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WORK PLAN FOR
SOIL VAPOR EXTRACTION PILOT TEST

eder associates
environmental scientists and engineers

NATIONAL PRESTO INDUSTRIES, INC.

EAU CLAIRE, WISCONSIN

WORK PLAN FOR
SOIL VAPOR EXTRACTION PILOT TEST

PROJECT #497-18

MARCH 1994

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March 17, 1994
File #497-18

Ms. Eugenia Chow
Remedial Project Manager
United States Environmental
Protection Agency - Region 5
77 West Jackson Boulevard - HSRW6J
Chicago, Illinois 60604-3590

Re: National Presto Industries, Inc.
Eau Claire, Wisconsin

Dear Ms. Chow:

Two copies of the Soil Vapor Extraction Pilot Test Work Plan are enclosed. The work plan has been revised in accordance with the comments contained in your March 8, 1994 letter to NPI. Please advise if you have any additional questions or comments. I am available to discuss the work plan at your convenience.

Very truly yours,

EDER ASSOCIATES

Nora M. Brew

Nora M. Brew
Project Engineer

NB/cg
Encl.

cc: R. Riedl (2 copies)
S. Thon
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D. Manning
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1.0 INTRODUCTION

1.1 Background Information

The National Presto Industries, Inc. (NPI) site is an inactive manufacturing facility comprising approximately 320 acres in Eau Claire, Wisconsin. A map of the NPI site is presented on Figure 1. The site was originally owned by the United States Government and operated between 1940 and 1947 by its contractors, the U.S. Rubber Company (Uniroyal) as a small arms ammunition plant, and Western Electric (AT&T) as a radar tube manufacturing plant. NPI purchased the site from the government in 1947. Between 1947 and 1954, NPI used the facility to produce consumer products, projectile fuzes, and military aircraft parts. Since 1954, all manufacturing activities at the NPI site have been dedicated to defense work for the Department of Defense (DOD). Between 1954 and 1959, the facility produced military aircraft parts and between 1966 and 1980 the facility produced 8-inch and 105 mm projectiles for the Department of the Army (DOA). Active production ceased in February 1980.

Waste forge compound, which in its virgin state consists of approximately equal parts of asphalt, graphite and mineral oil, was the primary waste material generated by the projectile production operation. Volatile organic compounds (VOCs) became incorporated into the waste forge compound during the forging operations. Waste forge compound with a low solids content flowed by gravity and was pumped to Lagoon No. 1 with process wastewaters between 1966 and 1980. From 1966 to 1970, waste forge compound with a higher solids content was heated in a basement collection sump so that it could be pumped into drums. The drums were hauled to the Melby Road Disposal Site (MRDS) where the waste forge compound was disposed of. The waste disposal area was originally delineated based on aerial photographs from 1968, which showed a trench area at the MRDS. Disposal of waste forge compound at the MRDS ceased in 1970 after a reclamation and recycling program was developed by NPI. The MRDS area was regraded in 1970.

The NPI site Remedial Investigation (RI) indicates the presence of VOCs and/or metals at the MRDS. The most commonly found VOCs were 1,1,1-trichloroethane (TCA), trichloroethylene (TCE), tetrachloroethylene (PCE), 1,1-dichloroethylene (1,1-DCE), and 1,1-dichloroethane (1,1-DCA).

As the Feasibility Study (FS) was being prepared for the NPI site, it became apparent that more information about the MRDS was needed to effectively evaluate potential remedial alternatives. Data gaps existed with respect to the vertical and areal extent of contamination and questions remained regarding the specific source of VOCs in groundwater. In addition, aerial photographs obtained from the Eau Claire County Health Department in early 1993 revealed that the waste disposal area was larger than originally delineated. Additional sampling and analysis was conducted at the MRDS in August 1993 to further define the nature and extent of waste disposal and soil contamination. The investigation was conducted in accord with the Pre-Design Pilot Studies Work Plan (Eder Associates, August 1993) approved by the United States Environmental Protection Agency (USEPA) and the Wisconsin Department of Natural Resources (WDNR).

The August 1993 investigation revealed that a variety of wastes were disposed of at the MRDS in a random manner. The wastes found included empty drums, drums containing waste forge compound, construction and demolition debris, and waste forge compound mixed with varying amounts of soil. Waste (primarily waste forge compound/soil mixture) and soil samples were collected from the test pits excavated and the soil borings drilled during the MRDS investigation and analyzed. The MRDS characterization results will be summarized in the RI report.

Soil vapor extraction (SVE) may be a component of the final remedy for the MRDS. An effective SVE system would act as a barrier to prevent the downward movement of vapors. A pilot test will be conducted to determine whether SVE would be effective in preventing VOC vapor transport through the vadose zone to groundwater at the MRDS. The pilot test will also provide the information required to determine design parameters (i.e. - radius of influence, air extraction rates, well spacing, screen intervals, and VOC concentrations in the extracted air) for a full-scale SVE system. This work plan describes the technical protocol for the SVE pilot test.

1.2 Pilot Test Approach

The SVE pilot test will be conducted at three locations selected based on the waste and soil characteristics identified during the August 1993 investigation. The test locations are shown on Figure 2 and described in Section 2.0. The test will determine whether SVE would be effective in creating a vapor barrier.

