluates, and controls all safety and health hazards. In addition, it provides for emergency response for hazardous operations. The plan is consistent with 29 CFR 1910.120.

Safety documentation will be prepared according to FMPC-2116 Topical Manual "Implementing FMPC Policies and Procedures for System Safety Analysis." FMPC-2116 has been prepared to implement DOE Order 5481.1B Safety Analysis and Review System and DOE/OR-901 Guidance for Preparation of Safety Analysis Reports.

VII. QUALITY ASSURANCE PLAN

The overall quality assurance program at the FMPC is described in the site Quality Assurance Plan, FMPC 2139. The Quality Assurance Plan is based on the criteria specified in ASME NQA-1, Federal EPA Guideline QAMS-005/80 and DOE Orders 5700.6 and 5400.1. Specific quality assurance requirements will be incorporated into written and approved procedures and during personnel training. The Quality Assurance Department will conduct periodic surveillances to verify compliance.

IX. ASSUMPTIONS

1. No new regulatory assessments or permits required.
2. Removal actions that are time critical are completed in an expeditious manner with the NEPA document being satisfied as a Categorical Exclusion with a Memo to File. There is a requirement to prepare a final report and a Community Relations Plan of the action taken and to document the removal action in the FMPC Administrative Record File.
3. Samples are presently being analyzed for organic and other chemical constituents on the Hazardous Substance List (HSL). The presence of significant levels of HSLs has not been addressed in this work plan and may therefore impact the system design and attached schedule.

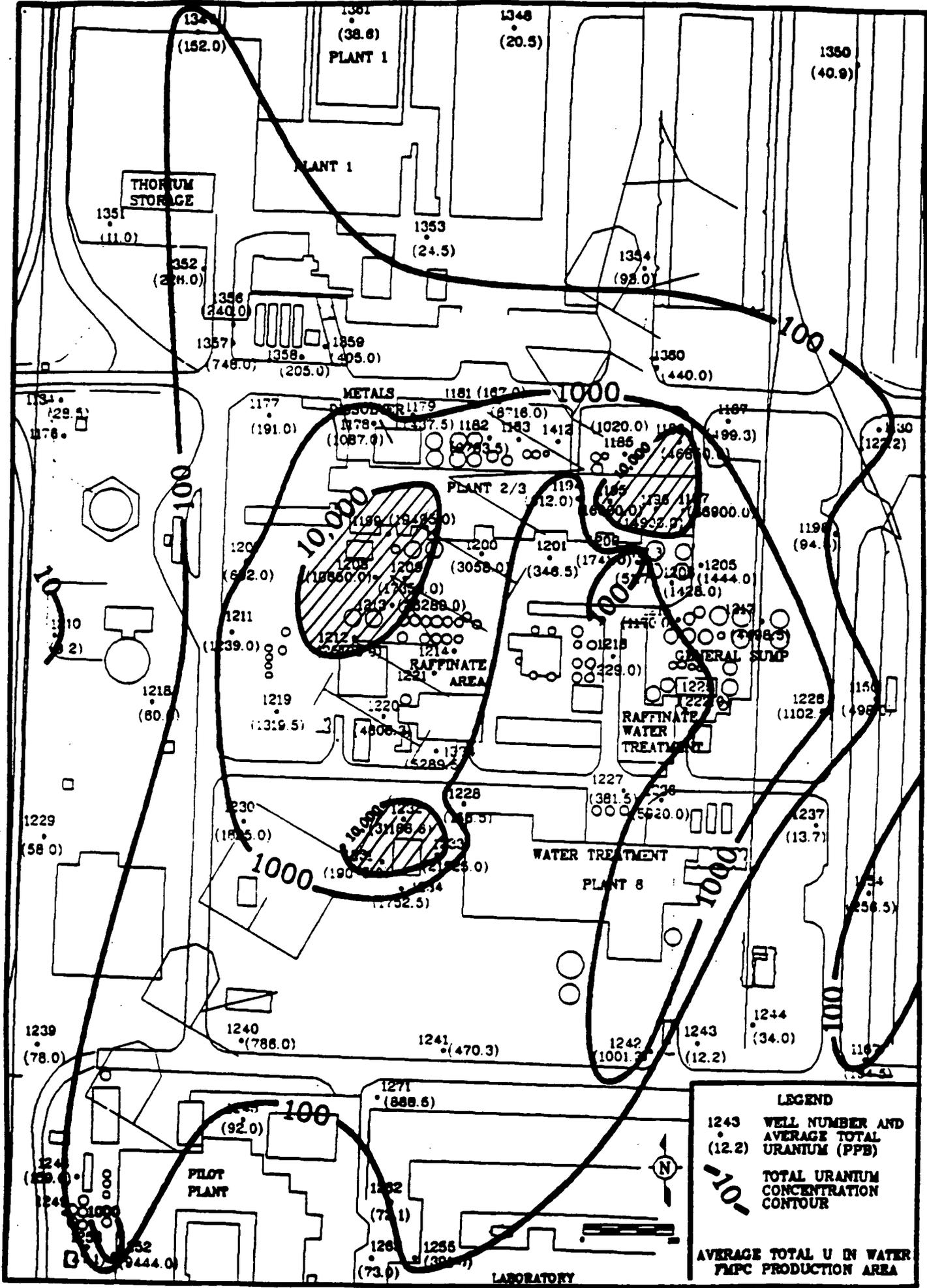


FIGURE 1

Plant 2/3 Contaminated Groundwater Pumping

FMPC

| Description | |
|---|--|
| Work Plan | (70 working days) <input type="text"/> |
| NEPA | (50 working days) <input type="text"/> |
| Design Collector Systems | (45 working days) <input type="text"/> |
| Contaminated Groundwater Source Detection | (85 working days) <input type="text"/> |
| Install Collector Systems | (65 working days) <input type="text"/> |
| Install Pumping System | (44 working days) <input type="text"/> |
| Pump Contaminated Water | (508 working days*) <input type="text"/> |

*Or longer if required NOTE 1: Pumping will continue until implementation of the Record of Decision (ROD) is completed for Operable Unit No. 3 or until concentration of hazardous substance in water becomes insignificant as compared to background.

ATTACHMENT 2

HEALTH AND SAFETY PLAN FOR THE PLANT 2/3
CONTAMINATED PERCHED WATER REMOVAL ACTION

FEED MATERIALS PRODUCTION CENTER

May 1990

APPROVED by:

for DE Ames 5/4/90
J. J. Volpe

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1.0 TASKS TO BE PERFORMED

The work to be performed involves determining the source of the contaminated water for each of the three pumping centers near Plant 2/3, providing a collector system at each pumping center, providing a pumping system for the collector system, and the actual operation of the pumping system.

The contaminant source detection will:

| | | | |
|------------|------------------------------|------------|-----------------------|
| <u>no</u> | Disturb Surface Soil | <u>yes</u> | Sample Surface Water |
| <u>no</u> | Disturb Subsurface Soil | <u>no</u> | Sample Lagoons |
| <u>no</u> | Use Heavy Equipment | <u>no</u> | Use Boat |
| <u>yes</u> | Enter Confined Space | <u>yes</u> | Involve Radioactivity |
| <u>yes</u> | Disturb Containerized Matter | <u>no</u> | Involve Trenches |

The installation of the collector system will:

| | | | |
|------------|------------------------------|------------|-----------------------|
| <u>yes</u> | Disturb Surface Soil | <u>no</u> | Sample Surface Water |
| <u>yes</u> | Disturb Subsurface Soil | <u>no</u> | Sample Lagoons |
| <u>no</u> | Use Heavy Equipment | <u>no</u> | Use Boat |
| <u>no</u> | Enter Confined Space | <u>yes</u> | Involve Radioactivity |
| <u>no</u> | Disturb Containerized Matter | <u>yes</u> | Involve Trenches |

The installation of the pumping system will:

| | | | |
|------------|------------------------------|------------|-----------------------|
| <u>yes</u> | Disturb Surface Soil | <u>no</u> | Sample Surface Water |
| <u>yes</u> | Disturb Subsurface Soil | <u>no</u> | Sample Lagoons |
| <u>no</u> | Use Heavy Equipment | <u>no</u> | Use Boat |
| <u>no</u> | Enter Confined Space | <u>yes</u> | Involve Radioactivity |
| <u>no</u> | Disturb Containerized Matter | <u>yes</u> | Involve Trenches |

The operation of the system for pumping the contaminated water will:

| | | | |
|-----------|------------------------------|------------|-----------------------|
| <u>no</u> | Disturb Surface Soil | <u>yes</u> | Sample Surface Water |
| <u>no</u> | Disturb Subsurface Soil | <u>no</u> | Sample Lagoons |
| <u>no</u> | Use Heavy Equipment | <u>no</u> | Use Boat |
| <u>no</u> | Enter Confined Space | <u>yes</u> | Involve Radioactivity |
| <u>no</u> | Disturb Containerized Matter | <u>no</u> | Involve Trenches |

2.0 SITE HISTORY

The task will be performed at Plant 2/3 and northwest of the Raffinate Area which is located within the FMPC property lines area. At present, the Plant 2/3 is routinely occupied. The production facility is not actively refining uranium at this time. Soils and groundwater near Plant 2/3 and the Raffinate Area have the potential to be contaminated with uranium, its daughter products and organics (kerosene and tributylphosphate).

Plant 2/3 is commonly referred to as the Refinery at FMPC. Naturally occurring uranium and recycled materials are processed by dissolving the uranium in nitric acid which produces uranyl nitrate. The uranyl nitrate is purified through an extraction process. The resulting solution is decomposed into UO_3 and the nitric acid is recovered.

The soil data from the Plant 2/3 area indicates an area where uranium is being introduced into the environment through surface deposition. The surface deposition does not appear to be contributing to the subsurface contamination as the uranium concentration decreases significantly below the depth of 1.5 feet. Virtually the entire Plant 2/3 is underlain with contaminated groundwater.

3.0 TASK SPECIFIC HAZARD ASSESSMENT

A preliminary review of the tank area (see Figure 1) in Plant 2/3 indicated the potential hazards identified below. Prior to the initiation of the activities, a formal walk-through survey of the conditions in the proposed work area in the Plant 2/3 complex will be conducted to ensure that conditions are such that a safe working environment can be provided for personnel within the defined exclusion area. All identified hazards will be addressed with the Industrial, Radiological, Safety and Training (IRS&T) representative(s) to determine the degree of hazard and if any additional requirements need to be included in the safety plan.

3.1 Physical Hazards

- o Noise
- o Overhead Hazards
- o Underground Utilities

3.2 Radiation Hazards

The potential radiation hazard are from uranium (depleted to 2% enriched in U-235) and short lived decay products.

3.3 Chemical Hazards

| <u>Contaminant</u> | <u>Primary Hazard</u> | <u>Limit</u> | <u>Action Level</u> |
|---------------------------------|-----------------------|--------------------------------|---------------------|
| Nitrogen Dioxide ⁽¹⁾ | Inhalation | 1 ppm (Note 3) | 0.5 ppm |
| Asbestos ⁽²⁾ | Inhalation | 0.2 f/cc (Note 4) | 0.1 f/cc |
| Nitric Acid | Contact Skin/Eyes | 2 ppm (Note 4) | |
| | | 4 ppm (Note 3) | |
| Sodium Hydroxide | Contact Skin/Eyes | 2 mg/M ³ (ceiling) | |
| Uranium | Inhalation/Ingestion | Note 5 | |
| Kerosene | Contact Skin/Eyes | 400 ppm (Notes 4 and 6) | |
| Tributylphosphate | Contact Skin/Eyes | 2.5 mg/M ³ (Note 4) | |
| Ammonia ⁽⁷⁾ | Inhalation | 35 ppm (Note 3) | 10 ppm |
| Calcium Hydroxide | Contact Skin/Eyes | 5 mg/M ³ (Note 4) | |
| Sodium Carbonate | Contact Skin/Eyes | --- | --- |

Data Sheets have been provided as attachments to this plan to provide additional information on these chemicals.

- (1) NO₂ may be produced if residual nitric acid is present in lines or sump.
- (2) The Digestion area of the Refinery and the Hot Raffinate building are controlled areas for asbestos. Special posted requirements apply if entry to these areas is necessary. These requirements include personal protective equipment and training. Asbestos hazard present if insulated lines or transite is damaged or disturbed (special permit required for asbestos work.)
- (3) Based on a 15 minute short term exposure limit.
- (4) Based on 8 hour time weighted average.
- (5) The action level for uranium is 5×10^{-12} uCi/ml which is based on the DOE derived air concentration limit of 2×10^{-11} uCi/ml.
- (6) Based on petroleum distillate.
- (7) Formerly used lines and equipment to be checked and secured prior to initiation of work in their vicinity.

4.0 MONITORING

4.1 Goals

During the contaminant source detection task, air monitoring will be performed as determined to be necessary at the time of issuance of the work permit(s) to ensure that exposure levels do not exceed established exposure limits.

4.2 Monitoring Equipment and Frequency of Monitoring

4.2.1 Airborne Radioactivity

During the contaminant source detection and installation of the pumping and collector system tasks, air samples will be taken in the general area of the work inside Plant 2/3 daily while work is in progress. Local or breathing zone samples will be taken in the vicinity of possible leaks of fluid systems as they are air-pressurized for hydrostatic testing. Radioactive surface contamination shall be monitored whenever soil is disturbed by drilling or digging.

4.2.2 Radioactive Surface Contamination

During the contaminant source detection and installation of the pumping and collector systems tasks, weekly surveys for removable radioactive surface contamination will be performed in Plant 2/3 area. Contamination surveys will be performed on potentially contaminated fluid systems, as they are opened, to ensure that adequate protective clothing is being worn and to verify radiological postings.

4.2.3 Radiation Surveys

Area radiation surveys will be taken monthly in Plant 2/3.

4.2.4 Chemical Hazard

Direct reading monitoring devices will be used to determine the concentration of NO₂ and/or other gases and vapors at the time of issuance of the work permit and thereafter as determined to be necessary by the Industrial Hygiene representative.

A HNu may be used periodically to test for organic vapors as determined to be necessary by the Industrial Hygiene representative. If organic vapors are detected, they will be treated as unknowns. The Breathing Zone action levels are listed in Section 4.3.

4.2.5 Thermoluminescent Dosimetry (TLD)

TLDs will be worn by all workers.

4.3 Action Levels

| <u>Measurement</u> | <u>Level</u> | <u>Action</u> |
|--|--|-------------------------------|
| Removable contamination on open surfaces | 20,000 dpm/100 cm ² (average) | Note 1 |
| Airborne radioactivity (long lived) | 5 x 10 ⁻¹² uCi/ml | Note 1 |
| HNU Meter (Breathing Zone) | Detection to 10 ppm (Note 2) | Note 1 |
| | 10-25 ppm | Supplied Air Respirator (SAR) |
| | >25 ppm | Withdraw |
| Nitrogen Dioxide (Breathing Zone) | 0.5 ppm | Withdraw |
| Ammonia | 10 ppm | Note 3 |

Notes

- 1 Full-face air purifying respirators with combination HEPA filter and organic vapor, acid gas, fume cartridges.
- 2 1 ppm above background.
- 3 Full-face air purifying respirators with ammonia cartridges.

5.0 PERSONAL PROTECTIVE EQUIPMENT (PPE)

All employees in the task exclusion area will wear the following personal protective equipment while performing the required tasks. See Note 3 in Section 3.3 for additional requirements.

5.1 Contaminant Source Detection

| <u>ITEM</u> | <u>NEED</u> | <u>APPLICABILITY</u> |
|---|-------------|---|
| Air purifying respirator | No (Yes) | Required if action levels are exceeded or as specified by IRS&T representative |
| Cartridges: HEPA Combination Radiological/OV/AG, or ammonia | No (Yes) | Required if action levels are exceeded or as specified by IRS&T representative |
| Hard Hat | No | |
| Hearing Protection | No | |
| Inner Gloves | No | |
| Rubber/Latex Boots | Yes | As needed to prevent contact with liquids (e.g., sump & drains) |
| Leather-Palm Gloves | Yes | As needed for physical protection of hands |
| Rubber/Nitrile Gloves | Yes | As needed to prevent contact with liquids (e.g., sump & drains) |
| Plain Tyvek | No | |
| PE Tyvek | No | |
| Process Coveralls | Yes | |
| PVC Gloves | No | |
| SAR | No | |
| Safety Glasses | Yes | Minimum Requirement |
| Safety Goggles/Face Shield | Yes | As needed to prevent contact with splash or particulates (e.g., cleaning/grinding on chemically contaminated drain lines) |
| Safety Shoes | Yes | Minimum Requirement |
| Saranex Tyvek | No | |
| Shoe Covers | No | |

5.2 Installation of Collector System

| <u>ITEM</u> | <u>NEED</u> | <u>JUSTIFICATION</u> |
|--|-------------|---|
| Air purifying respirator | No (Yes) | Required if action levels are exceeded or as specified by the IRS&T representative. |
| Cartridges: HEPA Combination Radionuclide/organic vapor/acid gas, or ammonia | No (Yes) | Required if action levels are exceeded or as specified by the IRS&T representative. |
| Hard Hat | Yes | As needed for overhead work |
| Hearing Protection | Yes | During concrete breaking/cutting |
| Inner Gloves | No | |
| Rubber/Latex Boots | Yes | As needed to prevent contact with liquids (e.g., sumps, drains, pumping) |
| Leather-Palm Gloves | Yes | As needed for physical protection of hands |
| Rubber/Nitrile Gloves | Yes | As needed to prevent contact with liquids (e.g., sumps, drains, pumping) |
| Plain Tyvek | No | |
| PE Tyvek | No | |
| Process Coveralls | Yes | |
| PVC Gloves | No | |
| SAR | No | |
| Safety Glasses | Yes | Minimum Requirement |
| Safety Goggles/Face Shield | Yes | During pump testing and as needed |
| Safety Shoes | Yes | Minimum Requirement |
| Saranex Tyvek | No | |
| Shoe Covers | No | |

5.3 Installation of Pumping System

| <u>ITEM</u> | <u>NEED</u> | <u>JUSTIFICATION</u> |
|--|-------------|---|
| Air purifying respirator | No (Yes) | Required if action levels are exceeded or as specified by the IRS&T representative. |
| Cartridges: HEPA Combination Radionuclide/organic vapor/acid gas | No (Yes) | Required if action levels are exceeded or as specified by the IRS&T representative. |
| Hard Hat | Yes | As needed for overhead work |
| Hearing Protection | Yes | During concrete breaking/cutting |
| Inner Gloves | No | |
| Rubber/Latex Boots | Yes | As needed to prevent contact with liquids (e.g., sumps, drains, pumping) |
| Leather-Palm Gloves | Yes | As needed for physical protection of hands |
| Rubber/Nitrile Gloves | Yes | As needed to prevent contact with liquids (e.g., sumps, drains, pumping) |
| Plain Tyvek | No | |
| PE Tyvek | No | |
| Process Coveralls | Yes | |
| PVC Gloves | No | |
| SAR | No | |
| Safety Glasses | Yes | Minimum Requirement |
| Safety Goggles/Face Shield | Yes | During pump testing and as needed |
| Safety Shoes | Yes | Minimum Requirement |
| Saranex Tyvek | No | |
| Shoe Covers | No | |

5.4 Operation of the Pumping System

| <u>ITEM</u> | <u>NEED</u> | <u>JUSTIFICATION</u> |
|--|-------------|---|
| Air purifying respirator | No (Yes) | Required if action levels are exceeded or as specified by the IRS&T representative. |
| Cartridges: HEPA Combination Radionuclide/organic vapor/acid gas | No (Yes) | Required if action levels are exceeded or as specified by the IRS&T representative. |
| Hard Hat | Yes | As needed for overhead work |
| Hearing Protection | No | |
| Inner Gloves | No | |
| Rubber/Latex Boots | Yes | As needed to prevent contact with liquids (e.g., sumps, drains, pumping) |
| Leather-Palm Gloves | Yes | |
| Rubber/Nitrile Gloves | Yes | As needed to prevent contact with liquids (e.g., sumps, drains, pumping) |
| Plain Tyvek | No | |
| PE Tyvek | No | |
| Process Coveralls | Yes | |
| PVC Gloves | No | |
| SAR | No | |
| Safety Glasses | Yes | Minimum Requirement |
| Safety Goggles/Face Shield | Yes | During initial testing and as needed |
| Safety Shoes | Yes | Minimum Requirement |
| Saranex Tyvek | No | |
| Shoe Covers | No | |

6.0 SITE CONTROL

6.1. Access

The work associated with this removal action will be within the FMPC controlled area. In addition, the work area related to this removal action will be posted as "RWP Required for Entry". This will establish the Exclusion Zone per 29 CFR 1910.120.