The pilot test will be implemented in two phases. Each location will be tested independently to avoid interference between the results collected for each pilot system. An array of soil monitoring points will be used to measure subsurface pressures and vapor concentrations. Vapors will be extracted from each test well to establish subsurface pressures that are representative of steady-state or dynamic conditions during the first phase of the pilot test. This first phase of the test is expected to run for less than eight hours. The results will be used to determine the air permeability of the subsurface materials, the radius of influence of the vapor extraction wells, and the need for VOC emission control during longer term operation.

The second phase of the pilot test will provide extended system operating information to determine the effectiveness of SVE based on sustained negative pressures and decreases in VOC vapor concentrations. This second phase of the test is expected to run for about two weeks at each location.

2.0 TEST WELLS AND EQUIPMENT

Three SVE test wells (VW-1 through VW-3) and nine nested monitoring points (MP-1 through MP-9) will be installed at the MRDS for the pilot test. The proposed locations of the vapor extraction wells and monitoring points are shown on Figure 2. Cross-sectional views of the vapor extraction wells and monitoring points are shown on Figures 3 and 4.

2.1 Soil Vapor Extraction Wells

Vapor extraction well VW-1 will be located near the deep trench area and screened from 25 feet to 30 feet below grade. VW-2 will be located in the area where the highest VOC concentrations were found in waste and soil during the August 1993 investigation. VW-2 will have a 30-foot long screen beginning at 30 feet below grade. VW-3 will be located in the eastern portion of the MRDS where the wastes were relatively consistent and representative of conditions found at the eastern and western portions of the MRDS during the August 1993 work. VW-3 will be screened from about 5 feet to 10 feet below grade. All three vapor extraction wells will be screened in the unsaturated native soil beneath the waste.

The SVE wells will be constructed of four-inch diameter Schedule 40 PVC in boreholes drilled using a 6.25-inch inner diameter hollow stem auger. A temporary 12-inch steel outer casing will be installed to at least two feet below the waste at each drilling location. The 12-inch casing will be installed in a 15-inch borehole drilled using mud-rotary methods. Hollow stem augering will then proceed through the outer casing to the required depth. Each well will have a Schedule 40 PVC screen with 0.020-inch slots, and a filter pack of #30 silica sand terminating approximately two feet above the top of the screen. A hydrated bentonite seal will be placed on top of a fine sand filter pack seal. Water will be added to hydrate the bentonite at five foot intervals. A native soil surface seal will be placed on top of the hydrated bentonite seal. The wells will terminate above grade with a tee fitting for connection to the vacuum blower. A detail of the

vapor extraction wells is presented on Figure 5. The temporary casing will be removed after well installation is completed.

Samples will be collected during drilling at 2.5-foot intervals using 24-inch split spoon samplers. The samplers will be decontaminated by steam cleaning if waste adheres to the split spoons. The sampling interval may be modified in the field based on the characteristics of the native material. Samples will be collected less frequently if the material is homogeneous, and more frequently if variations are observed. The native soil samples collected from each boring will be submitted to a laboratory for grain size analysis. The number of samples to be submitted for grain size analysis may be reduced in the field if the native material is homogeneous. Field decisions will be made in consultation with USEPA and WDNR. Subsurface lithology will be logged and classified by the hydrogeologist overseeing the drilling. The lithologic description will include the following:

- approximate percentages of major and minor grain-size constituents,
- color,
- geologic origin,
- moisture (qualitative),
- visual presence of secondary permeability,
- voids or layering, and
- any other pertinent observations.

2.2 Soil Gas Monitoring Points

Soil gas monitoring points will be used to collect data during the MRDS pilot test. The soil gas monitoring points are designed to evaluate the SVE system parameters horizontally and vertically over the test area, and to obtain information for evaluating air flow in three-dimensions. Five monitoring points (MP-1, MP-2, MP-3, MP-4, and MP-5) will be located between VW-1 and VW-2, as shown on Figures 2 and 3. These five monitoring points will be used to record pressure changes and collect vapor samples during the SVE tests at VW-1 and VW-2. Four

monitoring points (MP-6, MP-7, MP-8, and MP-9) will be used to record pressure changes and collect vapor samples during the SVE test at VW-3, as shown on Figures 2 and 4. Each monitoring point will contain nested probes placed at depths relative to the screened zone of the vapor extraction well(s) it is intended to monitor.

Monitoring point MP-1 will contain three nested soil gas monitoring probes. The upper probe will be screened at 20 feet, the middle probe at 30 feet, and the bottom probe at 45 feet below grade. Monitoring points MP-2 through MP-5 will contain four nested soil gas monitoring probes. The four monitoring probes will be screened at 20 feet, 30 feet, 45 feet, and 55 feet below grade. Monitoring point MP-6 will contain four nested soil gas monitoring probes. The uppermost probe at MP-6 will be screened entirely within the waste, and the sand filter pack for this probe will not extend into the cover material above the waste or the native soil below. The remaining probes at MP-6 will be screened at approximately 5 feet, 15 feet, and 25 feet below grade. The 5-foot probe will be screened entirely within the native soil beneath the waste. The difference in pressures measured at the uppermost probe and the 5-foot probe at MP-6 will provide qualitative information on the permeability of the waste and whether vapor extraction can establish air flow through the waste. Monitoring points MP-7 through MP-9 will contain three nested soil gas monitoring probes screened at approximately 5 feet, 15 feet, and 25 feet below grade. The uppermost probes at MP-7, MP-8, and MP-9 will be screened entirely within the native soil beneath the waste.