The Exclusion Zone is the zone of high potential hazard due to physical or chemical dangers. Access to the Exclusion Zone will be restricted by the Supervisor-in-charge to trained and certified employees, as regulated by 29 CFR 1910.120, who are required to enter in order to perform their job functions. There will be different Exclusion Zones for the various tasks. The Exclusion Zone will be marked with barrier tape or other easily recognizable devices. The zone may be expanded if airborne hazards are detected. All areas requiring the use of respiratory protection are included in the exclusion zone. Entrance shall be limited to one area and controlled by the supervisor in charge.

If necessary, IRS&T representatives will establish a Contamination Reduction Zone, consisting of step-off pads, at the exit to the Exclusion Zone. This zone will be used for removal of disposable PPE and for cleaning of contaminated equipment.

6.1.1 Radiological Postings

Radiological areas will be posted in accordance with DOE Order 5480.11. The following is a brief summary of posting requirements based on uranium:

| | |
|-----------------------------|--|
| Regulated Area | > 1000 dpm/100 cm ² removable |
| | > 5000 dpm/100 cm ² fixed and removable |
| Contaminated Area | > 10,000 dpm/100 cm ² removable |
| | > 50,000 dpm/100 cm ² fixed and removable |
| Airborne Radioactivity Area | > 2 x 10 ⁻¹² uCi/ml |
| Respirator Area | > 5 x 10 ⁻¹² uCi/ml |

In addition, special postings may be added for access to areas: "RWP Required for Entry" or "Contact HP for Entry."

6.2 Bioassay Samples

WMCO personnel involved in this project are required to participate in a routine periodic urine assay program. Any suspected exposure to hazardous substances shall be reported. Personnel are also required to wear a TLD at all times for radiological purposes.

6.3 Medical Monitoring

In accordance with 29 CFR 1910.120 OSHA requirements, all WMCO and WMCO subcontractor personnel are required to participate in a medical monitoring program which includes:

- o A baseline medical examination
- o Annual medical examination
- o Medical examinations may be required after exposures
- o WMCO respirator clearance for respirator users

Prior to the start of work, personnel involved in this project shall be identified by name and badge number. Each individual shall be subject to a medical surveillance approval by the Director, Medical Services. The approval statement shall certify that each individual is medically qualified to perform the work and is physically fit to wear PPE.

6.4 Training Requirements

All WMCO and WMCO subcontractor personnel assigned to the tasks will, as a minimum, meet the following training requirements:

- o Review of this health & safety plan for this work including site specified hazards and procedures. (This safety meeting(s) will be documented.)
- o WMCO radiation safety training
- o WMCO respiratory training and fit test or equivalent approved by WMCO Industrial Hygiene
- o 40-hour OSHA training
- o 8-hour annual refresher training
- o 8-hour supervisory training (for supervisors)
- o 24-hour supervised field experience

6.5 Safety Meetings

A safety meeting, which must be documented, shall be conducted prior to start of each day's work during the perched water source detection and the installation of the pumping system tasks. The meeting will cover the following applicable subjects:

- work operations
- personnel protective equipment
- all monitoring data
- hazard communications
- monitoring tests and results
- decontamination
- task organization
- physical stress
- emergency procedures
- communications
- general safety
- housekeeping

7.0 EXPOSURE SYMPTOMS

Exposure to low levels of radioactivity does not produce acute exposure symptoms. Such exposures may cause delayed effects such as cancer. Exposures are to be kept as low as reasonably achievable. No treatment is anticipated for the predicted contaminants and concentrations. See Section 11 for contingency plans.

Exposure symptoms for chemical hazards are described on the attached data sheets.

8.0 SITE ENTRY PROCEDURES

During the perched water source detection and installation of pumping system tasks, the following procedures apply:

- o Identify exclusion zone, contamination reduction zone, and break area.
- o Perform daily safety meeting to familiarize team with site specific hazards.
- o Discuss alternate communications signals (if applicable).
- o Perform respirator check out and fit test prior to use.
- o Use buddy system. Teams of at least two individuals will be used for all activities within an exclusion zone.

Prior to the initiation of these work tasks, the following permits are required:

- Radiation Work Permit
- Penetration Permit
- Chemical/Hazardous Material Permit
- Work Permit

All personnel entering the Exclusion Zone shall be trained and certified to perform their assigned task as defined by 29 CFR 1910.120.

Entrance to the Exclusion Zone shall be controlled and at the approval of the supervisor in charge.

9.0 DECONTAMINATION

Equipment for decontamination of radiological or chemical hazards shall be kept available in the area surrounding the exclusion zone if such is determined necessary by supervisor or by either Radiation Safety or Industrial Hygiene prior to the initiation of the activity. As a minimum, the location of the nearest water for decontamination and eye washing shall be identified and its operability verified prior to start of work.

10.0 WASTES

Wastes include, but are not limited to:

- o Disposable PPE
- o Excess materials such as soil or concrete

All potentially contaminated waste materials resulting from site activities will be collected and placed in drums or other containers. Disposable protective clothing will be placed in plastic bags and disposed of as compactible, potentially contaminated waste.

Drums or containers shall meet DOE 49 CFR Parts 171-178, EPA, 40 CFR Parts 264-265 and 300, and OSHA requirements. Hazard warning label shall be immediately applied to all drums as specified by WMCO management/supervisors and Solid Waste Compliance.

11.0 CONTINGENCY PLANS

11.1 Incidents or Injuries Involving Possible Intake of Radiological or Chemical Substances by Employees

See statement on submission of urine samples for radiation exposures in Standard Operating Procedure (SOP) No. 11-C-245.

Incidents or injuries involving potential intake of other hazardous substances shall be reported to supervisor and the WMCO Medical Section by the involved employee and an Incident Investigation Report completed by the involved employee.

11.2 Pre-Emergency Planning

During the training and pre-work safety meetings, all employees involved in this task shall be trained and reminded of the provisions of the plant emergency procedure, alarm signals and communications, evacuation routes and emergency reporting.

11.3 Lines of Authority

The supervisor in charge has the primary responsibility for the prevention of emergency conditions. In the event that an emergency does occur, the individual involved or observing the condition shall immediately notify a supervisor, the communication center or the Assistant Emergency Duty Officer (AEDO). The AEDO is responsible for ensuring that corrective actions have been implemented, the appropriate personnel notified, and reports completed as required.

11.4 Evacuation

In the event of an emergency which necessitates an evacuation of the Exclusion Area, the 2-2, 2-2 shall be sounded over the plant alarm system; a voice message will follow over the Emergency Message System instructing employees to go to their designated Rally Point (see Figure 2). Personnel shall immediately proceed to the Rally Point and participate in the accountability process. Personnel will follow instructions given by the Rally Point Coordinator. When an all-clear condition has been achieved, personnel will be released from the Rally Point.

11.5 Emergency Equipment

The following safety equipment, locations to be identified at safety meetings, is available for employee usage:

- fire extinguisher
- eye wash
- safety shower
- telephone
- spill drums
- absorbent
- other - List
- manual fire alarm
- two-way radio
- emergency SCBA units
- respirators
- clean-up materials
- local evacuation alarm

11.6 Emergency Notification

All emergencies shall be reported immediately. Emergencies can be reported by telephone dialing 6511; by contacting the communications center via two-way radio; or by pulling a manual fire alarm.

11.7 Fire, Explosion, or Medical Emergency

In the event of a fire, explosion or medical emergency, the communication center shall be notified immediately by manual fire alarm, two-way radio, or by calling 6511. The communication center operator will activate the emergency response team and dispatch them to your location. Personnel in the immediate area should evacuate to a safe position and await instructions.

11.8 Additional Information

11.8.1 Hospitals

The WMC0 Medical Facility (Building 53) is the primary choice for on-site injuries. The WMC0 ambulance will transport the injured to the nearest hospital if necessary. WMC0 maintains an emergency response capability which includes an ambulance and Emergency Medical Technicians.

11.8.2 Emergency Telephone Numbers

| | |
|------------|--------------|
| Ambulance: | 6511 or 6512 |
| Hospital: | 6511 or 6512 |
| Fire: | 6511 or 6512 |

| <u>Name</u> | <u>Work</u> | <u>Radio</u> |
|--|--------------|--------------|
| EMERGENCY RESPONSE | 6511 | |
| Industrial Hygiene | 6207 | 357 |
| Radiation Safety | 6889 | 355 |
| Fire and Safety | 6235 | 303 |
| Leo Singleton | 8908 | 709 |
| Assistant Emergency Duty Officer (AEDO) | 6431 or 6295 | 202 |

12.0 CONFINED SPACE ENTRY

A Confined Space Entry permit will be required for the perched water source detection task. A Confined Space Entry Permit will be obtained and its requirements followed. Permits will not be required for the installation of the pumping and collector systems and for the pumping of the contaminated water.

13.0 APPROVAL AND COMPLIANCE STATEMENT

This Health and Safety Plan was produced for the use of WMCO employees and WMCO subcontractors. It is intended for the FMPC and specifically for the following activities related to the Plant 9 removal action:

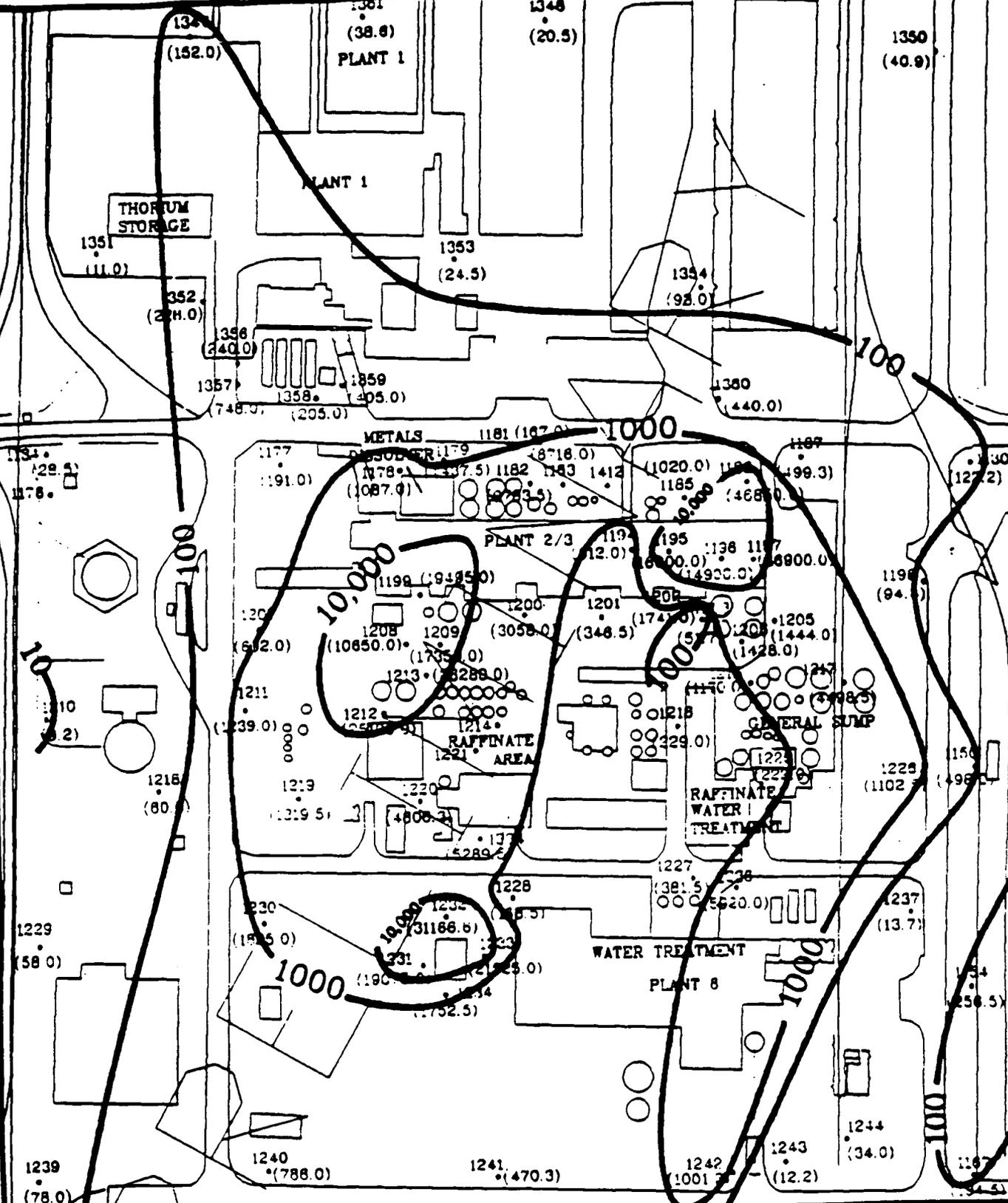
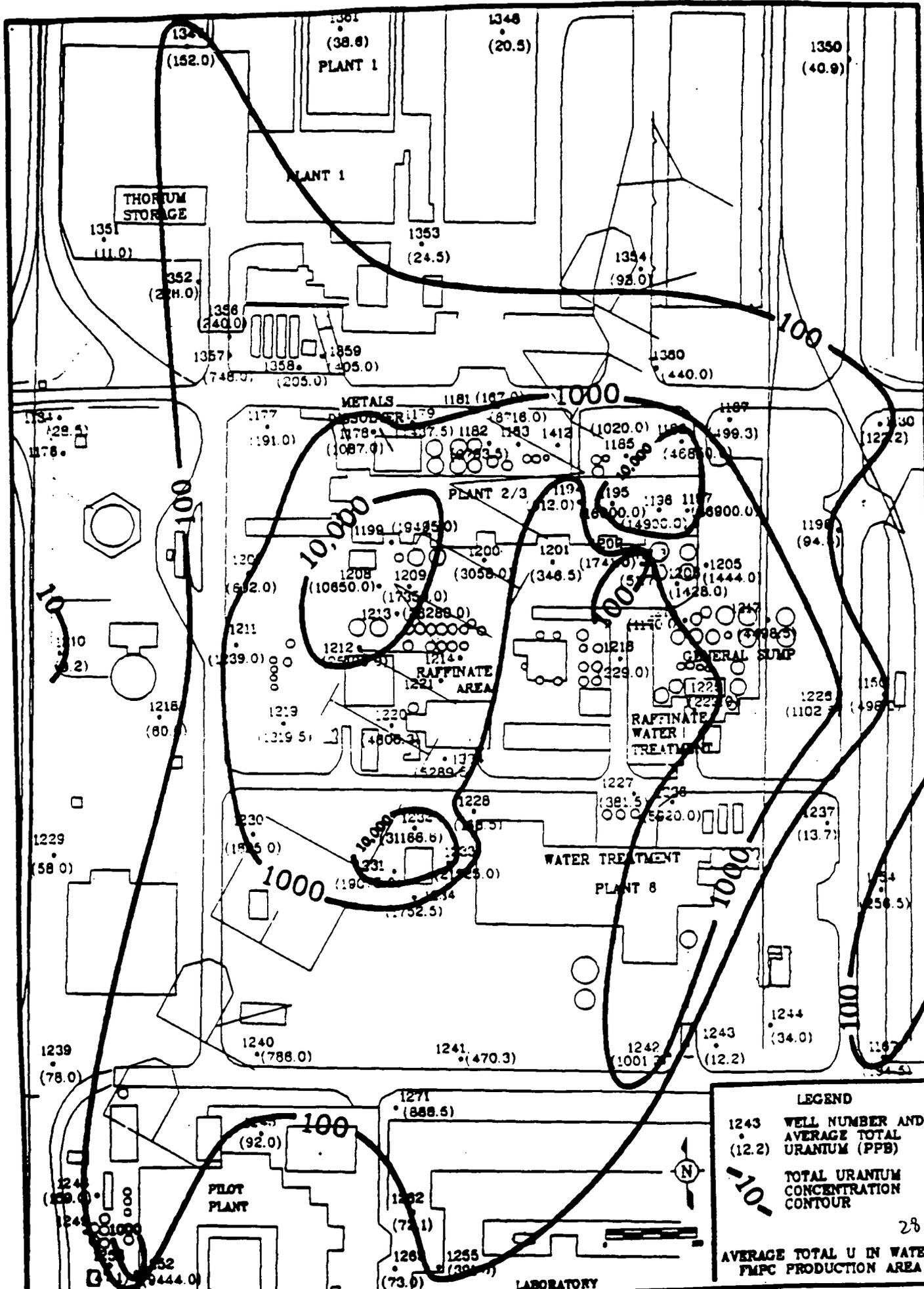
- Contaminant Source Detection
- Installation of Collector System
- Installation of Pumping System
- Pumping of the Contaminated Water

The undersigned person have read and understood this Health and Safety plan and agree to follow its provisions (See Note 1):

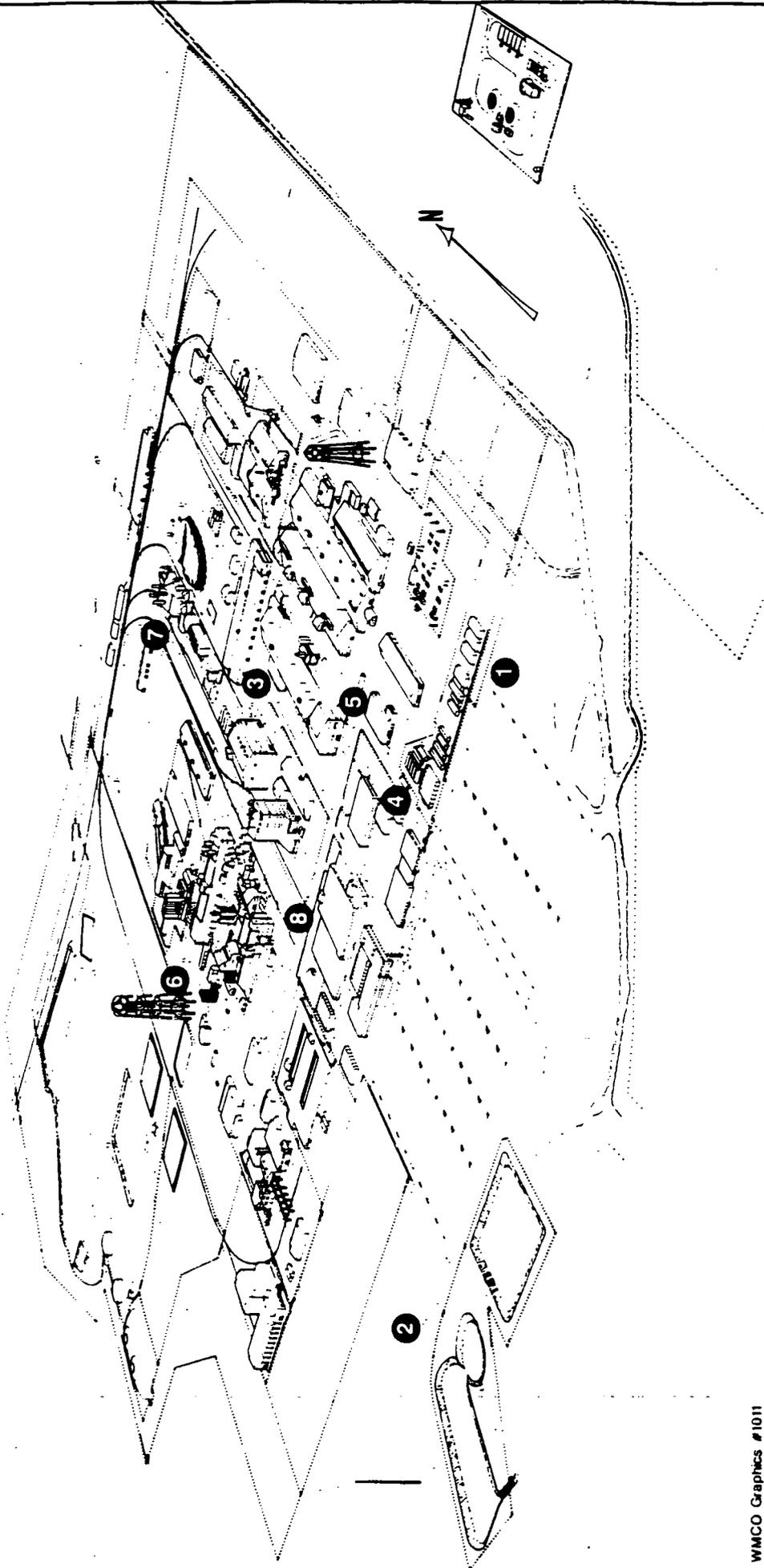
| Name (lettered) | Signature | Date |
|-----------------|-----------|-------|
| _____ | _____ | _____ |
| _____ | _____ | _____ |
| _____ | _____ | _____ |
| _____ | _____ | _____ |

Note 1: Compliance with the provisions of this HASP may be audited through announced or unannounced site visits. Be sure that you are implementing the provisions of the safety plan and documenting the reasons for field actions/changes when they are necessary. Site visits may be performed:

- ___ By WMCO
- ___ By DOE



FMPC RALLY POINTS



WMCO Graphics #1011

FIGURE 2

ATTACHMENTS

UNITED STATES DEPARTMENT OF ENERGY
MATERIAL SAFETY DATA SHEET
Entry Date: 06/18/1980 Revised Date: 06/18/1980

SECTION I -- IDENTIFICATION

Chem. Name: NITROGEN DIOXIDE
Chem. Id: 010102-44-0
Formula: No Info.
Hazard Rating (Scale: 0-4): HEALTH-(3); FIRE-(0); REACTIVITY-(0)
Molecular Weight: 46.000
DOT Class/ID: No Info.
Chem. Family: No Info.