All monitoring points will be constructed using a 6.25-inch inner diameter hollow stem auger. A temporary 12-inch steel outer casing will be installed to at least two feet below the waste at each drilling location. The 12-inch casing will be installed in a 15-inch borehole drilled using mud-rotary methods. Hollow stem augering will then proceed through the outer casing to the required depth. The probes will be one-inch diameter Schedule 40 PVC terminating with a six-inch long section of slotted screen. The probe screens will be segregated by hydrated bentonite seals and imbedded in a #30 silica sand filter pack. Each probe will have a quick-connect, air-tight coupling for use with a vacuum gauge. A detail of the soil gas monitoring point

construction is shown on Figure 6. Each probe will be labeled to identify its depth. The temporary casing will be removed after monitoring point installation is completed.

Samples will be collected at 2.5-foot intervals using 24-inch split spoon samplers when drilling MP-1, MP-5, and MP-6. The samplers will be decontaminated by steam cleaning if waste adheres to the split spoons. Subsurface lithology will be logged and classified by the hydrogeologist overseeing the drilling, as previously discussed. A five-foot (or greater) sampling interval may be used for the remaining monitoring points (MP-2, MP-3, MP-4, MP-7, MP-8, and MP-9) if the hydrogeologist determines that the native material is homogeneous. Sampling would resume at more frequent intervals if the hydrogeologist observes any variations in the material. The native soil samples collected from each boring will be submitted to a laboratory for grain size analysis. The number of samples to be submitted for grain size analysis may be reduced in the field if the native material is homogeneous. Field decisions will be made in consultation with USEPA and WDNR.

2.3 Soil Vapor Extraction Equipment

The SVE test will be conducted using a trailer mounted spark-proof positive displacement vacuum blower (Roots Model 33 URAI or equivalent) with a 5 horsepower explosion-proof motor and switch. This blower has an airflow range of 25 to 175 scfm at a maximum vacuum of ten inches of mercury. The trailer mounted rig is also equipped with a vacuum relief valve, an 80-gallon condensate separator tank, a discharge silencer, four manifold two-inch hose connections, vacuum gauges, and airflow meters. The blower is belt-driven and can be sheaved to provide nominal flow rates at 25 scfm increments. A bleed valve can be adjusted to provide minor flow rate variations. Vapor extraction well VW-2 has a 30-foot screen, and it may be necessary to use two or more blowers in parallel to extract a sufficient air flow to establish a subsurface vacuum at a reasonable distance from this well. The need to use additional blowers will be determined during implementation of the pilot test at WV-2.

The soil gas permeability test will run for a maximum of 8 hours at an air flow rate of approximately 100 scfm. More than 100 scfm may be extracted at VW-2 if necessary to obtain adequate data. USEPA and WDNR would be consulted before increasing the air flow rate at VW-2. The VOC data collected during the first phase of the SVE pilot test will be evaluated to determine whether emission controls would be required for longer term operation. The exhaust gas from the second phase of the SVE pilot test will be treated with activated carbon if necessary to comply with the limitations specified in Chapter NR 445, Wisconsin Administrative Code. Returnable 55 gallon (200 lb) carbon vessels will be staged on-site and used as necessary.

2.4 Field Instrumentation and Measurements

2.4.1 Concentrations of Volatile Organic Compounds

Soil gas and exhaust gas samples will be collected from the monitoring points and SVE wells using disposable aluminum vacuum sample canisters with a capacity of approximately 280 cc. The samples will be analyzed for the VOCs listed in Table 1, which were detected in samples collected at the MRDS, using a portable gas chromatograph (GC) (Photovac GC Model #10S50) equipped with a photoionization detector (PID). The portable GC operation procedures are presented in Appendix A.

2.4.2 Pressure/Vacuum Monitoring

Changes in soil gas pressure during the air permeability test will be measured at the soil gas monitoring points using Magnehelic™ or equivalent gauges with pressure ranges of 0 to 100 inches water. Tygon™ or equivalent tubing will be used to connect the pressure/vacuum gauge to the quick-disconnect at the top of each soil gas monitoring probe. Pressure gauges on the SVE unit will also be monitored during the test. The gauges are sealed and calibrated at the factory and will be zeroed before each test.

All attachments to the monitoring probes will be air tight. Vacuum measurement will be to two digits of accuracy (e.g. 0.01 to 0.99, 1.0 to 9.9, and 10 to 99 inches water column).

2.4.3 Air Flow Rate Measurement

Air extraction flow rates will be measured by the flowmeter mounted on the SVE unit during the pilot test. The flowmeter has a capacity up to 180 scfm and will be zeroed before each test. All flow rates will be corrected to standard temperature and ambient pressure conditions.