SECTION II -- HAZARDOUS INGREDIENTS

| Components | CAS # | PEL/TLV | Percentage |
|---|-------|---------|------------|
| NO COMPONENT INFORMATION ENTERED FOR THIS MATERIAL. | | | |

SECTION III -- PHYSICAL/CHEMICAL CHARACTERISTICS

Boiling Point: 21.150 C Specific Gravity: 1.450
(AT MHG)
Vapor Pressure: 720.000 MM HG Melting Point: -9.300 C
(AT 20 C)
Vapor Density: 2.800 Solubility: No Info.
(AIR = 1.0) (REACTS IN WATER)
Evaporation Rate: No Info. Volatiles by Vol.%: No Info.

Physical Description:

IT IS A YELLOW-BROWN, FUMING LIQUID (BELOW 21 C) OR A REDDISH-BROWN GAS WITH A PUNGENT ACRID ODOR AT ABOUT 10-20PPM. AT -12C THIS MATERIAL IS A COLORLESS SOLID (ESSENTIALLY ALL N2O4). THIS MATERIAL IS AN EQUILIBRIUM MIXTURE OF NO2 AND ITS DIMER N2O4. IT IS SUPPLIED COMMERCIALY AS A LIQUID UNDER ITS OWN VAPOR PRESSURE IN STEEL CYLINDERS.

SECTION IV -- FIRE AND EXPLOSION HAZARD INFORMATION

Flash Point: No Info. Auto-Ignition Temp.: No Info. UEL: No Info.
No Info. LEL: No Info. UEL: No Info.
Special Hazards:

THIS MATERIAL WILL NOT BURN, HOWEVER IT IS A VERY STRONG OXIDIZING AGENT WHICH IS ABLE TO CAUSE FIRE ON CONTACT WITH FLAMMABLE OR COMBUSTIBLE MATERIALS. FOR EXAMPLE, IT COULD CAUSE CLOTHING TO CATCH FIRE ON CONTACT. WATER SHOULD BE USED TO COOL FIRE- EXPOSED CYLINDERS (WHICH COULD EXPLODE FROM PRESSURE WHEN HEATED), AND A WATER SPRAY MAY BE USED TO DIRECT ESCAPING GAS AWAY FROM THOSE ATTEMPTING A SHUT OFF OF NO2 FLOW. FIRE FIGHTERS REQUIRE FULL PROTECTIVE CLOTHING AND

SELF-CONTAINED BREATHING APPARATUS.

SECTION V -- REACTIVITY INFORMATION

Conditions to Avoid:

THIS IS A STABLE MATERIAL AT ROOM TEMPERATURE IN A CLOSED CYLINDER. IT IS A VERY STRONG OXIDIZING AGENT. CONTACT WITH COMBUSTIBLES CAN CAUSE FIRE OR EXPLOSION. IF A MATERIAL BURNS IN AIR, IT WILL BURN IN NO2 BUT IT MIGHT ALSO EXPLODE. MIXTURES WITH AMMONIA, ACETIC ANHYDRIDE, ALCOHOLS, TOLUENE, PROPYLENE, ETC HAVE PRODUCED VIOLENT EXPLOSIONS. EXPLOSIVES CAN BE PREPARED BY MIXING NO2 WITH CARBON DISULFIDE OR WITH NITROBENZENE. IT FORMS EXPLOSIVE MIXTURES WITH INCOMPLETELY HALOGENATED HYDROCARBONS. REACTIVE WITH REDUCING AGENTS AND STRONGER OXIDIZING AGENTS. IT MUST BE HANDLED WITH COMPATIBLE MATERIALS AND EQUIPMENT. IT IS NOT CORROSIVE TO MILD STEEL WHEN DRY, BUT WILL REQUIRE A NITRIC ACID RESISTANT STAINLESS STEEL WHEN WET. ALUMINUM, NICKEL, PYREX, TEFLOM, AND ASBESTOS ARE AMONG THE COMPATIBLE MATERIALS.

SECTION VI -- HEALTH HAZARD INFORMATION

Toxicity and Exposure Limits:

Inhal. Toxicity: 88.000 PPM Dermal Toxicity: No Info.
Comments: LC-50
Oral Toxicity: No Info. Eye Toxicity: No Info.
Exp. Limit: 3.000 PPM Exp. Limit Max.: 5.000 PPM
Comments: RAT/4HRS Comments: STEEL

Health Effects and Symptoms:

INHALATION OF NO2 CAUSES LUNG DAMAGE WITH SEVERITY DEPENDENT ON THE TIME AND THE LEVEL OF EXPOSURE. SERIOUS RESULTS MAY NOT BE FELT UNTIL HOURS OR DAYS AFTER EXPOSURE, EVEN THOUGH HEAVY DAMAGE HAS OCCURRED. EXPOSURE AT 100PPM FOR EVEN A SHORT TIME IS DANGEROUS AND EXPOSURE TO OVER 200 PPM CAN BE FATAL EVEN WHEN TREATED. THE DISCOMFORT OR SLIGHT PAIN OCCURRING AT EXPOSURE MAY GO UNNOTICED. THE CYANOSIS AND PULMONARY EDEMA RESULTING FROM DAMAGED LUNG TISSUE BECOMES DISABLING AND CAN BE FATAL, ESPECIALLY IF NOT PROMPTLY TREATED AFTER EXPOSURE. CHROMIC EXPOSURE AT 5-50PPM CAN PRODUCE A SLOWLY EVOLVING PULMONARY EDEMA WITH RESPIRATORY TRACT IRRITATION, COUGH, HEADACHE, WEAKNESS, AND CORROSION OF THE TEETH. CONTACT WITH VAPORS IS IRRITATING TO THE EYES, NOSE, THROAT AND WET SKIN, CONTACT WITH LIQUID IS CORROSIVE. AN EIGHT HR TWA EXPOSURE LIMIT IS 3PPM WITH AN EXCURSION LIMIT OF 5PPM HAS BEEN RECOMMENDED BY ACGIH. THE CURRENT OSHA TLV IS 5PPM OR 9MG/M3. NIOSH (1976) RECOMMENDED A CEILING LEVEL OF 1PPM (15 MINUTE SAMPLE). PROVIDE PREPLACEMENT MEDICAL EXAMINATION OF EXPOSED PERSONNEL WITH SPECIAL ATTENTION TO PULMONARY FUNCTION TESTS AND DENTAL CARE. PRECLUDE INDIVIDUALS FROM EXPOSURE WITH CARDIAC OR PULMONARY DISEASE.

Emergency and First Aid Procedures:

IF EYE CONTACT OCCURS IMMEDIATELY FLUSH WITH PLENTY OF RUNNING WATER, INCLUDING UNDER EYELIDS, FOR AT LEAST 15 MINUTES. CONTACT PHYSICIAN OR OPHTHALMOLOGIST IF POSSIBLE. PROMPTLY. IF SKIN CONTACT OCCURS REMOVE CONTAMINATED CLOTHING

UNDER THE SAFETY SHOWER. WASH AFFECTED AREAS OF SKIN WITH RUNNING WATER AND SOAP AND WATER FOR 15 MINUTES. GET MEDICAL HELP. IF INHALED, REMOVE EXPOSED PERSON TO FRESH AIR AT ONCE. INSTRUCT TO BREATHE RAPIDLY AND DEEPLY FOR A FEW BREATHS TO FLUSH OUT LUNGS. KEEP WARM AND AT REST. HAVE QUALIFIED PERSON ADMINISTER OXYGEN. CONTACT PHYSICIAN IMMEDIATELY.

SECTION VII -- PRECAUTIONS FOR SAFE HANDLING AND USE

Steps to be taken in case material is released or spilled:

NOTIFY SAFETY PERSONNEL WHEN LEAKS ARE DETECTED OR SUSPECTED. PROVIDE MAXIMUM EXHAUST VENTILATION. DISCONTINUE OPERATIONS. EXCLUDE FROM SITE ALL EXCEPT THOSE INVOLVED IN CLEAN-UP WHO ARE PROPERLY PROTECTED (SEE SECT VIII). NO2 MEASURING DEVICES MOIST BLUE LITMUS PAPER OR STARCH-IODIDE PAPER CAN BE USED TO LOCATE SMALL LEAKS. THE RED-BROWN COLOR OF NO2 WILL MAKE LARGE LEAKS EVIDENT. STOP SOURCE OF NO2. ISOLATE AND REMOVE ANY LEAKING CYLINDER PLACE IN HOOD OR IN SAFE OUTDOOR AREA. WHEN SLOW RELEASE OF GAS TO THE AIR IS UNACCEPTABLE, ATTACH NEEDLE VALVE AND TUBE TO RUN NO2 INTO AN EXCESS OF 5-10% AQUEOUS SODIUM HYDROXIDE SOLUTION (CAUTION) AT A MODERATE RATE, THEN NEUTRALIZE FOR DISPOSAL. COVER LIQUID SPILL WITH AN EXCESS OF NAHCO3. MIX, SPRAY WITH WATER FROM ATOMIZER, THEN FLUSH TO HOLDING TANK FOR DISPOSAL.

Waste Disposal Method:

FOLLOW FEDERAL, STATE AND LOCAL REGULATIONS. DILUTE NEUTRAL, LOW NITRITE WASTE WITH MUCH WATER AND FLUSH TO DRAIN WITH LOTS OF WATER TO MEET DILUTION REQUIREMENTS FOR MANO3 DISCHARGE. (WASTE HIGH IN NITRITE REQUIRES OXIDATION TO NITRATE BEFORE DISCHARGE.)

SECTION VIII -- CONTROL MEASURES

Protection Measures:

USE CLOSED PROCESSING TO PREVENT EXPOSURE WHENEVER FEASIBLE. CONSIDER USE OF CONTINUOUS NO2 MONITORING DEVICES. USE AN EXHAUST HOOD WITH MINIMUM 100 FPM FACE VELOCITY TO ENCLOSE. PROVIDE GENERAL VENTILATION AND LOCAL EXHAUST VENTILATION TO MEET TLV REQUIREMENTS. FOR EMERGENCY AND NONROUTINE EXPOSURE PROVIDE AND APPROVED FULL FACEPIECE RESPIRATOR ABOVE THE TLV. A CARTRIDGE OR CANISTER TYPE CAN BE USED BELOW 50PPM. A SELF-CONTAINED OR AIR-SUPPLIED RESPIRATOR IS REQUIRED ABOVE 50PPM OR FOR UNKNOWN LEVELS. PREVENT SKIN CONTACT WITH LIQUID OR VAPORS BY USE OF GLOVES AND PROTECTIVE CLOTHING. USE SAFETY SAFETY GOGGLES AND A FACE SHIELD FOR EYE PROTECTION. INSTANT ACTION EYEWASH STATION AND SAFETY SHOWERS ARE NEEDED IN CLOSE PROXIMITY TO USE AND HANDLING AREA. THOSE WORKING WITH NO2 MUST HAVE SPECIAL TRAINING IN HAZARDS AND HANDLING AND CLOSE SUPERVISION. OBSERVE BASIC PRECAUTIONS FOR HANDLING AND USE OF PRESSURIZED CYLINDERS. NOTE - NO2 CYLINDERS DO NOT HAVE SAFETY DEVICES FOR PRESSURE RELIEF. STORE AWAY FROM HEAT SOURCES IN LOW FIRE RISK AREAS. KEEP AWAY FROM SOLVENTS, FUELS, LUBRICANTS, COMBUSTIBLES, REDUCING AGENTS. USE COMPATIBLE MATERIALS AND EQUIPMENT FOR HANDLING NO2. OBTAIN DETAILED INFORMATION FROM SUPPLIERS FOR HANDLING AND USE UNDER SPECIFIC CONDITIONS. O2 AND N2 CAN REACT IN AN ELECTRIC ARC OR OTHER HIGH TEMPERATURE SOURCE TO PRODUCE HAZARDOUS LEVELS OF NO2. COMBUSTION OF NITROGEN-CONTAINING MATERIALS WILL PRODUCE NO2.

Asbestos

SECTION I MATERIAL IDENTIFICATION

Chemical Name Asbestos **CAS#** 1332-21-4
Synonyms **Possible Occupational Exposure**
Amosite Anthrophyllite Miners and millers of ore
Actinolite Tremolite Manufacturers and users of asbestos-containing products such as brake shoes
Chrysotile UN 2212 (DOT) Repairers and demolishers of structures containing asbestos
Crocidolite UN 2509 (DOT)
Manufacturer: available from several sources.

SECTION II INGREDIENTS AND HAZARDS

Permissible Exposure Limit
0.2 fiber/cc — OSHA TWA (all forms) 2.0 fibers/cc — ACGIH TWA (other forms)
0.5 fiber/cc — ACGIH TWA (Amosite) 0.1 fiber/cc — NIOSH-recommended TWA (all forms)
2.0 fibers/cc — ACGIH TWA (Chrysotile) 0.5 fiber/cc — NIOSH-recommended 15-minute ceiling (all forms)
0.2 fiber/cc — ACGIH TWA (Crocidolite) Human Carcinogen (IARC, NTP, ACGIH); Animal Carcinogen (IARC)
CERCLA Hazard Rating — Toxicity 3 - Ignitability 0 - Persistence 3.
Immediately Dangerous to Life and Health Concentration — none specified

SECTION III PHYSICAL DESCRIPTION

Fibrous solid, ranging from long flexible fiber down to dust-like filler powder.
Asbestos can be white, gray, brown or blue in color.
Molecular Weight: Varies **Specific Gravity:** 2.5
Melting Point: Decomposes **Flash Point:** Nonflammable
Solubility in Water: Insoluble (breaks down slowly in hot water)
Upper Explosive Limit in Air, % by volume: nonflammable
Lower Explosive Limit in Air, % by volume: nonflammable

SECTION IV INCOMPATIBILITIES AND STORAGE

Incompatibilities: None
Store asbestos in closed containers (dust-tight) in a clean, secure area. Protect containers from damage. Do not open without proper control measures. Ensure containers are properly labeled.

SECTION V HEALTH HAZARD AND PROTECTION DATA

| Target Organs | Route of Entry Into Body | | | |
|--------------------|--------------------------|----------------------|------------------------|-----------------|
| Lungs | Inhalation | | | |
| Respiratory System | Ingestion | | | |
| Gastrointestinal | Skin or Eye Contact | | | |
| Symptoms | | | | |
| Coughing | Asbestosis | Mesothelioma | Respiratory Irritation | Pneumoconiosis |
| Cyanosis | Pleuritic Pain | Respiratory Cancer | Pleural Thickening | Finger Clubbing |
| Dyspnea | Skin Irritation | Respiratory Distress | Pulmonary Fibrosis | Weight Loss |

NOTE: Acute exposure may cause irritation and coughing. Chronic exposure may cause pulmonary fibrosis, a terminal pneumoconiosis called asbestosis which may appear as early as 13 years after exposure, but typically develops over 20-40 years. The incidence of pulmonary fibrosis and lung cancer in asbestos-exposed workers is synergistically increased by smoking.

Protective Equipment Requirements

29 CFR 1910.1001 Asbestos

Special clothing: The employer shall provide, and require the use of, special clothing, such as coveralls or similar whole-body clothing, head coverings, gloves and foot coverings for any employee exposed to airborne concentrations of asbestos fibers.

Medical examinations are required for asbestos workers (preplacement, periodic and termination examinations), 20-year recordkeeping required.

Employers are required to provide and ensure that employees use and/or follow these protective devices and measures; employees are required to use and/or follow them:

Posted warning signs.

Face shields, vented goggles or other appropriate protective equipment that complies with 1910.133 of this part.

Change rooms with two separate lockers or containers.

Routine changing of work clothing if there is a possibility that clothing may be contaminated.*

Protective Equipment Requirements (continued)

Employees who are required to shower do so before breaks, lunch or leaving the contaminated area.

Showering after each shift prior to leaving premises.

Not smoking, eating or drinking in the work area.

*Contaminated clothing should be sealed in a labeled plastic bag and laundered. Commercial laundries should be notified of the asbestos contamination.

Employers are required to provide engineering controls, i.e., negative-pressure ventilation with high-efficiency particulate air (HEPA) filtration, sealed enclosures for removal projects. (See EPA regulations for guidance.)

Respirator Selection

| | |
|----------------------------|--|
| 2 fibers/cc | Half-mask air-purifying respirator with a high-efficiency filter. |
| 10 fibers/cc | Full face-piece air-purifying respirator with a high-efficiency filter. |
| 20 fibers/cc | Air-purifying respirators with a high-efficiency filter. Supplied-air respirator operated in continuous-flow mode. |
| 200 fibers/cc | Supplied-air respirator with a full face-piece operated in pressure-demand mode. |
| Greater than 200 fibers/cc | Supplied-air respirator with a full face-piece operated in pressure-demand mode equipped with an auxiliary positive pressure self-contained breathing apparatus. |

Firefighting

Self-contained breathing apparatus with a full face-piece operated in pressure-demand or other positive-pressure mode.

Supplied-air respirator with full face-piece 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.