2.4.4 Temperature and Relative Humidity Measurements

Temperature and relative humidity will be measured at the extraction wells using a portable measurement device.

3.0 PILOT TEST PROCEDURES

3.1 Soil Gas Permeability Test Procedures

The first phase of the SVE test will gather data to estimate the soil gas permeability (k) and the radius of influence (ROI) of the vapor extraction well, to obtain qualitative information on the permeability of the waste, and to evaluate the need for VOC emission controls during the second phase of the test. The analytical method that will be used to estimate these parameters is presented in Appendix B.

3.1.1 System Check

Soil gas samples will be collected from the vapor extraction well and soil gas monitoring points before the test begins. The samples will be analyzed for the VOCs listed in Table 1 to establish baseline concentrations. After the SVE unit has been connected to the vapor extraction well, air will be extracted for 10 to 15 minutes to ensure proper operation of the SVE unit, pressure gauges, and air flow gauges. Pressure response at each monitoring point will be measured before and after the system check period.

3.1.2 Test Procedures

The soil gas permeability test will begin after all monitoring point pressures have returned to zero after the system check. The test will be conducted independently at the three test areas. Samples will be collected and analyzed in accord with the schedule described in Section 4.1.

The first SVE test will be conducted at VW-2. If the data indicate that air extraction rates above the capacity of the blower are required to evaluate SVE at this location, the test would be discontinued to allow one or more additional blowers to be obtained. In the meantime, the SVE

tests would be conducted at VW-1 and/or VW-3 to avoid delaying the overall pilot test project schedule.

The soil gas permeability test procedures are summarized below:

1. Connect the pressure gauge to the top of each monitoring probe and return the gauges to zero.

2. Turn the SVE unit on to extract approximately 100 scfm.

3. Record the pressure at each soil monitoring probe at one-minute intervals. (Note: VW-1 will be considered to be a monitoring probe during the test at VW-2).

4. After 10 minutes, record the pressure reading at the well head, the temperature and relative humidity of the exhaust gas, and the flow rate from the SVE unit. Record the pressure at each monitoring probe at two-minute intervals.

5. After 20 minutes, record the pressure at each monitoring probe at three-minute intervals. Continue to record all SVE unit data at ten-minute intervals.

6. Continue to record the pressure at each monitoring probe at three-minute intervals until the change in pressure is less than 0.1 inches of water. At this time, a 5- to 20-minute interval will be used.

7. Review results to ensure that accurate data are collected during the first 30 minutes of the test. If the quality of the data is in question (i.e. - if a stronger vacuum is measured in monitoring points distant from the test well than in monitoring points closer to the well, there is a problem with the pressure gauges), turn off the blower, allow all monitoring probes to return to zero pressure, and restart the test.

Note: If the data indicate negligible pressure changes during the VW-2 test, additional blowers may be obtained and used in parallel to achieve sufficient data. USEPA and WDNR would be consulted before increasing the air flow rate at VW-2.

8. Continue to collect data for four hours to a maximum of eight hours. The test will be terminated when pressure readings do not change by more than 10 percent over a one-hour interval (assumed to represent steady state conditions), or after the test has run for eight hours.

9. Collect soil gas samples from the vapor extraction well and soil gas monitoring probes every two hours during the test and immediately after completing the soil gas permeability test. The samples will be analyzed for the VOCs listed in Table 1 using a portable GC.

10. Obtain hourly barometric pressure data and record information on weather conditions (precipitation events, presence of frost, etc.) for consideration during data evaluation. Meteorological data will be obtained from the Chippewa Valley Regional Airport in Eau Claire, Wisconsin.

11. Calculate k based on the test data using the method outlined in Appendix B. The steady state equations will be used if the pressure readings did not change by more than ten percent over a one-hour period. The dynamic equations will be used if the test does not reach representative steady state conditions and is ended after eight hours. The emissions of VOCs from the SVE system will be calculated and compared to the NR 445 limitations to evaluate the need for emission controls during the second phase SVE test and for full-scale system design.

12. The pilot test data will be evaluated using a three-dimensional model to determine the ROI of the vapor extraction wells.

Any condensate collected by the SVE pilot system will be drummed. Headspace analysis using a portable GC will be performed on one condensate sample from each drum. The condensate will be analyzed for TCA, TCE, PCE, 1,1-DCE, and 1,1-DCA, and the results will be compared to the discharge limits established for these VOCs under the on-site groundwater interim remedial action (IRA). The headspace analysis of the condensate will be performed in accord with the USEPA-approved portable GC method for VOC screening of water samples (Eder, August 1991). The condensate will be hauled to the IRA cascade aerator at the MRDS for treatment and discharge to the Chippewa River if the VOC discharge limits are met. The condensate will be transported to an off-site treatment/disposal facility if the VOC discharge limits are exceeded.

3.2 Soil Vapor Extraction Test

The second phase SVE test will be conducted at the three test areas independently to evaluate longer term SVE system response and effectiveness. The air extraction rate will be determined based on an evaluation of the soil gas permeability test results.

The second phase SVE test results will be evaluated and the test discontinued when the data suggest that further operation would not provide useful information. The decision to discontinue the test at each location will be made in conjunction with USEPA and WDNR. It is expected that the three extended tests would be completed within a total of six weeks.

3.2.1 System Installation

The trailer mounted SVE system will be used for the extended SVE test. A carbon adsorption unit will be used to treat emissions if the exhaust-gas sampling results from the soil gas permeability test show that estimated benzene, individual VOC, and/or total VOC emissions would exceed the NR 445 allowable limits.

3.2.2 System Operation and Maintenance

The blower will be operated continuously throughout the extended SVE test periods. The system will be checked daily to ensure that the blower is operating within the intended flow rate, pressure, and temperature range. Maintenance such as replacing filters or gauges, or draining condensate, will be performed as necessary. Serious problems, such as motor or blower failures, will be corrected to ensure the credibility of SVE test.

Any condensate recovered by the SVE pilot system will be drummed. Headspace analysis using a portable GC will be performed on one condensate sample from each drum. The condensate will be analyzed for TCA, TCE, PCE, 1,1-DCE, and 1,1-DCA, and the results will be compared to the discharge limits established for these VOCs under the on-site groundwater IRA. The headspace analysis of the condensate will be performed in accord with the USEPA-approved portable GC method for VOC screening of water samples (Eder, August 1991). The condensate will be hauled to the IRA cascade aerator at the MRDS for treatment and discharge to the Chippewa River if the VOC discharge limtis are met. The condensate will be transported to an off-site treatment/disposal facility if the VOC discharge limtis are exceeded.

3.2.3 System Monitoring

Soil gas and exhaust gas sampling will be conducted to monitor the progress of the extended SVE tests. All SVE unit parameters, such as pressure, air extraction flow rates, temperature, and relative humidity will also be recorded. Information on barometric pressure and weather conditions (precipitation events, presence of frost, etc.) will be noted and considered when evaluating the data. Meteorological data will be obtained form the Chippewa Valley Regional Airport. A detailed sampling and analytical schedule is presented in Section 4.1.

4.0 SAMPLING AND ANALYSIS

4.1 Analytical Schedule

4.1.1 Soil Gas Permeability Test

The soil gas permeability test will be conducted for a maximum of eight hours. Samples will be collected from the vapor extraction well and soil gas monitoring probes before the test at each location. Samples will be collected every two hours during the test. At the end of the test, samples will be collected from the SVE system exhaust and soil gas monitoring probes immediately after the system is shut down. All samples will be analyzed for the VOCs listed in Table 1 using a portable GC.

4.1.2 Soil Vapor Extraction Test

The extended SVE test will run for approximately two weeks at each location. The three locations will be tested independently, so the second phase of testing is expected to run for approximately six weeks. Three samples of the SVE exhaust gas will be collected on the first three days of operation (at the beginning, middle, and end of each day) at each location. Samples will then be collected twice a week for the remainder of the test. The monitoring probes will be sampled at the beginning, middle, and end of the test period. All samples will be analyzed by portable GC for the VOCs listed in Table 1. The SVE system parameters, such as air flow rates, pressures, temperature, and relative humidity will be monitored during each sampling event. Information on weather conditions and barometric pressure will be recorded and considered when evaluating the data. Meteorological data will be obtained from teh Chippewa Valley Regional Airport.

4.2 Sample Collection and Handling

Soil vapor samples and exhaust gas samples will be collected from the monitoring probes and SVE wells, respectively, using disposable aluminum vacuum sample canisters which have a capacity of approximately 280 cc. At least two probe volumes of air will be purged using a portable pump before collecting samples from each soil gas monitoring probe. Once the samples are collected, the aluminum sample canisters will be sealed in a cooler, stored in a dark environment and preserved at 4°C for a maximum 48-hour holding time before analysis. The samples collected during the soil permeability tests will be analyzed on-site. The samples collected from the extended test will be shipped via overnight courier service to Eder's New York office, where they will be analyzed for the VOCs listed in Table 1 using a portable GC (Photovac GC Model #10S50) equipped with a PID. The data quality objective (DQO) for the sample analysis is Level 2 (field analyses).

4.3 Quality Control/Quality Assurance (QA/QC) Procedures

All instruments (i.e. - portable GC and pressure gauges) will be calibrated daily prior to use. The portable GC calibration will be checked at the end of each day. The calibration will follow standard manufacturers' instructions to assure that the equipment is functioning within the tolerances established by the analytical requirements. The following QA/QC procedures will be used during the collection and shipment of soil gas samples:

- Use disposable latex gloves when collecting soil vapor samples.

- Place all samples on ice in a cooler following collection. Analyze samples collected during the soil gas permeability tests using a portable GC brought on-site. Ship samples collected during the extended test via overnight courier service to Eder's New York office for portable GC analysis in accord with the procedures outlined in Appendix A.

- Complete a chain of custody record to accompany each sample shipment.

Field duplicates and trip blanks will be collected and analyzed to monitor sampling reproducibility, to check for cross-contamination in the sampling system, and to check for procedural contamination due to analyte migration during shipment and storage of samples. Field duplicate samples will be collected every 20 samples, or at least once a day if less than 20 samples are collected. One trip blank (vacuum canister filled with Ultra Zero air) will be used per sample shipment.

Appendix C presents the example chain of custody and field measurement and record forms.