First Aid

Skin Contact: Remove contaminated clothing and shoes immediately. Wash affected area with soap and water until no evidence of the substance remains. Get medical attention at once.

Eye Contact: Wash eyes immediately with large amounts of water, occasionally lifting the lower and upper lids. Get medical attention at once.

Inhalation: Remove from area at once to fresh air. If breathing has stopped, perform artificial respiration. Get medical attention at once.

Ingestion: Get medical attention at once.

SECTION VI REGULATIONS/OSHA

| | |
|------------------------------|---|
| OSHA Standard 29CFR1910.1200 | Hazard Communication |
| OSHA Standard 29CFR1910.1001 | Asbestos |
| OSHA Standard 29CFR1910.94 | Ventilation |
| OSHA Standard 29CFR1910.134 | Respiratory Protection |
| OSHA Standard 29CFR1910.20 | Access to Employee Exposure and Medical Records |
| OSHA Standard 29CFR1910.132 | Personal Protective Equipment |
| OSHA Standard 29CFR1910.141 | Sanitation |
| OSHA Standard 29CFR1910.151 | Medical Services and First Aid |
| OSHA Standard 29CFR1910.133 | Eye and Face Protection |

SECTION VII EMERGENCY HANDLING OF HAZARDOUS MATERIALS

If Material Is On Fire or Involved in Fire:

Extinguish fire using agent suitable for type of surrounding fire (material itself does not burn or burns with difficulty).

If Material Is Not on Fire and Is Not Involved in Fire:

Keep material out of water sources and sewers. Build dikes to contain flow as necessary.

Personal Danger Situation Protection:

Keep upwind. Wear boots, protective gloves and gas-tight goggles. Avoid breathing dust, vapors/fumes from material. Wash away any materials which may have contacted the body with copious amounts of water or soap and water.

SECTION VIII SPILL, LEAK AND DISPOSAL PROCEDURES

Adequately wet or mix with water to form a slurry. Seal material in a leak-tight container. Label containers as specified in 1910.1001. The SARA Act of 1986 requires that a release equal to or greater than the reportable quantity for this substance must be reported to the Local Planning Commission, the State Emergency Response Commission, and the National Response Center.

Contact the Ohio EPA for Emergency Spill Information: 1-800-282-9378.

Effective 1/87. For further chemical information contact the Resource Center at 1-800-282-3045, Ext. 7388.

NITRIC ACID
NITRIC ACID
NITRIC ACID
NITRIC ACID

MATERIAL SAFETY DATA SHEET

10176

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

EMERGENCY CONTACTS
GASTON L. PILLORI
(201) 796-7100

DATE: 03/02/86
PO NBR: N/A
ACCT: 878202-02
INDEX: 12-8603-40259
CAT NO: A2005212

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SUBSTANCE IDENTIFICATION

SUBSTANCE: **NITRIC ACID**

CAS-NUMBER 7697-37-2

TRADE NAMES/SYNONYMS: AQUA FORTIS; HYDROGEN NITRATE; AZOTIC ACID; NITRYL HYDROXIDE; A-200; A-200C; A-198; A-202; A-206-C

CHEMICAL FAMILY:
INORGANIC ACID

MOLECULAR FORMULA: H-N-O3 MOL WT 63.02

CERCLA RATINGS (SCALE 0-3): HEALTH=3 FIRE=0 REACTIVITY=0 PERSISTENCE=0
COMPONENTS AND CONTAMINANTS

PERCENT: 70 COMPONENT: HYDROGEN NITRATE

PERCENT: 30 COMPONENT: WATER

OTHER CONTAMINANTS: NONE

EXPOSURE LIMITS:

2 PPM (5 MG/M3) OSHA TWA; 2 PPM NIOSH RECOMMENDED TWA;
2 PPM ACGIH TWA; 4 PPM ACGIH STEL

PHYSICAL DATA

DESCRIPTION: COLORLESS FUMING LIQUID WITH AN ACRID ODOR; SUFFOCATING

FUMES. THE ODOR IS NOT CONSIDERED AN ADEQUATE WARNING PROPERTY.

BOILING POINT: 181 F (83 C) MELTING POINT: -44 F (-42 C)

SPECIFIC GRAVITY: 1.5 VAPOR PRESSURE: 62 MMHG @ 25 C

NITRIC ACID PAGE 02 OF 06
EVAPORATION RATE: NOT AVAILABLE SOLUBILITY IN WATER: MISCIBLE

SOLVENT SOLUBILITY: ETHER ODOR THRESHOLD: <5.0 PPM VAPOR DENSITY: 2.2

FIRE AND EXPLOSION DATA

FIRE AND EXPLOSION HAZARD:
INCREASES THE FLAMMABILITY OF COMBUSTIBLES, ORGANIC MATERIAL, AND READILY
OXIDIZABLE MATERIALS, CAUSING IGNITION OF SOME. SEVERE EXPLOSION HAZARD BY
REACTION WITH MANY INCOMPATIBLES, INCLUDING METALLIC POWDERS, CARBIDES,
HYDROGEN SULFIDE, AND TURPENTINE. IN OR NEAR FIRE, MATERIAL EMITS TOXIC AND
REACTIVE NITROGEN OXIDES AS GASES.

FLASH POINT: NONCOMBUSTIBLE

FIREFIGHTING MEDIA:
WATER SPRAY

FIREFIGHTING:
MOVE CONTAINER FROM FIRE AREA IF POSSIBLE. COOL CONTAINERS EXPOSED TO FLAMES
WITH WATER FROM SIDE UNTIL WELL AFTER FIRE IS OUT. FOR MASSIVE FIRE IN
STORAGE AREA, USE UNMANNED HOSE HOLDER OR MONITOR NOZZLES; ELSE WITHDRAW FROM
AREA AND LET FIRE BURN (1984 EMERGENCY RESPONSE GUIDEBOOK, DOT P 5800.3).

EXTINGUISH USING AGENTS INDICATED. IF LARGE AMOUNTS OF COMBUSTIBLE MATERIALS
ARE INVOLVED, USE WATER SPRAY OR FOG IN FLOODING AMOUNTS. USE WATER SPRAY TO
ABSORB CORROSIVE VAPORS. COOL CONTAINERS WITH FLOODING AMOUNTS OF WATER FROM
AS FAR A DISTANCE AS POSSIBLE. AVOID BREATHING CORROSIVE VAPORS; KEEP UPWIND

TOXICITY

430 MG/KG ORAL-HUMAN LDLO; 110 MG/KG UNKNOWN-MAN LDLO;

CARCINOGEN STATUS: NONE.

NITRIC ACID IS A SEVERE EYE, MUCOUS MEMBRANE, AND SKIN IRRITANT.

HEALTH EFFECTS AND FIRST AID

INHALATION:

CORROSIVE. 100 PPM IS IMMEDIATELY DANGEROUS TO LIFE AND HEALTH.

ACUTE EXPOSURE- MAY CAUSE COUGHING, HEADACHE, DIZZINESS, AND WEAKNESS.
DELAYED SYMPTOMS MAY INCLUDE DRYNESS OF THE THROAT AND NOSE, CHEST PAIN OR
TIGHTNESS, DYSPNEA, FROTHY SPUTUM, HYPOTENSION AND CYANOSIS FOLLOWED BY
PNEUMONITIS AND PULMONARY EDEMA, WHICH MAY BE FATAL. IF PATIENT RECOVERS,
SCAR TISSUE MAY CAUSE STRICTURE OF THE PYLORUS OR ESOPHAGUS.

CHRONIC EXPOSURE- REPEATED OR PROLONGED EXPOSURE CAUSES DENTAL EROSION
FOLLOWED BY JAW NECROSIS, CHRONIC COUGH AND BRONCHITIS OR CHEMICAL
PNEUMONITIS AND GASTROINTESTINAL DISTURBANCES.

FIRST AID- REMOVE FROM EXPOSURE AREA TO FRESH AIR IMMEDIATELY. IF BREATHING
HAS STOPPED, GIVE ARTIFICIAL RESPIRATION. MAINTAIN AIRWAY AND ADMINISTER
OXYGEN IF AVAILABLE. KEEP AFFECTED PERSON WARM AND AT REST.

SKIN CONTACT:
CORROSIVE.

ACUTE EXPOSURE-- DIRECT CONTACT WITH LIQUID OR CONCENTRATED VAPOR CAUSES IMMEDIATE SEVERE AND PENETRATING BURNS, STAINING THE SKIN YELLOW OR YELLOWISH-BROWN.

CHRONIC EXPOSURE-- PROLONGED OR REPEATED EXPOSURE MAY CAUSE DERMATITIS.

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). IN CASE OF CHEMICAL BURNS, COVER AREA WITH STERILE, DRY DRESSING. BANDAGE SECURELY, BUT NOT TOO TIGHTLY. GET MEDICAL ATTENTION.

EYE CONTACT:
CORROSIVE.

ACUTE EXPOSURE-- DIRECT CONTACT WITH THE LIQUID MAY CAUSE PAIN, PHOTOPHOBIA, TEARING, EDEMA, CORNEAL ULCERATION, SEVERE BURNS, AND NECROSIS OF THE DEEPER TISSUES WITH PERMANENT DAMAGE AND BLINDNESS IS POSSIBLE.

CHRONIC EXPOSURE-- REPEATED OR PROLONGED EXPOSURE MAY CAUSE CONJUNCTIVITIS.

FIRST AID-- WASH EYES IMMEDIATELY WITH LARGE AMOUNTS OF WATER, OCCASIONALLY LIFTING UPPER AND LOWER LIDS, UNTIL NO EVIDENCE OF CHEMICAL REMAINS (APPROXIMATELY 15-20 MINUTES). IN PRESENCE OF BURNS, APPLY STERILE BANDAGES LOOSELY WITHOUT MEDICATION. GET MEDICAL ATTENTION.

INGESTION:
CORROSIVE.

ACUTE EXPOSURE-- IMMEDIATE PAIN IN THE MOUTH, THROAT, AND STOMACH MAY BE FOLLOWED BY VOMITING, AND DIARRHEA OF DARK PRECIPITATED BLOOD. HYPOTENSION, OLIGURIA, ANURIA, SEVERE, POSSIBLY FATAL, CIRCULATORY COLLAPSE, AND ASPHYXIA FROM EDEMA OF THE GLOTTIS ARE POSSIBLE. BURNS OF THE GASTROINTESTINAL TRACT MAY BE SEVERE ENOUGH TO CAUSE PERFORATION OF THE ESOPHAGUS AND STOMACH WHICH MAY BE FOLLOWED BY MEDIASTINITIS OR PERITONITIS, INDICATED BY FEVER.

FIRST AID-- IF VICTIM IS CONSCIOUS, GIVE HIM LARGE QUANTITIES OF WATER IMMEDIATELY TO DILUTE THE ACID. DO NOT INDUCE VOMITING. GIVE PATIENT 1 OUNCE (30 ML) OF MILK OF MAGNESIA. GET MEDICAL ATTENTION IMMEDIATELY.

REACTIVITY

REACTIVITY:

STABLE UNDER NORMAL TEMPERATURES AND PRESSURES. HOWEVER NITRIC VAPOR AND/OR NITRIC OXIDES ARE QUIETLY EVOLVED. ALSO SUNLIGHT CATALYSES THE FORMATION OF THE OXIDES AND THIS GIVES A YELLOW COLOR TO THE CONCENTRATED ACID.

INCOMPATIBILITIES:

EASILY OXIDIZED SUBSTANCES, EXAMPLES FOLLOW:

EXPLOSION: ACETONITRILE, CESIUM CARBIDE, CUPRIC NITRIDE, CYANIDES, 1,2-DIAMINOETHANE BISTRIMETHYL GOLD, DINITROTOLUENE, EPICHLOROHYDRIN, 5-ETHYL-2-METHYL PYRIDINE, CYCLOPENTADIENE, BENZENE, TOLUENE, METALS, METAL CARBIDES, 4-METHYLCYCLOHEXANONE, NITROBENZENE AND WATER, NITROMETHANE, POLYDIBROMOSILANES, PHOSPHORUS TRICHLORIDE, POTASSIUM HYPOPHOSPHITE (ON EVAPORATION), RUBIDIUM CARBIDE, SELENIUM IODOPHOSPHIDE, SULFUR DIOXIDES, THIOCYANATES,

PROBABLE EXPLOSION: ACETONE AND ACETIC ACID, SULFURIC ACID AND GLYCERIDES, TRIAZINE AND TRIFLUOROACETIC ANHYDRIDE @ 36 C.
 POSSIBLE EXPLOSION: ACETIC ACID, 1-AMINOTHIAZOLE AND SULFURIC ACID, CYANATES, 1,3-CYCLOPENTADIENE, FLUORINE, LACTIC ACID AND HYDROGEN FLUORIDE, MESITYLENE, ORGANIC SUBSTANCES AND SULFURIC ACID, ORGANIC SUBSTANCES AND PERCHLORATES, PHTHALIC ACID OR PHTHALIC ANHYDRIDE AND SULFURIC ACID, REDUCING AGENTS, SULFURIC ACID, TITANIUM ALLOY.

EXPLOSION BY FRICTION OR IMPACT: ACETIC ANHYDRIDE.
 EXPLOSIVE OXIDATION: NON-METAL OXIDES- ARSINE, PHOSPHINE, OR TETRABORANE, DIPHENYLDISIBENE.

POSSIBLE EXPLOSION BY IMPACT : TITANIUM-MAGNESIUM ALLOY.
 VIOLENT REACTION: ACRYLONITRILE, ALCOHOLS, ARSINE, CARBON (PULVERIZED), CHLORINE TRIFLUORIDE, CUPROUS NITRIDE, CYCLIC KETONES, CYCLOHEXANOL, ETHANOL, GERMANIUM, HYDRAZINE, SULFUR HALIDES, SULFURIC ACID AND TEREPHTHALIC ACID, THIOALDEHYDES OR THIOKETONES, URANIUM, URANIUM ALLOYS.

VIOLENT OXIDATION: ACETONE AND SULFURIC ACID, SULFAMIC ACID.
 VIOLENT DECOMPOSITION: BUTANETHIOL, PHOSPHINE.
 VIOLENT DECOMPOSITION RESULTING IN IGNITION: CROTONALDEHYDE, TETRAPHOSPHORUS TRITIOIDE.

POSSIBLE VIOLENT REACTION: ANTIMONY.

POSSIBLE VIOLENT EXOTHERMIC REACTION: ANION EXCHANGE RESIN.
 INTENSE EXOTHERMIC REACTION: ACROLEIN, ALLYL ALCOHOL, ALLYL CHLORIDE, 2-AMINOETHANOL, AMMONIUM HYDROXIDE, BISMUTH, N-BUTYRALDEHYDE, CHLOROSULFONIC ACID, CRESOL, CUMENE, DIISOPROPYL ETHER, ETHYLENEDIAMINE, POLYALKENES, GLYOXAL, ISOPRENE, MESITYL OXIDE, 2-METHYL-5-ETHYLPYRIDINE, OLEUM, PROPYLENE OXIDE, PROPIOLACTONE (BETA-), PYRIDENE, SODIUM HYDROXIDE, VINYL ACETATE, VINYLDENE CHLORIDE.

INTENSE REACTION: DIETHYLETHER, HYDRAZOIC ACID, P-XYLENE IN THE PRESENCE OF SULFURIC ACID, SELENIUM, SODIUM AZIDE, TOLUENE, TRIMETHYLTRIOXANE.
 IGNITION WITH POSSIBLE EXPLOSION: HYDROGEN TELLURIDE.
 IGNITION: ANILINE, BORON PHOSPHIDE, BROMINE PENTAFLUORIDE, N-BUTYLMERCAPTAN, CALCIUM HYPOPHOSPHITE, DIBORANE, DIPHENYL TIN, M-ETHYL ANILINE, ETHYL PHOSPHINE, FURFURYL ALCOHOL, HALOGEN PHOSPHIDES, HYDROGEN IODIDES, LITHIUM, METALS, PHOSPHONIUM IODIDE, PHOPHORUS, SELENIUM HYDRIDE, SODIUM, TERPENES, TOLUIDINE, TRIETHYLGALLIUM MONOETHYL ETHER COMPLEX, UNS-DIMETHYLHYDRAZINE.
 POSSIBLE IGNITION: AMMONIA, ANION EXCHANGE RESIN AND CHROMITES OR DICHROMATE, AROMATIC AMINES, DIVINYL ETHER, DIENE OR ACETYLENE DERIVATIVES, LITHIUM, REDUCING AGENTS.

INCANDESCENT REACTION: BORON, FERROUS OXIDE (POWDER), HYDROGEN SULFIDE, LITHIUM SILICIDE, SELENIUM HYDRIDE, MAGNESIUM PHOSPHIDE, MANGANESE, ZINC.
 FORMATION OF HIGHLY EXPLOSIVE PRODUCTS: NITROAROMATIC HYDROCARBONS.
 FORMATION OF EXPLOSIVE PRODUCTS: ACETYLENE, 4-CHLORO-2-NITROANILINE, CYCLOHEXANE, CYCLOHEXYLAMINE, 2,6-DI-T-BUTYL PHENOL, DICHLOROMETHANE, ETHANOL AND SILVER, 5-ETHYL-2-PICOLINE, HYDROGEN PEROXIDE AND KEONES, HYDROGEN PEROXIDE AND MERCURIC OXIDE, HYDROGEN PEROXIDE AND THIOUREA, INDANE AND SULFURIC ACID, METAL SALICYLATES, PHENYLORTHOPOSPHORIC ACID DISODIUM SALT, TITANIUM.
 FORMATION OF POSSIBLY EXPLOSIVE PRODUCTS: BENZOTHIOPHENE DERIVATIVES.
 FORMATION OF EASILY COMBUSTIBLE ESTER: CELLULOSE.
 DETONATABLE MIXTURE (DEPENDING ON AMOUNT OF WATER PRESENT): NITROBENZENE.

DECOMPOSITION:

DECOMPOSES ON EXPOSURE TO AIR OR ORGANIC MATTER, OR WITH HEAT, TO RELEASE HIGHLY TOXIC FUMES OR OXIDES OF NITROGEN, INCLUDING NITRIC OXIDE AND NITROGEN DIOXIDE, AND HYDROGEN NITRATE. REACTS WITH THE FOLLOWING TO RELEASE TOXIC GASES: SULFIDES, CARBONATES, CYANIDES. VIOLENT REACTION WITH ALL CARBIDES, GAS MIXTURE EVOLVED (N2O4) REACTS STRONGLY WITH HYDROCARBONS, FLUORINE, OR

FORMALDEHYDE.

POLYMERIZATION:
WILL NOT OCCUR.

CONDITIONS TO AVOID

MAY IGNITE COMBUSTIBLE MATERIALS (WOOD, PAPER, OIL, ETC.). REACTS VIOLENTLY WITH WATER AND FUELS. FLAMMABLE. POISONOUS GASES MAY ACCUMULATE IN TANKS AND HOPPER CARS. RUNOFF TO SEWER MAY CREATE FIRE OR EXPLOSION HAZARD. AVOID CONTACT WITH OR STORAGE WITH INCOMPATIBLE MATERIALS, INCLUDING THOSE MATERIALS AND CLASSES OF MATERIALS LISTED IN THE REACTIVITY SECTION. HEATING MAY INCREASE THE EVOLUTION OF NITRIC ACID VAPOR AND/OR NITROGEN OXIDES (GASES) BEYOND AN ACCEPTABLE LEVEL.