5.0 PILOT TEST REPORT

A report will be prepared after the SVE pilot test is completed and the data are evaluated. The report will include the following as specified in the Wisconsin Soil Venting Guidance:

5.1 Discussion

- A description of the test and final conclusions based on the objective to evaluate whether SVE would be effective in creating a vapor barrier. The text will include dates, weather (ambient temperature, wind, etc.), and any other pertinent field observations from the pilot test. The barometric pressure and whether climbing or falling will also be listed.

- Three-dimensional air flow modeling results. A 3-D model selected in consultation with USEPA and WDNR will be used to evaluate the pilot test data and develop a conceptual SVE system design.

- Conceptual full-scale SVE system design

5.2 Figures

- A site map drawn to scale (horizontal accuracy to +/- one foot). The map will indicate:

  - Locations of soil vapor extraction wells and soil gas monitoring points.
  - Zone of soil contamination.
  - Paved areas, buildings, and structures.
  - Buried utility trenches.

- Scale, north arrow, title block, site name, key or legend, and date(s) of pilot test.
- Any other pertinent site information.

- Graphs representing subsurface vacuum at a distance from each soil vapor extraction well.

- A water table map of the site for the day of the pilot test.

- Cross sections showing screened intervals, geological units, contour lines of steady state vacuum readings, and soil monitoring points for each soil vapor extraction well.

- Plots of mass removal of VOCs vs. time for each soil vapor extraction well.

5.3 Tables

- Tabulated flow rates, vacuum distribution, soil gas temperatures, times of readings, ambient barometric pressure, and the ambient temperature.

- Water levels in existing groundwater monitoring wells.

5.4 Appendices

- A complete description of the field equipment and field procedures that were used.

- Sampling methods and procedures.

- Analytical methods, analytical results, and lab reports.

- Boring logs and well construction diagrams for the soil vapor extraction wells and the soil gas monitoring points.

- Grain size analysis results.

- Engineering calculations.

- Any other pertinent field data.

6.0 TEST SCHEDULE

Figure 7 presents the proposed schedule for the SVE system pilot test.

7.0 HEALTH AND SAFETY

The SVE pilot test will be conducted in accordance with the Health and Safety Plan presented in Appendix D.

NATIONAL PRESTO INDUSTRIES, INC.
EAU CLAIRE, WISCONSIN

TABLE 1

SVE PILOT TEST

VOCs TO BE ANALYZED BY PORTABLE GAS CHROMATOGRAPH

1,1-Dichloroethane
1,1,1-Trichloroethane
Tetrachloroethylene
Trichloroethylene
2-Butanone
Benzene
Toluene
Xylenes (Total)
Ethylbenzene
Acetone
Methylene Chloride
Chloroethane
2-Hexanone
4-Methyl-2-pentanone
1,2-Dichlorobenzene
1,1-Dichloroethylene
Styrene

NOTE:

The GC results will be added to estimate total VOC emission rates.

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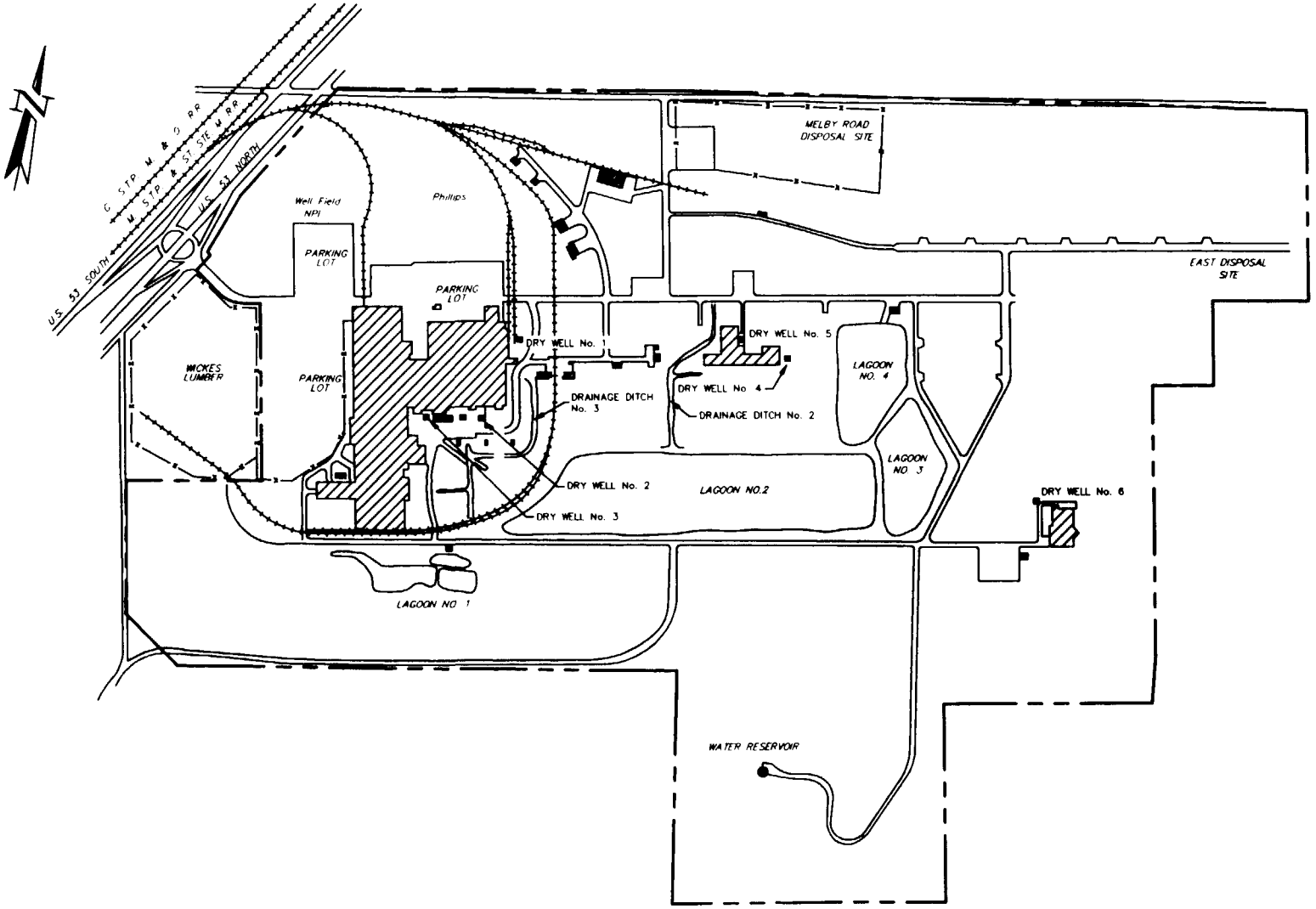
FIGURE 1