SPILL AND LEAK PROCEDURES

OCCUPATIONAL SPILL:
KEEP COMBUSTIBLES (WOOD, PAPER, OIL AND OTHER EASILY OXIDIZABLE MATERIALS) AWAY FROM SPILLED MATERIAL. WEAR PERSONAL PROTECTIVE EQUIPMENT. DO NOT TOUCH SPILLED MATERIAL. STOP LEAK IF YOU CAN DO IT WITHOUT RISK. USE WATER SPRAY TO REDUCE VAPORS. DILUTE SPILLS OR LEAKS WITH PLENTY OF WATER. NEUTRALIZE RESIDUE WITH (A) ALKALI, SUCH AS SOLDA ASH, LIME, LIMESTONE; OR (B) OTHER SUITABLE NEUTRALIZATION MATERIALS. ADEQUATE VENTILATION IS REQUIRED TO ELIMINATE ANY NITROGEN OXIDES RELEASED AND, IF SODA ASH OR LIMESTONE IS USED, CO₂. ABSORB WITH EXCESS SODA ASH, SCOOP UP AND PLACE IN A SUITABLE E.G. GLASS OR PLASTIC CONTAINER AND CLOSE. LABEL 'OXIDIZER'. KEEP OUT OF SEWERS AND WATER SOURCES. KEEP UNNECESSARY PEOPLE AWAY. ISOLATE HAZARD AREA AND DENY ENTRY. VENTILATE CLOSED SPACES BEFORE ENTERING.

PROTECTIVE EQUIPMENT

VENTILATION:
PROVIDE LOCAL EXHAUST VENTILATION, PROCESS ENCLOSURE OR GENERAL DILUTION VENTILATION TO MEET PERMISSIBLE EXPOSURE LIMITS REQUIREMENTS. EQUIPMENT MUST BE CORROSION-RESISTANT.

RESPIRATOR:
EXPOSURE LIMIT TO 100 MG/M³-
SELF-CONTAINED BREATHING APPARATUS WITH A FULL FACEPIECE OPERATED IN PRESSURE-DEMAND OR OTHER POSITIVE-PRESSURE MODE.
TYPE 'C', SUPPLIED-AIR RESPIRATOR OPERATED IN PRESSURE-DEMAND OR OTHER POSITIVE-PRESSURE OR CONTINUOUS FLOW MODE.

> 100 MG/M³, INCLUDING THE IDLH LEVEL, 250 MG/M³-
SELF-CONTAINED BREATHING APPARATUS WITH A FULL FACEPIECE OPERATED IN PRESSURE-DEMAND OR OTHER POSITIVE-PRESSURE MODE,
OR USE EQUIVALENT RESPIRATOR.

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

CLOTHING:
EMPLOYEE MUST WEAR IMPERVIOUS CLOTHING AS NECESSARY TO AVOID ANY POSSIBILITY

OF CONTACT WITH CHEMICAL. **NITRIC ACID** PAGE 06 OF 06

GLOVES: WEAR IMPERVIOUS GLOVES AS NECESSARY TO AVOID ANY POSSIBILITY OF CONTACT WITH SUBSTANCE. PREFERRED MATERIALS: VITON OR SARANEX.

EYE PROTECTION: WEAR FACESHIELD (8 INCH MINIMUM) AND VENTED SAFETY GOGGLES. DO NOT WEAR CONTACT LENSES WHEN WORKING WITH CHEMICALS.

AUTHORIZED - ALLIED FISHER SCIENTIFIC
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10036

MMSODIUM HYDROXIDEMM
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MATERIAL SAFETY DATA SHEET

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

EMERGENCY CONTACTS
GASTON L. PILLORI
(201) 796-7100

DATE: 10/21/86
PO NBR: N/A
ACCT: 878202-02
INDEX: 12-8628-90170
CAT NO: 5318500

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SUBSTANCE IDENTIFICATION

SUBSTANCE: MMSODIUM HYDROXIDEMM
CAS-NUMBER 1310-73-2

TRADE NAMES/SYNONYMS: CAUSTIC SODA; SODA LYE; LYE; WHITE CAUSTIC; CAUSTIC ALKALI; CAUSTIC SODA, BEAD; CAUSTIC SODA, DRY; CAUSTIC SODA, FLAKE; CAUSTIC SODA, GRANULAR; CAUSTIC SODA, SOLID; SODIUM HYDRATE; SODIUM HYDROXIDE, BEAD; SODIUM HYDROXIDE, FLAKE; SODIUM HYDROXIDE, DRY; SODIUM HYDROXIDE, SOLID; S-613 ASCARITE; S-310; S-320; S-612

CHEMICAL FAMILY:
INORGANIC BASE

MOLECULAR FORMULA: NA-O-H MOL WT: 40.00

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

COMPONENTS AND CONTAMINANTS

- PERCENT: 97 COMPONENT: SODIUM HYDROXIDE
- PERCENT: 0.50 COMPONENT: SODIUM CARBONATE
- PERCENT: .008 COMPONENT: SODIUM CHLORIDE
- PERCENT: <0.1 COMPONENT: SODIUM SULFATE
- PERCENT: 0.1 COMPONENT: POTASSIUM, CALCIUM, AND MAGNESIUM

OTHER CONTAMINANTS: SILICON DIOXIDE (0.03%) AND OTHER METALS (0.01%).

1003

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PHYSICAL DATA

DESCRIPTION: ODORLESS, WHITE OR OFF-WHITE HYGROSCOPIC SOLID.

BOILING POINT: 2534 F (1390 C) MELTING POINT: 605 F (318 C)

SPECIFIC GRAVITY: 2.1 VAPOR PRESSURE: 42 MMHG @ 1000 C

PH: 14 FOR A 5% AQ SOLN SOLUBILITY IN WATER: 42%

SOLVENT SOLUBILITY: ALCOHOL, GLYCEROL.

FIRE AND EXPLOSION DATA

FIRE AND EXPLOSION HAZARD:
NEGLECTIBLE FIRE AND EXPLOSION HAZARD WHEN EXPOSED TO HEAT OR FLAME.

FLASH POINT: NON-FLAMMABLE

FIREFIGHTING MEDIA:
DRY CHEMICAL, CARBON DIOXIDE, WATER SPRAY OR FOAM
(1984 EMERGENCY RESPONSE GUIDEBOOK, DOT P 5800.3).

FOR LARGER FIRES, USE FLOODING QUANTITIES OF WATER.

FIREFIGHTING:
MOVE CONTAINERS FROM FIRE AREA IF POSSIBLE. COOL CONTAINERS EXPOSED TO FLAMES
WITH WATER FROM SIDE UNTIL WELL AFTER FIRE IS OUT (1984 EMERGENCY RESPONSE
GUIDEBOOK, DOT P 5800.3).

TOXICITY

1 1/24 HOURS EYE-MONKEY SEVERE IRRITATION; 50 MG/24 HOURS SKIN-RABBIT SEVERE
IRRITATION; 1x EYE-RABBIT SEVERE IRRITATION; 50 UG/24 HOURS EYE-RABBIT SEVERE
IRRITATION; 1 MG/24 HOURS EYE-RABBIT SEVERE IRRITATION;
CARCINOGEN STATUS: NONE.

SODIUM HYDROXIDE IS AN EYE AND MUCOUS MEMBRANE IRRITANT AND SEVERE SKIN
IRRITANT.

HEALTH EFFECTS AND FIRST AID

INHALATION:

-CORROSIVE. 200 MG/M3 IS IMMEDIATELY DANGEROUS TO LIFE AND HEALTH.
ACUTE EXPOSURE- THE EFFECTS OF THE DUST OR MIST WILL VARY FROM MILD
IRRITATION OF THE NOSE & 2 MG/M3 TO SEVERE PNEUMONITIS DEPENDING ON THE
SEVERITY OF EXPOSURE. LOW CONCENTRATIONS MAY CAUSE SORE THROAT, COUGHING,
AND LABORED BREATHING. INTENSE EXPOSURES MAY RESULT IN DELAYED PULMONARY
EDEMA.

CHRONIC EXPOSURE- PROLONGED EXPOSURE MAY CAUSE BRONCHIAL IRRITATION,
COUGHING, BRONCHIAL PNEUMONIA, AND GASTROINTESTINAL DISTURBANCES.

2
- BREATHING

MADE U.S. OF 06
HAS STOPPED, GIVE ARTIFICIAL RESPIRATION. KEEP AFFECTED PERSON WARM AND AT REST. GET MEDICAL ATTENTION AS SOON AS POSSIBLE.

SKIN CONTACT:

ACUTE EXPOSURE- ON THE SKIN. SOLUTIONS OF 25 TO 50X MAY CAUSE THE SENSATION OF IRRITATION WITHIN ABOUT 3 MINUTES. WITH SOLUTIONS OF 4X THIS DOES NOT OCCUR UNTIL AFTER SEVERAL HOURS. IF NOT REMOVED FROM THE SKIN, SEVERE BURNS WITH DEEP ULCERATION MAY OCCUR. EXPOSURE TO THE DUST OR MIST MAY CAUSE MULTIPLE SMALL BURNS AND TEMPORARY LOSS OF HAIR.

CHRONIC EXPOSURE- REPEATED EXPOSURE MAY RESULT IN DERMATITIS.

FIRST AID- REMOVE CONTAMINATED CLOTHING WHILE RUNNING STREAMS OF WATER UNDER CLOTHING. WASH AFFECTED AREA WITH SOAP OR MILD DETERGENT AND LARGE AMOUNTS OF WATER (APPROXIMATELY 15-20 MINUTES) UNTIL NO EVIDENCE OF CHEMICAL REMAINS. FOR CHEMICAL BURNS, APPLY STERILE BANDAGE SECURELY, BUT NOT TOO TIGHTLY. GET MEDICAL ATTENTION.

EYE CONTACT:

ACUTE EXPOSURE- CONTACT MAY CAUSE DISINTEGRATION AND SLOUGHING OF CONJUNCTIVAL AND CORNEAL EPITHELIUM, CORNEAL OPAECIFICATION, MARKED EDEMA AND ULCERATION; AFTER 7 TO 13 DAYS EITHER GRADUAL RECOVERY BEGINS OR THERE IS PROGRESSION OF ULCERATION AND CORNEAL OPAECIFICATION. COMPLICATIONS OF SEVERE EYE BURNS ARE SYMBLEPHARON WITH OVERGROWTH OF THE CORNEA BY A VASCULARIZED MEMBRANE, PROGRESSIVE OR RECURRENT CORNEAL ULCERATION AND PERMANENT CORNEAL OPAECIFICATION.

CHRONIC EXPOSURE- REPEATED OR PROLONGED VAPOR CONTACT AT LOW LEVELS OF EXPOSURE MAY CAUSE CONJUNCTIVITIS.

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

INGESTION:

CORROSIVE.

ACUTE EXPOSURE- SEVERE ABDOMINAL PAIN, CORROSION OF THE LIPS, MOUTH, TONGUE, AND PHARYNX, AND VOMITING OF LARGE PIECES OF MUCOSA. ASPHYXIA CAN OCCUR FROM SWELLING OF THE THROAT. PERFORATION OF THE ESOPHAGUS AND STOMACH CAN OCCUR. CASES OF SQUAMOUS CELL CARCINOMA OF THE ESOPHAGUS HAVE OCCURRED WITH LATENT PERIODS OF 12 TO 42 YEARS AFTER INGESTION; A RESULT TISSUE DESTRUCTION AND POSSIBLY SCAR FORMATION RATHER THAN THE RESULT OF DIRECT CARCINOGENIC ACTION.

FIRST AID- IF VICTIM IS CONSCIOUS, GIVE HIM LARGE QUANTITIES OF WATER IMMEDIATELY TO DILUTE THE ALKALI. DO NOT INDUCE VOMITING. GET MEDICAL ATTENTION IMMEDIATELY.

REACTIVITY

REACTIVITY:

THE SUBSTANCE IS A STRONG BASE. IT REACTS EXOTHERMICALLY WITH WATER RELEASING CORROSIVE FUMES OF SODIUM HYDROXIDE.

INCOMPATIBILITIES:

ACETALDEHYDE: RESULTS IN VIOLENT POLYMERIZATION OF ACETALDEHYDE.
 ACETIC ACID: MIXING IN A CLOSED CONTAINER INCREASES TEMPERATURE AND PRESSURE
 ACETIC ANHYDRIDE: MIXING IN A CLOSED CONTAINER INCREASES TEMPERATURE AND PRESSURE.
 ACROLEIN: RESULTS IN AN EXTREMELY VIOLENT POLYMERIZATION OF ACROLEIN.
 ACRYLONITRILE: VIOLENT POLYMERIZATION.
 ALLYL ALCOHOL: AS A BENZENE EXTRACT OF ALLYL BENZENESULFONATE WAS PREPARED FROM ALLYL ALCOHOL AND BENZENE SULFONYL CHLORIDE IN THE PRESENCE OF AQUEOUS SODIUM HYDROXIDE, UNDER VACUUM DISTILLATION TWO FRACTIONS CAME OFF, THEN THE TEMPERATURE ROSE TO 135 C, WHEN THE RESIDUE DARKENED AND EXPLODED.
 ALLYL CHLORIDE: IN CONTACT WITH DRY CAUSTIC SODA BEADS, HYDROLYSIS MAY TAKE PLACE PRODUCING ALLYL ALCOHOL.
 ALUMINUM: VIGOROUS REACTION WITH THE EVOLUTION OF FLAMMABLE HYDROGEN GAS.
 CHLORINE TRIFLUORIDE: VIOLENT REACTION.
 CHLOROFORM AND METHYL ALCOHOL: EXOTHERMIC REACTION.
 CHLOROHYDRIN: MIXING IN A CLOSED CONTAINER CAUSES AN INCREASE IN TEMPERATURE AND PRESSURE.
 CHLORONITROTOLUENES: POSSIBLE EXPLOSION.
 CHLOROSULFONIC ACID: MIXING IN A CLOSED CONTAINER CAUSES AN INCREASE IN TEMPERATURE AND PRESSURE.
 1,2-DICHLOROETHYLENE: MAY FORM SPONTANEOUSLY FLAMMABLE MONOCHLOROACETYLENE.
 ETHYLENE CYANOHYDRIN: MIXING IN A CLOSED CONTAINER CAUSES AN INCREASE IN TEMPERATURE AND PRESSURE.
 GLYOXAL: MIXING IN A CLOSED CONTAINER INCREASES TEMPERATURE AND PRESSURE.
 HALOGENATED HYDROCARBONS: VIOLENT REACTION.
 HYDROCHLORIC ACID: MIXING IN A CLOSED CONTAINER CAUSES AN INCREASE IN TEMPERATURE AND PRESSURE.
 HYDROFLUORIC ACID: MIXING IN A CLOSED CONTAINER CAUSES AN INCREASE IN TEMPERATURE AND PRESSURE.
 HYDROQUINONE: RAPID DECOMPOSITION OF HYDROQUINONE WITH EVOLUTION OF HEAT.
 MALEIC ANHYDRIDE: EXPLOSIVE DECOMPOSITION.
 METALS: CORRODES METALS, REACTING TO FORM FLAMMABLE HYDROGEN GAS.
 NITRIC ACID: MIXING IN A CLOSED CONTAINER INCREASES TEMPERATURE AND PRESSURE
 NITROETHANE: FORMS AN EXPLOSIVE SALT.
 NITROMETHANE: FORMS AN EXPLOSIVE SALT.
 NITROPARAFFINS: THE NITROPARAFFINS, IN THE PRESENCE OF WATER, FORM DRY SALTS WITH ORGANIC BASES. THE DRY SALTS ARE EXPLOSIVE.
 NITROPROPANE: FORMS AN EXPLOSIVE SALT.
 OLEUM: MIXING IN A CLOSED CONTAINER CAUSES AN INCREASE IN TEMPERATURE AND PRESSURE.
 PENTOL (3-METHYL-2-PENTEN-4-YN-1-OL): POSSIBLE EXPLOSION.
 PHOSPHORUS: PHOSPHORUS BOILED WITH ALKALINE HYDROXIDES YIELDS MIXED PHOSPHINES WHICH MAY IGNITE SPONTANEOUSLY IN AIR.
 PHOSPHORUS PENTOXIDE: EXTREMELY VIOLENT REACTION WHEN INITIATED BY LOCAL HEATING.
 B-PROPIOLACTONE: MIXING IN A CLOSED CONTAINER CAUSES AN INCREASE IN TEMPERATURE AND PRESSURE.
 SULFURIC ACID: MIXING IN A CLOSED CONTAINER CAUSES AN INCREASE IN TEMPERATURE AND PRESSURE.
 TETRACHLOROBENZENE AND METHYL ALCOHOL: POSSIBLE EXPLOSION.
 TETRAHYDROFURAN: SERIOUS EXPLOSIONS CAN OCCUR.
 TRICHLOROETHYLENE: FORMATION OF EXPLOSIVE MIXTURES OF DICHLOROACETYLENE.
 WATER: CAUSTIC SODA BEADS IN CONTACT WITH WATER MAY GENERATE ENOUGH HEAT TO IGNITE ADJACENT COMBUSTIBLES.

DECOMPOSITION: MAY RELEASE TOXIC FUMES OF SODIUM OXIDE, WHICH CAN REACT WITH WATER OR STEAM TO PRODUCE HEAT AND FLAMMABLE HYDROGEN VAPORS.

POLYMERIZATION: NOT KNOWN TO OCCUR.

CONDITIONS TO AVOID

MAY BURN BUT DOES NOT IGNITE READILY. FLAMMABLE, POISONOUS GASES MAY ACCUMULATE IN TANKS AND HOPPER CARS. MAY IGNITE COMBUSTIBLES (WOOD, PAPER, OIL, ETC.).

SPILL AND LEAK PROCEDURES

SOIL SPILL: DIG HOLDING AREA SUCH AS LAGOON, POND OR PIT FOR CONTAINMENT.

USE PROTECTIVE COVER SUCH AS A PLASTIC SHEET TO PREVENT MATERIAL FROM DISSOLVING IN FIRE EXTINGUISHING WATER OR RAIN.

WATER SPILL: ADD SUITABLE AGENT TO NEUTRALIZE SPILLED MATERIAL TO PH-7.

OCCUPATIONAL SPILL: DO NOT TOUCH SPILLED MATERIAL. STOP LEAK IF YOU CAN DO IT WITHOUT RISK. FOR SMALL SPILLS, TAKE UP WITH SAND OR OTHER ABSORBENT MATERIAL AND PLACE INTO CONTAINERS FOR LATER DISPOSAL. FOR SMALL DRY SPILLS, WITH CLEAN SHOVEL PLACE MATERIAL INTO CLEAN, DRY CONTAINER AND COVER. MOVE CONTAINERS FROM SPILL AREA. FOR LARGER SPILLS, DIKE FAR AHEAD OF SPILL FOR LATER DISPOSAL. KEEP UNNECESSARY PEOPLE AWAY. ISOLATE HAZARD AREA AND DENY ENTRY.

PROTECTIVE EQUIPMENT

VENTILATION: PROVIDE LOCAL EXHAUST VENTILATION SYSTEM TO MEET PERMISSIBLE EXPOSURE LIMITS.

RESPIRATOR: 100 MG/M3- HIGH-EFFICIENCY PARTICULATE RESPIRATOR WITH A FULL FACEPIECE. SUPPLIED-AIR RESPIRATOR WITH A FULL FACEPIECE, HELMET, OR HOOD. SELF-CONTAINED BREATHING APPARATUS WITH A FULL FACEPIECE.

200 MG/M3- POWERED AIR-PURIFYING RESPIRATOR WITH A HIGH-EFFICIENCY PARTICULATE FILTER AND A FULL FACEPIECE.
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.

ESCAPE- DUST MASK, EXCEPT SINGLE-USE AND QUARTER-MASK RESPIRATORS. SELF-CONTAINED BREATHING APPARATUS.

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

R-2-207.4

CLOTHING:
EMPLOYEE MUST WEAR APPROPRIATE PROTECTIVE CLOTHING AND EQUIPMENT TO PREVENT ANY POSSIBILITY OF 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 AND A FACESHIELD TO PREVENT CONTACT WITH THIS SUBSTANCE.

WHERE THERE IS ANY POSSIBILITY THAT AN EMPLOYEE'S EYES MAY BE EXPOSED TO THIS SUBSTANCE, THE EMPLOYER SHALL PROVIDE AN EYE-WASH FOUNTAIN WITHIN THE IMMEDIATE WORK AREA FOR EMERGENCY USE.

AUTHORIZED - ALLIED FISHER SCIENTIFIC
- CREATION DATE: 01/21/85 REVISION DATE: 05/01/85

- ADDITIONAL INFORMATION -
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R-2-207.4

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CHEM REPORT
05/23/1986

11252

CHEM ID CHEM NAME
* * *
* 6034-86-0 URANIUM COMPOUNDS

ENTRY INFORMATION
05/23/1986

PREPARER REVIEWER ENTRY DATE REVISED
* * *
* P. AVERILL J. BROWER 02/13/1985 05/16/1986

DOE CHEMICAL HAZARDS EMERGENCY MANAGEMENT SYSTEM
05/23/1986

HEALTH AND SAFETY INFORMATION (AUTHOR)

CHEMICAL NAME OR SYNONYM
* * *
* URANIUM COMPOUNDS
* URANIUM INSOLUBLE COMPOUNDS
* URANIUM SOLUBLE COMPOUNDS
* 6034-86-0

DISPOSAL

RECOVERY FOR REPROCESSING URANIUM IS THE PREFERRED METHOD FOR HANDLING WASTE URANIUM COMPOUNDS. SHIP TO LICENSED RECOVERY FACILITY. UNRECOVERED MATERIAL SHOULD BE HANDLED AND PACKAGED AS RADIOACTIVE WASTE SHIPPED TO AN APPROVED SITE BY AN APPROVED DISPOSAL FIRM.

DECOMPOSITION PRODUCTS

TOXIC GASES AND VAPORS (SUCH AS HYDROGEN FLUORIDE, NITROGEN OXIDES, AND CARBON MONOXIDE) MAY BE RELEASED WHEN URANIUM COMPOUNDS DECOMPOSE. SEE SPECIFIC COMPOUND.

ENVIRONMENTAL EFFECTS

NO CRITERIA SET, BUT EPA SUGGEST A PERMISSIBLE CONCENTRATION IN WATER OF 3 UG/L BASED ON HEALTH EFFECTS.

EMERGENCY PROCEDURES

PERSONS NOT WEARING PROTECTIVE EQUIPMENT AND CLOTHING SHOULD BE RESTRICTED FROM AREAS OF SPILLS UNTIL CLEANUP HAS BEEN COMPLETED. IF URANIUM COMPOUNDS ARE SPILLED, 1. VENTILATE AREA OF SPILL. 2. COLLECT SPILLED MATERIAL IN THE MOST CONVENIENT AND SAFE MANNER AND DEPOSIT IN SEALED CONTAINERS FOR RECLAMATION. LIQUID CONTAINING URANIUM OR INSOLUBLE COMPOUNDS SHOULD BE ABSORBED IN VERMICULITE, DE SAND, EARTH, OR A SIMILAR MATERIAL. SPILL AREAS MAY BE DECONTAMINATE USING A SOLUTION WITH A CHELATING AGENT SUCH AS EDTA.

FIRST AID

IF MATERIAL GET INTO THE EYES, WASH EYES IMMEDIATELY WITH LARGE AMOUNTS OF WATER. GET MEDICAL AID. CONTACT LENSES SHOULD NOT BE WORN WHEN WORKING WITH THESE CHEMICALS.
SKIN EXPOSURE - IF COMPOUND GET ON THE SKIN, PROMPTLY WASH THE CONTAMINATED SKIN USING SOAP AND MILD DETERGENT AND WATER. IF THEY PENETRATE THROUGH THE CLOTHING, REMOVE THE CLOTHING IMMEDIATELY AND WASH THE SKIN USING SOAP OR MILD DETERGENT AND WATER. IF IRRITATION IS PRESENT AFTER WASHING, GET MEDICAL ATTENTION.
BREATHING - IF A PERSON BREATHE IN LARGE AMOUNTS OF URANIUM COMPOUND MOVE THE EXPOSED PERSON TO FRESH AIR AT ONCE. IF BREATHING HAS STOPPED, PERFORM ARTIFICIAL RESPIRATION. KEEP THE AFFECTED PERSON WARM AND AT REST. GET MEDICAL ATTENTION AS SOON AS POSSIBLE.
SWALLOWING - WHEN SOLIDS OR LIQUIDS CONTAINING URANIUM OR INSOLUBLE COMPOUNDS HAVE BEEN SWALLOWED, GIVE THE PERSON LARGE QUANTITIES OF WATER IMMEDIATELY. AFTER THE WATER HAS BEEN SWALLOWED, TRY TO GET THE PERSON TO VOMIT BY TOUCHING THE BACK OF THE THROAT WITH A FINGER DO NOT MAKE AN UNCONSCIOUS PERSON VOMIT. GET MEDICAL ATTENTION IMMEDIATELY.

FIRE HAZARD

MANY URANIUM COMPOUNDS ARE FLAMMABLE, IF IN FIRE, URANIUM COMPOUNDS ARE NOT COMBUSTIBLE, IF IN FIRE, URANIUM COMPOUNDS MAY EMIT TOXIC PRODUCTS. SOME COMPOUNDS ARE WATER REACTIVE. SEE SPECIFIC COMPOUND.

HEALTH HAZARD

HIGHLY TOXIC AND RADIOACTIVE. URANIUM COMPOUNDS ARE TOXIC IF THEY ARE INHALED, SWALLOWED, OR IF THEY COME IN CONTACT WITH THE EYES OR SKIN. URANIUM INSOLUBLE COMPOUNDS ARE LESS TOXIC THAN THE SOLUBLE COMPOUNDS. THEY ARE WEAKLY RADIOACTIVE AND ARE PRINCIPALLY ALPHA PARTICLE EMITTERS. THEY DO NOT CONSTITUTE A SIGNIFICANT EXTERNAL RADIATION AND CHEMICAL HAZARD. THEY MAY CAUSE AN INCREASE IN CANCER OF THE LYMPHATIC AND BLOOD-FORMING TISSUES IN MAN. PROLONGED CONTACT WITH THE SKIN MIGHT CAUSE RADIATION DAMAGE TO THE SKIN AND/OR SKIN RASH (DERMATITIS). PROLONGED INHALATION HAS CAUSED DAMAGE TO THE LUNGS OF ANIMALS. THEY ARE HIGHLY TOXIC TO THE KIDNEY AND LIVER.

CHEMICAL INCOMPATIBILITIES

VARIES WITH COMPOUND.

MEDICAL RECOMMENDATIONS

SPECIAL ATTENTION SHOULD BE GIVEN TO THE BLOOD, LUNGS, KIDNEY, AND LIVER IN PREEMPLOYMENT MEDICAL EXAMS. PERIODIC MEDICAL EXAM SHOULD INCLUDE A CHEST X-RAY, URINALYSIS, COMPLETE BLOOD COUNT AND CHEMISTRY.

PHYSICAL DESCRIPTION

VARIES WITH COMPOUND.

PROTECTION MEASURES

GOOD ENGINEERING CONTROLS SHOULD BE USED TO REDUCE ENVIRONMENTAL CONCENTRATION TO THE PERMISSIBLE EXPOSURE LEVEL (PEL). ABOVE THE PEL RESPIRATORY PROTECTION MUST BE WORN. AT A U CONCENTRATION OF 2.5 MG/ OR LESS WEAR ANY FUME RESPIRATOR OR HIGH EFFICIENCY PARTICULATE RESPIRATOR APPROVED FOR RADIONUCLIDES. A SUPPLIED-AIR RESPIRATOR, OR A SCBA. EMPLOYEES SHOULD WEAR IMPERVIOUS CLOTHING, GLOVES, AND GOGGLES TO PREVENT REPEATED OR PROLONGED SKIN CONTACT WITH SOLIDS OR LIQUIDS URANIUM OR INSOLUBLE COMPOUNDS. SKIN THAT BECOMES CONTAMINATED WITH URANIUM OR INSOLUBLE COMPOUNDS SHOULD BE PROMPTLY WASHED WITH SOAP OR MILD DETERGENT AND WATER. EATING AND SMOKING SHOULD NOT BE PERMITTED IN AREAS WHERE SOLIDS OR LIQUIDS CONTAINING URANIUM OR INSOLUBLE COMPOUNDS ARE HANDLED, PROCESSED, OR STORED. EMPLOYEES WHO HANDLE SOLIDS OR LIQUIDS CONTAINING URANIUM OR INSOLUBLE COMPOUNDS SHOULD WASH THEIR HANDS THOROUGHLY WITH SOAP OR MILD DETERGENT AND WATER BEFORE EATING, SMOKING, OR USING TOILET FACILITIES.

SAMPLING METHODS

NO STANDARD MEASUREMENT METHODS FOR URANIUM COMPOUNDS HAVE BEEN PUBLISHED BY NIOSH. MAY BE SAMPLED USING A CELLULOSE ESTER FILTER AND ANALYZED BY ATOMIC ABSORPTION.

SHIPPING INFORMATION

SHIP AS RADIOACTIVE MATERIAL. OTHER REQUIREMENTS VARY WITH COMPOUND LEVEL OF RADIOACTIVITY, PROPORTION OF FISSIONABLE ISOTOPES AND AMOUNT SH

CHEMICAL CATEGORIES
05/23/1986

| CATEGORY | CLASS NAME | CLASS CODE |
|------------------------------|-------------------|------------|
| *** | | |
| * CHEMICAL | URANIUM COMPOUNDS | |
| * HAZARD CODE | HEALTH | 3 |
| * HEALTH HAZARD | KIDNEY | |
| * PHYSICAL HAZARD | RADIOACTIVE | |
| * TRANSPORTATION | RADIOACTIVE | |
| CHEM NAME: URANIUM COMPOUNDS | | |

CHEMICAL ATTRIBUTES
05/23/1986

| ATTRIBUTE | VALUE | UNITS | QUALITY | COMMENTS |
|------------------|-------|-----------------------|---------|------------|
| *** | | | | |
| * HALF LIFE | 4.500 | 10 ⁹ YEARS | | |
| * EXPOSURE LIMIT | 0.050 | MG/CM ³ | PEL | SOLUBLE U |
| * EXPOSURE LIMIT | 0.200 | MG/CM ³ | TEL | AS U |
| * EXPOSURE LIMIT | 0.250 | MG/CM ³ | PEL | AS INSOLUI |

SELECTED MATERIALS THAT ARE RELATED TO OR CONTAIN THE SUBSTANCE
05/23/1986

CHEM NAME* URANIUM COMPOUNDS

- ***
- * URANIUM
- * URANIUM DICARBIDE
- * URANIUM DIOXIDE
- * URANIUM HEXAFLUORIDE
- * URANIUM HYDRIDE
- * URANIUM TETRAFLUORIDE
- * URANYL NITRATE

MATERIAL SAFETY DATA SHEET

KEROSENE

10055

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MARKETED BY:

THE STANDARD OIL COMPANY (OHIO)
 BORON OIL COMPANY
 BP OIL INC.
 Midland Building
 Cleveland, Ohio 44115

CORPORATE EMERGENCY TELEPHONE (Toll-Free)

FROM WITHIN OHIO: 800-362-8059
 FROM OUTSIDE OHIO: 800-321-8642
 CHEMTREC (CMA): 800-424-9300

DESCRIPTION

CHEMICAL NAME: Petroleum hydrocarbons **CAS REGISTRY NO.:** 8008-20-6
SYNONYMS: Refined straight-run petroleum distillate, also used as No. 1 Heat Oil, No. 1 Diesel Fuel, Kerosene
CHEMICAL FAMILY: Hydrocarbons **FORMULA:** Mixture **MOL. WT.:** N.A.
COMPOSITION: Refined petroleum hydrocarbons distilling within the range of 300° to 550°F (paraffins, naphthenes, aromatics) plus very minor amounts (ppm range) of metal deactivator and antistatic agent. Product contains not more than 0.3% S, and conforms to ASTM D-3699 specifications for type K-2 kerosine, suitable for use in flue-connected appliances and heaters. **PRODUCT DOES NOT MEET 0.04% SULFUR LIMIT FOR TYPE K-1 KEROSENE AND SHOULD NOT BE USED IN NON-FLUE CONNECTED APPLIANCES OR HEATERS OR WICK LAMPS.**

STATEMENT OF HEALTH HAZARD

HAZARD DESCRIPTION: Combustible liquid. No acute effects from limited incidental contact. Ingestion may be accompanied by aspiration into lungs, which can cause severe pneumonitis.
EXPOSURE LIMITS: 500 ppm threshold limit value (TLV) for vapors; 5 mg./M³ for oil mist in air (8 hour time weighted average exposure, OSHA 29 CFR 1910.1000, Table Z-1).

EMERGENCY TREATMENT

EFFECTS OF OVEREXPOSURE: Vapors may irritate eyes, nose, and throat, and at high concentration cause headache, dizziness. Excessive prolonged or repeated skin contact may cause drying, dermatitis due to defatting action common to all oils. Ingestion may create discomfort, but without lasting effect. Aspiration of liquid oil into lungs can cause dangerous pneumonitis. Inhalation of mist is not known to have adverse effect but should be avoided.
EMERGENCY AID: Eyes: flush with copious water for 15 min., holding eyelids apart and away from eyeball. Skin contact: remove contaminated clothing and wash contacted areas with mild soap and water. Use emollient cream if needed. Inhalation of vapors: remove patient to fresh air, administer oxygen or artificial respiration if needed. Swallowing: Do not induce vomiting because of risk of aspiration. After spontaneous vomiting, monitor patient for difficult breathing. **EFFECT OF LIQUID IN LUNGS MAY BE DELAYED ONE OR TWO DAYS. IF SYMPTOMS PERSIST OR EXPOSURE IS SEVERE, SEEK PROMPT MEDICAL HELP.**
NOTE TO PHYSICIAN: Petroleum aspiration may cause severe pneumonitis ("oil pneumonia"). Vomiting should not be induced, and gastric lavage should be undertaken with consideration of endotracheal intubation, especially in an unconscious patient.

PHYSICAL DATA

BOILING PT.: Initial: 300°F **FREEZING PT.:** Not applicable
VAPOR PRESSURE: at 68°F: 0.4 mm. Hg **VAPOR DENSITY (Air=1):** 4.7
SPECIFIC GRAVITY: at 60°F: 0.825 **SOLUBILITY IN WATER:** Negligible
PERCENT VOLATILE: at 100°F: 0% **EVAPORATION RATE (Water=1):** Slower
APPEARANCE AND ODOR: Colorless or straw-colored clear liquid with hydrocarbon odor.

FIRE AND EXPLOSION HAZARD DATA

FLASH POINT: min. 120°F (ASTM D 93) **AUTOIGNITION TEMP.:** 410°F
FLAMMABLE LIMITS IN AIR: LOWER: 0.7% UPPER: 5.0%
EXTINGUISHING MEDIA: Foam, carbon dioxide, dry chemicals, water fog, sand or earth.
SPECIAL FIRE-FIGHTING PROCEDURES: Do not direct water directly into fire to avoid splatter, spread. Use water to cool threatened surroundings. Avoid breathing fumes. Use self-contained air supply if needed.
UNUSUAL FIRE AND EXPLOSION HAZARDS: Product is a combustible liquid. Exposure to extreme heat may cause pressure in closed containers. Atomized mist or heated vapor may ignite with explosive violence.

MATERIAL SAFETY DATA SHEET - KEROSENE

Page Two

CHEMICAL REACTIVITY

STABILITY: Stable.

CONDITIONS TO AVOID: Extreme heat, contact with strong oxidizers (peroxides, chlorine, oxygen under pressure).

HAZARDOUS DECOMPOSITION PRODUCTS: Volatile hydrocarbons from thermal decomposition; carbon monoxide from combustion.

SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN: Remove sources of ignition. Contain spill. Recover liquid by mopping, vacuum, or solid absorbent. Avoid excessive contact with liquid or vapors.

WASTE DISPOSAL: Deposit recovered liquid in waste oil system, incinerate, or dispose of liquid and contaminated absorbent and diking material in landfill in compliance with federal, state, and local regulations. Kerosene may be a hazardous waste under RCRA (40 CFR 261.21). EPA hazardous waste number D001, characteristic of ignitibility, flash point below 140°F.

SPECIAL PROTECTION AND PROCEDURES

RESPIRATORY PROTECTION: Not needed in normal use. A cartridge-type respirator should be used where misting is a problem, and self-contained breathing apparatus in emergencies involving high vapor concentration.

VENTILATION: Local or mechanical ventilation sufficient to control exposure below TLV level. Explosion-proof where there is risk of ignition.

PROTECTIVE EQUIPMENT: Not needed in normal use. Barrier creams, oil-impervious gloves and sleeves or other protective equipment, including eye shield, may be used to reduce chances of contact.

SPECIAL PRECAUTIONS

HANDLING AND STORING: Avoid extremes of temperature in storage. Store away from sources of ignition. Avoid contamination. Ground containers during transfer to prevent static electricity build-up from flowing liquid. Avoid splashing during transfer.

WORKPLACE: Observe TLV limits. Practice good housekeeping.

DISPOSAL: Deposit in plant waste oil system, incinerate, transfer to re-refiner, or dispose in landfill in compliance with federal, state, and local regulations. SEE WASTE DISPOSAL.

PERSONAL: Practice good personal hygiene. Do not continue to wear oil-contaminated clothing or carry oil-soaked rags. Discard oil-soaked leather goods. Avoid unnecessary exposure to liquid, mist, or vapor.

LABELING AND SHIPPING

HAZARD CLASS: Combustible Liquid

PROPER SHIPPING NAME: Kerosene, Combustible Liquid, UN 1223

PLACARD: Combustible (when in bulk)

LABEL: None required.

STCC NO.: 29-112-25

IDENTIFICATION NO.: UN 1223

OTHER REGULATORY REQUIREMENTS

Any environmental release which introduces oil into a navigable waterway must be reported promptly to the National Response Center, U.S. Coast Guard, Washington, D.C. (1-800-424-8802) (FWPCA §311(b)(3)).

REVISION DATE: 11/19/81

REPLACING DATE OF: 9/24/76 OSHA-20 Form

PRODUCT CODES: P 1410

REVIEWED BY: PJF/WDM/ECP/RAR/CWS/WJW/SMD

APPROVED: *[Signature]*

TITLE: Product Safety Coordinator

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N-BUTYL PHOSPHATE

PAGE 01 OF 05

N-BUTYL PHOSPHATE
N-BUTYL PHOSPHATE
N-BUTYL PHOSPHATE

MATERIAL SAFETY DATA SHEET

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

EMERGENCY CONTACTS
GASTON L. PILLORI
(201) 796-7100

DATE: 05/04/86
PO NBR: N/A
ACCT: 878202-02
INDEX: 12-8612-10106
CAT NO: B4044

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SUBSTANCE IDENTIFICATION

CAS-NUMBER 126-73-8

SUBSTANCE: **N-BUTYL PHOSPHATE**

TRADE NAMES/SYNONYMS: TRI-N-BUTYL PHOSPHATE; TBP; TRIBUTYL PHOSPHATE; PHOSPHORIC ACID, TRIBUTYL ESTER; PHOSPHORIC ACID TRIBUTYL ESTER; B-104

CHEMICAL FAMILY:
ESTER, NON-CARBOXYLIC

MOLECULAR FORMULA: C12-H27-O4-P MOL WT: 266.32

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

COMPONENTS AND CONTAMINANTS

PERCENT: 100.0 COMPONENT: N-BUTYL PHOSPHATE

OTHER CONTAMINANTS: NONE

EXPOSURE LIMITS:
5 MG/M3 OSHA TWA;
0.2 PPM (2.5 MG/M3) ACGIH TWA; 0.4 PPM (5 MG/M3) ACGIH STEL (NOTICE OF INTEND
FD CHANGE 1984-1985)

PHYSICAL DATA

DESCRIPTION: ODORLESS, COLORLESS TO PALE YELLOW LIQUID.