SITE PLAN

NATIONAL PRESTO INDUSTRIES, INC. SITE

EAU CLAIRE, WISCONSIN

SK4971BA
012694

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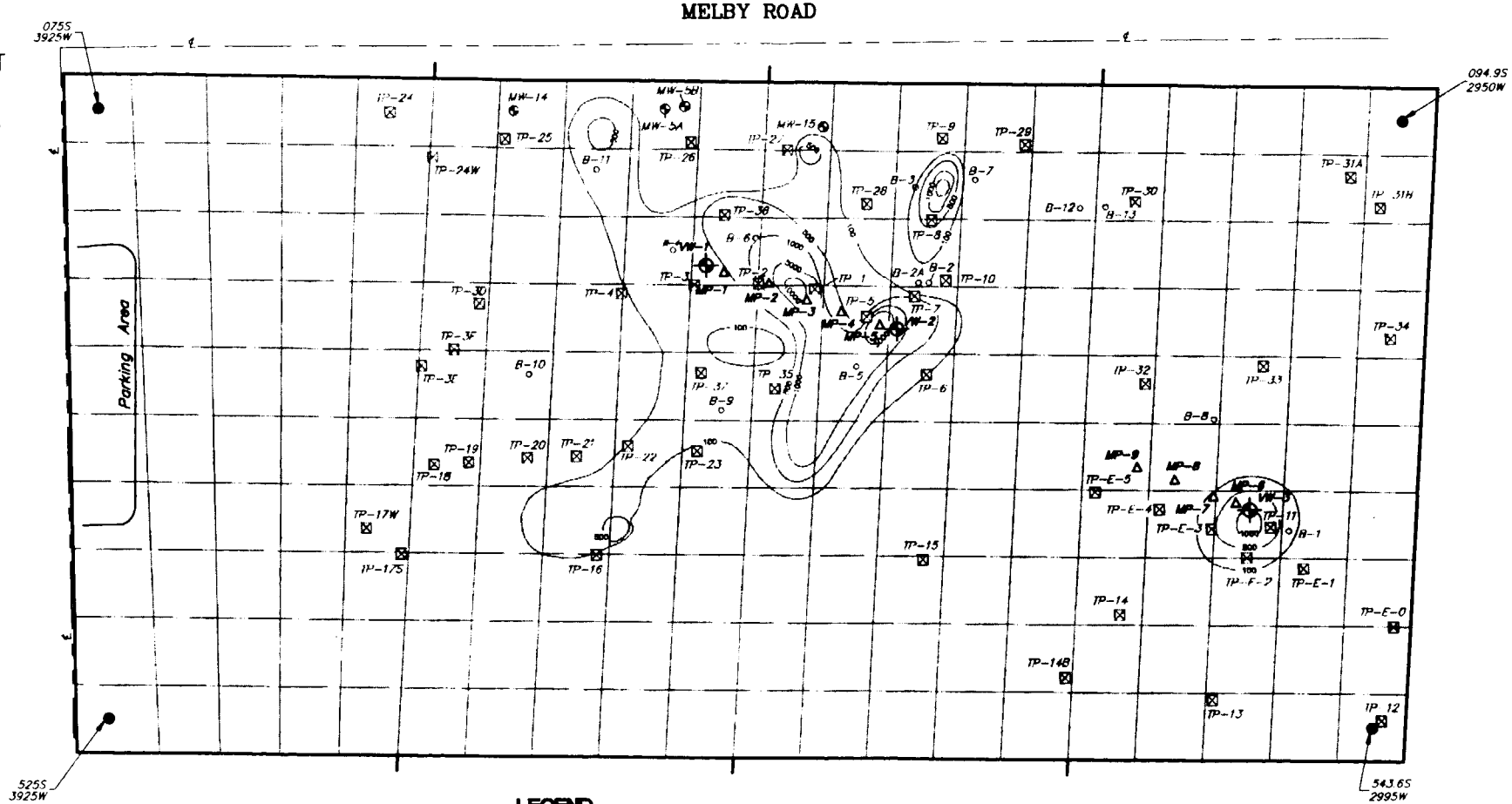
FIGURE 2