BOILING POINT: 560 F (293 C) MELTING POINT: -112 F (-80 C)

SPECIFIC GRAVITY: 0.98 VAPOR PRESSURE: 13.7 MM @ 20 C MMHG

EVAPORATION RATE: NOT AVAILABLE SOLUBILITY IN WATER: INSOLUBLE

10019

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N-BUTYL PHOSPHATE
SOLVENT SOLUBILITY: MISCIBLE IN ALCOHOL OR ETHER

PAGE 02 OF 05
VAPOR DENSITY: 9.1

FIRE AND EXPLOSION DATA

FIRE AND EXPLOSION HAZARD:
A SLIGHT FIRE HAZARD OR EXPLOSION HAZARD WHEN EXPOSED TO HEAT OR FLAME OR BY REACTION WITH INCOMPATIBLE SUBSTANCES.

FLASH POINT: 295 F (146 C) (OC) UPPER EXPLOSION LIMIT: NOT AVAILABLE
LOWER EXPLOSION LIMIT: NOT AVAILABLE AUTOIGNITION TEMP.: 900 F (543 C)

FIREFIGHTING MEDIA:
DRY CHEMICAL, CARBON DIOXIDE, WATER SPRAY OR FOAM
(1984 EMERGENCY RESPONSE GUIDEBOOK, DOT P 5800.3).

FOR LARGER FIRES, USE WATER SPRAY, FOG OR ALCOHOL FOAM
(1984 EMERGENCY RESPONSE GUIDEBOOK, DOT P 5800.3).

FIREFIGHTING:
MOVE CONTAINERS FROM FIRE AREA IF POSSIBLE. COOL CONTAINERS EXPOSED TO FLAMES WITH WATER FROM SIDE UNTIL WELL AFTER FIRE IS OUT (1984 EMERGENCY RESPONSE GUIDEBOOK, DOT P 5800.3).

EXTINGUISH USING AGENTS INDICATED; DO NOT USE WATER DIRECTLY ON MATERIAL. IF LARGE AMOUNTS OF COMBUSTIBLE MATERIALS ARE INVOLVED, USE WATER SPRAY OR FOG IN FLOODING AMOUNTS. USE WATER SPRAY TO ABSORB CORROSIVE VAPORS. COOL CONTAINERS WITH FLOODING AMOUNTS OF WATER FROM AS FAR A DISTANCE AS POSSIBLE. AVOID BREATHING CORROSIVE VAPORS; KEEP UPWIND (BUREAU OF EXPLOSIVES, EMERGENCY HANDLING OF HAZARDOUS MATERIALS IN SURFACE TRANSPORTATION, 1981).

TOXICITY

3000 MG/KG ORAL RAT LD50; 100 MG/KG INTRAVENOUS RAT LDLO; CARCINOGEN STATUS: NONE.

N-BUTYL PHOSPHATE IS A SEVERE PULMONARY, SKIN, AND MUCOUS MEMBRANE IRRITANT. SEVERE EXPOSURE MAY AFFECT THE CENTRAL NERVOUS SYSTEM. PERSONS WITH A HISTORY OF CHRONIC RESPIRATORY OR SKIN DISEASE MAY BE AT AN INCREASED RISK FROM EXPOSURE.

HEALTH EFFECTS AND FIRST AID

INHALATION:

→ CORROSIVE. 1300 MG/M3 IMMEDIATELY DANGEROUS TO LIFE OR HEALTH.
ACUTE EXPOSURE- EXPOSURE TO THE LIQUID MAY IRRITATE EYES, SKIN, THROAT, NOSE, MUCOUS MEMBRANES, OR MAY CAUSE HEADACHE, NAUSEA, WEAKNESS, FEVER, OR COUGHING. SEVERE EXPOSURE MAY CAUSE PROLONGED PULMONARY EDEMA, NARCOSIS, OR COMA.

CHRONIC EXPOSURE- HAS NOT BEEN REPORTED.

→ FIRST AID- REMOVE FROM EXPOSURE TO FRESH AIR IMMEDIATELY. IF BREATHING HAS STOPPED, GIVE ARTIFICIAL RESPIRATION. MAINTAIN AIRWAY AND BLOOD PRESSURE AND ADMINISTER OXYGEN IF AVAILABLE. KEEP AFFECTED PERSON

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N-BUTYL PHOSPHATE
WARM AND AT REST. GET MEDICAL ATTENTION.

SKIN CONTACT:
IRRITANT.

ACUTE EXPOSURE- MAY CAUSE IRRITATION. PROLONGED CONTACT MAY CAUSE BURNS.

CHRONIC EXPOSURE- MAY CAUSE DERMATITIS.

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.

EYE CONTACT:
IRRITANT.

ACUTE EXPOSURE- MAY CAUSE IRRITATION. PROLONGED CONTACT MAY CAUSE BURNS, TEMPORARY EPITHELIAL INJURY, OR VISUAL DISTURBANCES.

CHRONIC EXPOSURE- MAY CAUSE CONJUNCTIVITIS.

FIRST AID- WASH EYES IMMEDIATELY WITH LARGE AMOUNTS OF WATER, OCCASIONALLY LIFTING UPPER AND LOWER LIDS, UNTIL NO EVIDENCE OF CHEMICAL REMAINS (APPROXIMATELY 15-20 MINUTES). IN PRESENCE OF BURNS, APPLY STERILE BANDAGES LOOSELY WITHOUT MEDICATION. GET MEDICAL ATTENTION.

INGESTION:
CORROSIVE.

ACUTE EXPOSURE- MAY CAUSE ABDOMINAL PAIN, VOMITING, OR DIARRHEA. TOXIC AMOUNTS WILL CAUSE NARCOSIS.

FIRST AID- IF VICTIM IS CONSCIOUS, IMMEDIATELY GIVE 2 TO 4 GLASSES OF WATER, AND INDUCE VOMITING BY TOUCHING FINGER TO BACK OF THROAT. GET MEDICAL ATTENTION IMMEDIATELY.

REACTIVITY

REACTIVITY:

STABLE UNDER NORMAL CONDITIONS. REACTS VIOLENTLY WITH STRONG OXIDANTS.

INCOMPATIBILITIES:

REACTS VIOLENTLY WITH STRONG OXIDANTS.

DECOMPOSITION:

ON COMBUSTION EMITS TOXIC OXIDES OF NITROGEN AND TOXIC OXIDES OF PHOSPHORUS.

-POLYMERIZATION:

NOT KNOWN TO OCCUR.

CONDITIONS TO AVOID

MAY BE IGNITED BY HEAT OR FLAMES. CONTAINER MAY EXPLODE IN HEAT OF FIRE. VAPOR EXPLOSION HAZARD INDOORS. AVOID CONTACT OR STORAGE WITH STRONG OXIDANTS.

***N-BUTYL PHOSPHATE**

SPILL AND LEAK PROCEDURES

OCCUPATIONAL SPILL:

SHUT OFF IGNITION SOURCES. STOP LEAK IF YOU CAN DO IT WITHOUT RISK. FOR SMALL SPILLS, TAKE UP WITH SAND OR OTHER ABSORBENT MATERIAL AND PLACE INTO CONTAINERS FOR LATER DISPOSAL. FOR LARGER SPILLS, DIKE FAR AHEAD OF SPILL FOR LATER DISPOSAL. NO SMOKING, FLAMES OR FLARES IN HAZARD AREA. KEEP UNNECESSARY PEOPLE AWAY; ISOLATE HAZARD AREA AND DENY ENTRY.

PROTECTIVE EQUIPMENT

VENTILATION:

PROVIDE LOCAL EXHAUST VENTILATION OR GENERAL DILUTION VENTILATION TO MEET PERMISSIBLE EXPOSURE LIMITS.

RESPIRATOR:

EXPOSURE LIMITS TO 50 MG/M3-

50 MG/M3- SUPPLIED-AIR RESPIRATOR.
SELF-CONTAINED BREATHING APPARATUS.

250 MG/M3- GAS MASK WITH AN ORGANIC VAPOR CANISTER (CHIN-STYLE OR FRONT-OR BACK-MOUNTED CANISTER) WITH A DUST AND MIST FILTER.
SUPPLIED-AIR RESPIRATOR WITH A FULL FACEPIECE, HELMET, OR HOOD.
SELF-CONTAINED BREATHING APPARATUS WITH A FULL FACEPIECE.

1300 MG/M3- TYPE 'C' SUPPLIED -AIR RESPIRATOR OPERATED IN PRESSURE-DEMAND, OTHER POSITIVE-PRESSURE, OR CONTINUOUS-FLOW MODE.

ESCAPE- GAS MASK WITH AN ORGANIC VAPOR CANISTER WITH A HIGH -EFFICIENCY PARTICULATE FILTER.
SELF-CONTAINED BREATHING APPARATUS.

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

CLOTHING:

EMPLOYEE MUST WEAR APPROPRIATE PROTECTIVE 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:

WEAR FACESHIELD (8 INCH MINIMUM) AND VENTED SAFETY GOGGLES. DO NOT WEAR CONTACT LENSES WHEN WORKING WITH CHEMICALS.

AUTHORIZED - ALLIED FISHER SCIENTIFIC
CREATION DATE: 01/11/85 REVISION DATE: 10/22/85

-ADDITIONAL INFORMATION-

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rec'd 1/2/86

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A KDI Company
4600 Dues Drive P.O. Box 46130 Cincinnati, Ohio 45246 (513)874-9261

Anhydrous Ammonia

Reactivity

0

Flammability

1

Health

3

Ratings based on Fire Protection Guide on Hazardous Materials 7th Edition.

Material Safety Data Sheet

| I PRODUCT IDENTIFICATION | | |
|---|--|------------------------------|
| MANUFACTURER'S NAME Herbert-Verkamp-Calvert Chemical Co. | REGULAR TELEPHONE NO. EMERGENCY TELEPHONE NO. | 513-874-9261 513-874-9261 |
| ADDRESS 4600 Dues Drive Cincinnati, OH 45246 | | |
| TRADE NAME Ammonia, Anhydrous | CAS # | 7664-41-7 |
| SYNONYMS Ammonia Liquified | | |
| II HAZARDOUS INGREDIENTS | | |
| MATERIAL OR COMPONENT | % | HAZARD DATA |
| Ammonia | 100 | TLV = 50 ppm |
| | | |
| | | |
| | | |
| | | |
| III PHYSICAL DATA | | |
| BOILING POINT, 760 MM HG - 28° F | MELTING POINT N/A | FREEZING POINT - 108° F |
| SPECIFIC GRAVITY (H ₂ O=1) 0.618 | VAPOR PRESSURE 115 PSI @ 20° C | |
| VAPOR DENSITY (AIR=1) 0.6 | SOLUBILITY IN H ₂ O, % BY WT. 89.9 gm/100 cc at 0° C | |
| % VOLATILES BY VOL. 100 | EVAPORATION RATE (BUTYL ACETATE=1) Greater than one | |
| APPEARANCE AND ODOR Liquid at low temperatures. Colorless gas at moderate temperature. | | |
| pH Not available | | Has penetrating pun 56 |

IMPORTANT: The Herbert-Verkamp-Calvert Chemical Company warrants that this product conforms to the Chemical Description and/or Product Description contained in this sheet as the exclusive responsibility of the user to determine the safety, toxicity and/or suitability of this product for its own use. THE HERBERT-VERKAMP-CALVERT CHEMICAL COMPANY MAKES NO OTHER WARRANTY, WHETHER EXPRESSED OR IMPLIED, INCLUDING WARRANTIES OF MERCHANTABILITY OR OF FITNESS FOR A PARTICULAR PURPOSE. Additional information concerning this product may be obtained from the information contained herein to be absolutely complete. Additional information concerning this product may be obtained from the information contained herein to be absolutely complete.

Data Sheet

| IV FIRE AND EXPLOSION DATA | | |
|--|------------------------------------|---------------|
| FLASH POINT (TEST METHOD) Not applicable | AUTOIGNITION TEMPERATURE 651° C | |
| FLAMMABLE LIMITS IN AIR, % BY VOL. | LOWER -16.0 | UPPER 25.0 |
| EXTINGUISHING MEDIA Water spray, fog, dry chemical or foam to extinguish fires. | | |
| SPECIAL FIRE FIGHTING PROCEDURES Wear self-contained breathing apparatus and full fire fighting protective clothing. Stop flow of gas. Use water to keep containers cool. Use water spray to reduce vapors but do not put water on leak area. | | |
| UNUSUAL FIRE AND EXPLOSION HAZARD Ammonia is stored under pressure. Heat can cause relief valves to blow, releasing ammonia vapor. Cool tank with water if exposed to fire. The presence of oil or other combustible materials increases the fire hazard. | | |
| V HEALTH HAZARD INFORMATION | | |
| HEALTH HAZARD DATA Ammonia is a strong irritant. | | |
| ROUTES OF EXPOSURE | | |
| INHALATION Acute exposure can result in severe injury to respiratory membranes, mouth, throat and stomach and may result in death or permanent injury. | | |
| SKIN CONTACT High levels of ammonia vapor may cause skin burns or blisters. Direct contact with liquid will cause severe burns. | | |
| SKIN ABSORPTION See - skin contact above. | | |
| EYE CONTACT Ammonia is a severe irritant, exposure to high levels of vapor can cause severe eye damage. Direct contact with liquid will cause serious eye burns and may cause permanent blindness. | | |
| INGESTION Because of the characteristics of ammonia, ingestion of liquid is very unlikely, but it will result in severe burns to mouth, throat and stomach. | | |
| EFFECTS OF OVEREXPOSURE ACUTE OVEREXPOSURE Severe burns to any tissues contacted. Blindness may occur if direct contact with liquid. Death may result in inhalation of high levels of ammonia. | | |
| CHRONIC OVEREXPOSURE Severe irritation of tissues contacted. | | |
| EMERGENCY AND FIRST AID PROCEDURES | | |
| EYES: Hold eyelids open and flush with plenty of water for at least 20 minutes. Get medical attention immediately. Speed in flushing of eyes is very important. | | |
| SKIN: Remove contaminated clothing and flush with plenty of water for at least 15 minutes. Get medical attention at once. Use no ointments on burns. | | |
| INHALATION: Remove to an uncontaminated area. Give artificial respiration if necessary. Give oxygen after severe exposures. Get medical attention immediately. | | |
| INGESTION: If conscious, give the person large quantities of water to dilute. Get medical attention immediately. Do not induce vomiting. | | |
| NOTES TO PHYSICIAN: | | |

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Data Sheet

| | |
|---|---|
| VI REACTIVITY DATA | |
| CONDITIONS CONTRIBUTING TO INSTABILITY | |
| Stable at room temperature. Exothermic with acids. | |
| INCOMPATIBILITY | |
| Contact with strong oxidizers may cause fires and explosions. Contact with hypochlorites, gold, mercury and silver may form highly explosive products. Contact with chlorine, iodine, bromine may cause violent spattering. | |
| HAZARDOUS DECOMPOSITION PRODUCTS | |
| Thermal combustion produces oxides of nitrogen. | |
| CONDITIONS CONTRIBUTING TO HAZARDOUS POLYMERIZATION | |
| Will not occur. | |
| VII SPILL OR LEAK PROCEDURES | |
| STEPS TO BE TAKEN IF MATERIAL IS RELEASED OR SPILLED | |
| Evacuate people if spill is significant. Wear respiratory protection and protective clothing. Shut off source if possible. Contain spill by diking and dilute with water, carefully neutralize and discharge with an excess of water. | |
| NEUTRALIZING CHEMICALS | |
| Diluted Acids. | |
| WASTE DISPOSAL METHOD | |
| Allow ammonia to dissipate if practical. Reclaim liquids by pumping. Classed as a hazardous waste under RCRA. Comply with all Local, State and Federal regulations. | |
| VIII INDUSTRIAL HYGIENE CONTROL MEASURES | |
| VENTILATION REQUIREMENTS | |
| Provide sufficient ventilation to control exposure concentration below airborne exposure limits. Exhaust equipment should be explosion proof. | |
| SPECIFIC PERSONAL PROTECTIVE EQUIPMENT | |
| RESPIRATORY (SPECIFY IN DETAIL) | Use NIOSH approved cartridge respirators where concentrations are below 100 ppm. Full face mask with cartridge below 300 ppm. Above, 300 ppm, use self-contained breathing apparatus. |
| EYE | Chemical safety goggles. Provide eye wash facilities in immediate exposure area. |
| GLOVES | Rubber |
| OTHER CLOTHING AND EQUIPMENT | |
| Note: The above personal protective equipment is the minimum recommended protection for handling this product. Additional protection may be advisable depending upon | |

10011

Data Sheet

IX SPECIAL PRECAUTIONS

PRECAUTIONARY STATEMENTS

- Do not breathe fumes or vapors.
- Do not get into eyes, on skin, or on clothing.
- Wear recommended eye and skin protection equipment.
- Train employees in correct handling procedures.
- Contact lens should not be worn when working with this chemical.
- Do not mix ammonia with any other chemicals.
- Do not expose containers to extreme heat.

OTHER HANDLING AND STORAGE REQUIREMENTS

DEPARTMENT OF TRANSPORTATION INFORMATION

PROPER SHIPPING NAME: Anhydrous Ammonia UN 1005

HAZARD CLASS: Non-Flammable Compressed Gas

PREPARED BY:

DATE:

2-10-85

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10035

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CALCIUM HYDROXIDE

PAGE 01 OF 05

CALCIUM HYDROXIDE
CALCIUM HYDROXIDE
CALCIUM HYDROXIDE

MATERIAL SAFETY DATA SHEET

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

EMERGENCY CONTACTS
GASTON L. PILLORI
(201) 796-7100

DATE 05/27/87
PO NBR: 486864-00
ACCT: 878202-02
INDEX: 12871350130
CAT NO: C97500

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SUBSTANCE IDENTIFICATION

CAS-NUMBER 1305-62-0

SUBSTANCE: **CALCIUM HYDROXIDE**

TRADE NAMES/SYNONYMS:
HYDRATED LIME; CALCIUM HYDRATE; LIME WATER; SLAKED LIME; CAUSTIC LIME;
BIOGAB; CARBOXIDE; CALCIUM DIHYDROXIDE; KALKHYDRATE; MILK OF LIME; C-88;
C-97; ACC03980

CHEMICAL FAMILY:
INORGANIC BASE

MOLECULAR FORMULA: CA-H2-O2 MOL WT: 74.10

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

COMPONENTS AND CONTAMINANTS

COMPONENT: CALCIUM HYDROXIDE PERCENT: 100

OTHER CONTAMINANTS: NONE

EXPOSURE LIMITS:
5 MG/M3 ACGIH TWA

PHYSICAL DATA

DESCRIPTION: ODORLESS, WHITE, CRYSTALLINE POWDER WITH A SLIGHTLY BITTER TASTE. BOILING POINT: NOT APPLICABLE

MELTING POINT: 1076 F (580 C) -H2O SPECIFIC GRAVITY: 2.2

PH: 12.5 SATURATED SOLN SOLUBILITY IN WATER: 0.185%

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****CALCIUM HYDROXIDE****
SOLVENT SOLUBILITY: AMMONIA SALTS, ALCOHOL, & GYL CEROL

PAGE 02 OF 05

FIRE AND EXPLOSION DATA

FIRE AND EXPLOSION HAZARD:
NEGLECTIBLE FIRE HAZARD WHEN EXPOSED TO HEAT OR FLAME.

FLASH POINT: NON-FLAMMABLE

FIREFIGHTING MEDIA:
DRY CHEMICAL, CARBON DIOXIDE, WATER SPRAY OR FOAM
(1984 EMERGENCY RESPONSE GUIDEBOOK, DOT P 5800.3).

FOR LARGER FIRES, USE WATER SPRAY, FOG OR ALCOHOL FOAM
(1984 EMERGENCY RESPONSE GUIDEBOOK, DOT P 5800.3).

FIREFIGHTING:
MOVE CONTAINERS FROM FIRE AREA IF POSSIBLE. COOL CONTAINERS EXPOSED TO FLAMES
WITH WATER FROM SIDE UNTIL WELL AFTER FIRE IS OUT (1984 EMERGENCY RESPONSE
GUIDEBOOK, DOT P 5800.3).

EXTINGUISH USING AGENT INDICATED; DO NOT USE WATER DIRECTLY ON MATERIAL.
IF LARGE AMOUNTS OF COMBUSTIBLE MATERIALS ARE INVOLVED, USE WATER SPRAY
OR FOG IN FLOODING AMOUNTS. AVOID BREATHING CORROSIVE DUSTS AND FUMES FROM
BURNING MATERIAL, KEEP UPWIND (BUREAU OF EXPLOSIVES, EMERGENCY HANDLING OF
HAZARDOUS MATERIALS IN SURFACE TRANSPORTATION, 1981).

TOXICITY

7340 MG/KG ORAL-RAT LD50; MUTAGENIC DATA (RTECS); CARCINOGEN STATUS: NONE.
CALCIUM HYDROXIDE IS A SEVERE EYE, MUCOUS MEMBRANE AND SKIN IRRITANT.

HEALTH EFFECTS AND FIRST AID

INHALATION:
CORROSIVE.

ACUTE EXPOSURE- INHALATION OF LOW CONCENTRATIONS MAY CAUSE SORE THROAT,
COUGHING, CHOKING, DYSPNEA, AND VARIABLE SYMPTOMS OF HEAD-
ACHE, DIZZINESS, AND WEAKNESS. INTENSE EXPOSURES MAY RESULT
IN TIGHTNESS IN THE CHEST AND DELAYED PULMONARY EDEMA. THE
SOLUBILITY OF THE SUBSTANCE ALLOWS FURTHER PENETRATION THAT
MAY CONTINUE FOR SEVERAL DAYS.

CHRONIC EXPOSURE- BRONCHIAL IRRITATION WITH CHRONIC COUGH AND FREQUENT AT-
TACKS OF BRONCHIAL PNEUMONIA ARE COMMON. SEE ANIMAL
MUTAGENIC REFERENCES IN TOXICITY SECTION.

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

SKIN CONTACT:

CORROSIVE.

ACUTE EXPOSURE- THE SUBSTANCE PENETRATES THE SKIN SLOWLY, PRODUCING SOFT.

****CALCIUM HYDROXIDE**** PAGE 03 OF 05
 NECROTIC, DEEPLY PENETRATING AREAS ON CONTACT. THE SOLUBILITY
 ALLOWS FURTHER PENETRATION THAT MAY CONTINUE FOR SEVERAL
 DAYS. THE EXTENT OF DAMAGE DEPENDS ON DURATION OF CONTACT.

CHRONIC EXPOSURE- A CHRONIC DERMATITIS MAY FOLLOW REPEATED CONTACT. SEE
 ANIMAL MUTAGENIC REFERENCE IN TOXICITY SECTION.

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 (AT LEAST 15-20 MINUTES). IN CASE OF CHEMICAL
 BURNS, COVER AREA WITH STERILE, DRY DRESSING. BANDAGE SECURELY, BUT NOT
 TOO TIGHTLY. GET MEDICAL ATTENTION IMMEDIATELY.

EYE CONTACT:
CORROSIVE.

ACUTE EXPOSURE- DIRECT CONTACT WITH THE SOLID OR AQUEOUS SOLUTIONS MAY CAUSE
 CONJUNCTIVAL EDEMA AND CORNEAL DESTRUCTION. BLINDNESS MAY OCCUR. IT
 USUALLY PRODUCES ONLY SUPERFICIAL OPACITIES OF THE CORNEA, APPARENTLY
 BECAUSE IT PENETRATES CORNEAL EPITHELIUM SO SLOWLY. IT TENDS TO REACT
 WITH THE MOISTURE AND PROTEIN FOUND THERE AND FORM CLUMPS OF MOIST
 COMPOUND, WHICH IS VERY DIFFICULT TO REMOVE. SUCH CLUMPS TEND TO LODGE
 DEEP IN THE CONJUNCTIVA AND ACT AS RESERVOIRS FOR THE LIBERATION OF CAL-
 CIUM HYDROXIDE OVER LONG PERIODS OF TIME.

CHRONIC EXPOSURE- PROLONGED CONTACT MAY CAUSE CONJUNCTIVITIS.

FIRST AID- WASH EYES IMMEDIATELY WITH LARGE AMOUNTS OF WATER, OCCASIONALLY
 LIFTING THE UPPER AND LOWER LIDS, UNTIL NO EVIDENCE OF CHEMICAL REMAINS
 (APPROXIMATELY 15-20 MINUTES). A NEAR NEUTRAL SOLUTION OF 0.01 TO 0.05
 MOLAR SODIUM EDTA IS HELPFUL AS AN IRRIGANT TO LOOSEN MASSES FROM
 TISSUES. GET MEDICAL ATTENTION IMMEDIATELY. (GRANT, TOXICOLOGY OF THE
 EYE, VOLUME II). ADMINISTRATION OF DRUGS TO THE EYES SHOULD BE PERFORMED
 BY QUALIFIED MEDICAL PERSONNEL. GET MEDICAL ATTENTION IMMEDIATELY.

INGESTION:
CORROSIVE.

ACUTE EXPOSURE- INGESTION IS FOLLOWED BY SEVERE PAIN, VOMITING, DIARRHEA,
 AND COLLAPSE. THE VOMITUS MAY CONTAIN BLOOD AND DESQUAMATED
 MUCOSAL LINING. IF DEATH DOES NOT OCCUR IN THE FIRST 24
 HOURS, THE PATIENT MAY IMPROVE FOR 2-4 DAYS AND THEN HAVE A
 SUDDEN ONSET OF SEVERE ABDOMINAL PAIN, ABDOMINAL RIGIDITY,
 AND RAPID HYPOTENSION INDICATING DELAYED GASTRIC OR
 ESOPHAGEAL PERFORATION.

FIRST AID- IF VICTIM IS CONSCIOUS, GIVE LARGE QUANTITIES OF WATER IMMEDIATELY
 TO DILUTE THE ALKALI. DO NOT INDUCE VOMITING. GET MEDICAL ATTENTION
 IMMEDIATELY.

REACTIVITY

REACTIVITY:
 STABLE UNDER NORMAL TEMPERATURES AND PRESSURES.

**WHEN EXPOSED TO THE AIR, IT WILL ABSORB CARBON DIOXIDE AND FORM CALCIUM
 CARBONATE.**

****CALCIUM HYDROXIDE****

INCOMPATIBILITIES:

CALCIUM HYDROXIDE:
MALEIC ANHYDRIDE: EXPLOSIVE DECOMPOSITION OF MALEIC ANHYDRIDE.
NITROPARAFFINS: FORMATION OF AN EXPLOSIVE SALT.
NITROMETHANE: FORMATION OF AN EXPLOSIVE SALT.
NITROETHANE: FORMATION OF AN EXPLOSIVE SALT.
NITROPROPANE: FORMATION OF AN EXPLOSIVE SALT.
PHOSPHORUS: WHEN BOILED WITH ALKALINE HYDROXIDES YIELDS MIXED PHOSPHINES WHICH MAY IGNITE SPONTANEOUSLY IN AIR.

DECOMPOSITION:

WHEN HEATED AT TEMPERATURES ABOVE 580 C, THE SUBSTANCE LOSES WATER TO FORM CALCIUM OXIDE OR LIME.

POLYMERIZATION:

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

CONDITIONS TO AVOID

AVOID HEATING TO THE MELTING POINT, WHERE DECOMPOSITION OCCURS.

CONTACT WITH OR STORAGE WITH INCOMPATIBLE MATERIALS LISTED ABOVE AND EXCESSIVE HEAT.

SPILL AND LEAK PROCEDURES

OCCUPATIONAL SPILL:

PROVIDE VENTILATION AND RESPIRATORY PROTECTION. KEEP UNAUTHORIZED PERSONNEL AWAY. KEEP OUT OF SEWERS AND WATER SOURCES. CAREFULLY SWEEP UP SPILLAGE AND PLACE IN A SUITABLE CONTAINER (PLASTIC) FOR LATER DISPOSAL.

PROTECTIVE EQUIPMENT

VENTILATION:

PROVIDE LOCAL EXHAUST VENTILATION AND/OR GENERAL DILUTION VENTILATION TO MEET PUBLISHED EXPOSURE LIMITS.

RESPIRATOR:

5000 MG/M3- SUPPLIED-AIR RESPIRATOR WITH A FULL FACEPIECE, HELMET, OR HOOD. SELF-CONTAINED BREATHING APPARATUS WITH A FULL FACEPIECE.

FIREFIGHTING- SELF-CONTAINED BREATHING APPARATUS WITH A FULL FACEPIECE 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 AND A
FACESHIELD TO PREVENT CONTACT WITH THIS SUBSTANCE.

WHERE THERE IS ANY POSSIBILITY THAT AN EMPLOYEE'S EYES MAY BE EXPOSED TO
THIS SUBSTANCE, THE EMPLOYER SHALL PROVIDE AN EYE-WASH FOUNTAIN WITHIN THE
IMMEDIATE WORK AREA FOR EMERGENCY USE.

AUTHORIZED - FISHER SCIENTIFIC GROUP, INC.
CREATION DATE: 05/02/85 REVISION DATE: 06/18/85

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***SODIUM CARBONATE**
***SODIUM CARBONATE**
***SODIUM CARBONATE**
***SODIUM CARBONATE**

MATERIAL SAFETY DATA SHEET

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

EMERGENCY CONTACTS
GASTON L. PILLORI
(201) 796-7100

DATE 04/09/88
PO NBR: 99246-B
ACCT: 878202-02
INDEX: 12880950040
CAT NO: S263500

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SUBSTANCE IDENTIFICATION

CAS-NUMBER 497-19-8

SUBSTANCE: ***SODIUM CARBONATE**

TRADE NAMES/SYNONYMS:
CARBONIC ACID, DISODIUM SALT; SODIUM CARBONATE (2:1); SODA ASH;
CRYSTOL CARBONATE; BISODIUM CARBONATE; CARBONIC ACID DISODIUM SALT;
CARBONIC ACID SODIUM SALT; SODA; SODIUM CARBONATE DODECAHYDRATE; S-261;
S-262; S-263; S-264; S-281; S-495; S-636; ACC21080

CHEMICAL FAMILY:
INORGANIC SALT

MOLECULAR FORMULA: C-NA2-O3 MOL WT: 105.99

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

COMPONENTS AND CONTAMINANTS

COMPONENT: SODIUM CARBONATE PERCENT: 99

OTHER CONTAMINANTS: NONE

EXPOSURE LIMITS:
NONE ESTABLISHED

PHYSICAL DATA

DESCRIPTION: ODORLESS, WHITE HYGROSCOPIC POWDER OR GRANULAR SOLID.

BOILING POINT: DECOMPOSES MELTING POINT: 1564 F (851 C)

SPECIFIC GRAVITY: 2.5 PH: 11.6 SOLUBILITY IN WATER: 7.1x

SOLVENT SOLUBILITY: ALCOHOL; INSOLUBLE IN ACETONE
 SODIUM CARBONATE
 PAGE 02 OF 04

 FIRE AND EXPLOSION DATA

FIRE AND EXPLOSION HAZARD:
 SLIGHT FIRE HAZARD WHEN EXPOSED TO HEAT OR FLAME.

FLASH POINT: NON-COMBUSTIBLE

FIREFIGHTING MEDIA:
 DRY CHEMICAL, CARBON DIOXIDE, WATER SPRAY OR ALCOHOL FOAM
 (1984 EMERGENCY RESPONSE GUIDEBOOK, DOT P 5800.3).

FOR LARGER FIRES, USE WATER SPRAY, FOG OR ALCOHOL FOAM
 (1984 EMERGENCY RESPONSE GUIDEBOOK, DOT P 5800.3).

FIREFIGHTING:
 NO ACUTE HAZARD. MOVE CONTAINER FROM FIRE AREA IF POSSIBLE. AVOID BREATHING
 VAPORS OR DUSTS; KEEP UPWIND.

 TOXICITY

500 MG/24 HOURS SKIN-RABBIT MODERATE IRRITATION; 100 MG/24 HOURS EYE-RABBIT
 SEVERE IRRITATION; 4000 MG/KG ORAL-RAT LD50; 117 MG/KG INTRAPERITONEAL-MOUSE
 LD50; CARCINOGEN STATUS: NONE.
 SODIUM CARBONATE IS A SEVERE EYE, SKIN, AND MUCOUS MEMBRANE IRRITANT.

 HEALTH EFFECTS AND FIRST AID

INHALATION:
 CORROSIVE/TOXIC.

ACUTE EXPOSURE-- MAY CAUSE SEVERE IRRITATION AND DELAYED PULMONARY EDEMA.
 1200 AND 2300 MG/M3 FOR 2 HOURS CAUSED DYSPNEA AND GASTROINTESTINAL
 CHANGES IN MICE AND RATS.

CHRONIC EXPOSURE-- PROLONGED INHALATION MAY RESULT IN NASAL SEPTUM
 PERFORATION.

FIRST AID: REMOVE FROM EXPOSURE AREA TO FRESH AIR IMMEDIATELY. IF BREATHING
 HAS STOPPED, GIVE ARTIFICIAL RESPIRATION. MAINTAIN AIRWAY AND BLOOD
 PRESSURE AND ADMINISTER OXYGEN IF AVAILABLE. KEEP AFFECTED PERSON HARM AND
 AT REST. ADMINISTRATION OF OXYGEN SHOULD BE PERFORMED BY QUALIFIED
 PERSONNEL. GET MEDICAL ATTENTION IMMEDIATELY.

SKIN CONTACT:
 CORROSIVE.

ACUTE EXPOSURE-- ALKALIES PENETRATE SKIN SLOWLY, THEREFORE THE EXTENT OF
 DAMAGE DEPENDS ON THE DURATION OF CONTACT. SOLID MAY CAUSE SEVERE BURNS,
 ULCERATION, AND NECROSIS. FUMES ARE HIGHLY IRRITATING.

CHRONIC EXPOSURE-- MAY CAUSE CHRONIC DERMATITIS.

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 (AT LEAST 15-20 MINUTES). IN CASE OF CHEMICAL BURNS, COVER AREA WITH STERILE, DRY DRESSING. BANDAGE SECURELY, BUT NOT TOO TIGHTLY. GET MEDICAL ATTENTION IMMEDIATELY.

EYE CONTACT:
CORROSIVE.

ACUTE EXPOSURE- DIRECT CONTACT WITH ALKALIES MAY CAUSE SEVERE BURNS, CONJUNCTIVAL EDEMA, CORNEAL DESTRUCTION, AND PERMANENT CORNEAL OPACIFICATION. FUMES ARE HIGHLY IRRITATING AND MAY CAUSE BLURRED VISION AND CORNEAL DAMAGE.

CHRONIC EXPOSURE- REPEATED OR PROLONGED CONTACT WITH VAPORS MAY CAUSE CONJUNCTIVITIS, BLURRED VISION, AND CORNEAL DAMAGE.

FIRST AID- WASH EYES IMMEDIATELY WITH LARGE AMOUNTS OF WATER, OCCASIONALLY LIFTING UPPER AND LOWER LIDS, UNTIL NO EVIDENCE OF CHEMICAL REMAINS (AT LEAST 15-20 MINUTES). IN CASE OF BURNS, APPLY STERILE BANDAGES LOOSELY WITHOUT MEDICATION. GET MEDICAL ATTENTION IMMEDIATELY.

INGESTION:
CORROSIVE.

ACUTE EXPOSURE- MAY CAUSE SEVERE PAIN, VOMITING, DIARRHEA, AND COLLAPSE. THE VOMITUS CONTAINS BLOOD AND SHREDS OF MUCOUS. IF DEATH DOES NOT OCCUR IN THE FIRST 24 HOURS, THE PATIENT MAY IMPROVE FOR 2-4 DAYS AND THEN HAVE A SUDDEN ONSET OF ABDOMINAL PAIN, BOARDLIKE ABDOMINAL RIGIDITY, AND HYPOTENSION INDICATING DELAYED GASTRIC OR ESOPHAGEAL PERFORATION. MAY CAUSE CORROSIVE DAMAGE TO THE ESOPHAGUS AND UPPER GASTROINTESTINAL TRACT.

FIRST AID- IF VICTIM IS CONSCIOUS, GIVE LARGE QUANTITIES OF WATER IMMEDIATELY TO DILUTE THE ACID. DO NOT INDUCE VOMITING. GET MEDICAL ATTENTION IMMEDIATELY.

REACTIVITY

REACTIVITY:
STABLE UNDER NORMAL TEMPERATURES AND PRESSURES.

INCOMPATIBILITIES:
SODIUM CARBONATE:

ACIDS: MAY REACT VIOLENTLY.
ALUMINUM: POSSIBLE EXPLOSION UPON HEATING.
PHOSPHORUS PENTOXIDE: HIGHLY EXOTHERMIC REACTION.
SULFURIC ACID: MAY REACT VIOLENTLY.
FLUORINE: MAY CAUSE VIOLENT IGNITION.
LITHIUM: MAY REACT VIOLENTLY.
2,4,6-TRINITRO-TOLUENE: POSSIBLE EXPLOSION.
ZINC: CORROSIVE.

DECOMPOSITION:

— THERMAL DECOMPOSITION MAY RELEASE ACRID SMOKE AND IRRITATING FUMES.

SODIUM CARBONATE

POLYMERIZATION:
NONE KNOWN.

CONDITIONS TO AVOID

MAY BURN BUT DOES NOT IGNITE READILY. PREVENT DISPERSION OF DUST IN THE
ATMOSPHERE. PROTECT CONTAINER FROM PHYSICAL DAMAGE. DO NOT STORE WITH
INCOMPATIBLE SUBSTANCES.

SPILL AND LEAK PROCEDURES

OCCUPATIONAL SPILL:
WITH A CLEAN SHOVEL, PLACE MATERIAL INTO CLEAN, DRY CONTAINER AND COVER. MOVE
CONTAINERS AWAY FROM SPILL AREA.

PROTECTIVE EQUIPMENT

VENTILATION:
PROVIDE LOCAL EXHAUST OR GENERAL DILUTION VENTILATION SYSTEM.

RESPIRATOR:
HIGH LEVELS-- CHEMICAL CARTRIDGE RESPIRATOR WITH AN ORGANIC VAPOR CARTRIDGE.

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

CLOTHING:
EMPLOYEE MUST WEAR APPROPRIATE PROTECTIVE (IMPERVIOUS) CLOTHING AND EQUIPMENT
TO PREVENT ANY POSSIBILITY OF 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 AND A
FACESHIELD TO PREVENT CONTACT WITH THIS SUBSTANCE.

WHERE THERE IS ANY POSSIBILITY THAT AN EMPLOYEE'S EYES MAY BE EXPOSED TO
THIS SUBSTANCE, THE EMPLOYER SHALL PROVIDE AN EYE-WASH FOUNTAIN WITHIN THE
IMMEDIATE WORK AREA FOR EMERGENCY USE.

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