LEGEND

- VW-3 — *Proposed Vapor Extraction Well*
- MP-5 — *Proposed Nested Monitoring Point*
- TP-25 — *Approximate Location Of Test Pit Excavated In August, 1993*
- B-11 — *Approximate Location Of Boring Drilled In August, 1993*
- MW-14 — *Existing Monitoring Well*
- ---100--- — *Contours Of 1,1,1-TCA Concentrations (ppb) In Soil Vapor Samples Collected In 1989*

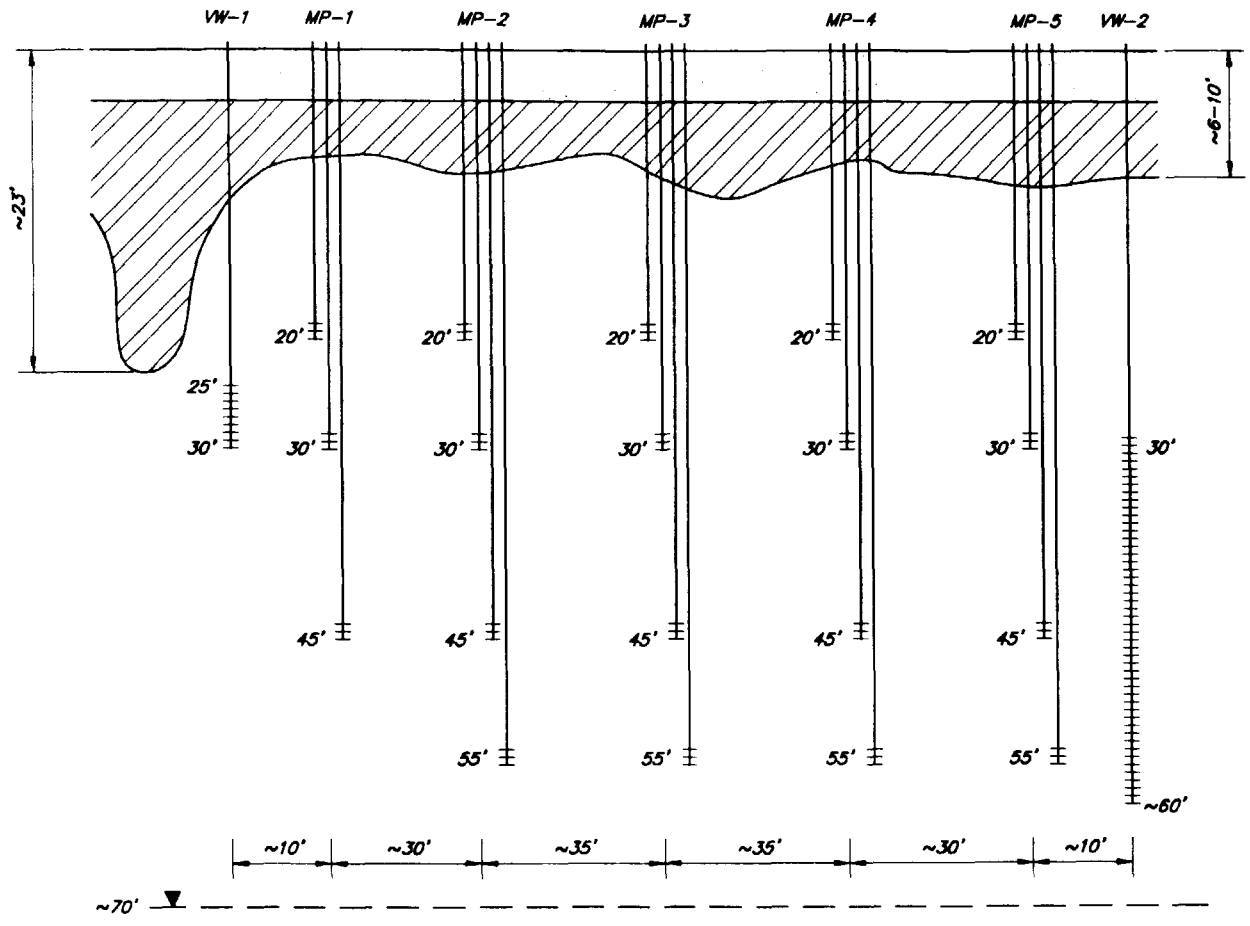
0 80

Scale In Feet

SK497188
022494

SOIL VAPOR EXTRACTION PILOT TEST

NATIONAL PRESTO INDUSTRIES, INC. SITE
MELBY ROAD DISPOSAL SITE
EAU CLAIRE, WISCONSIN



LEGEND

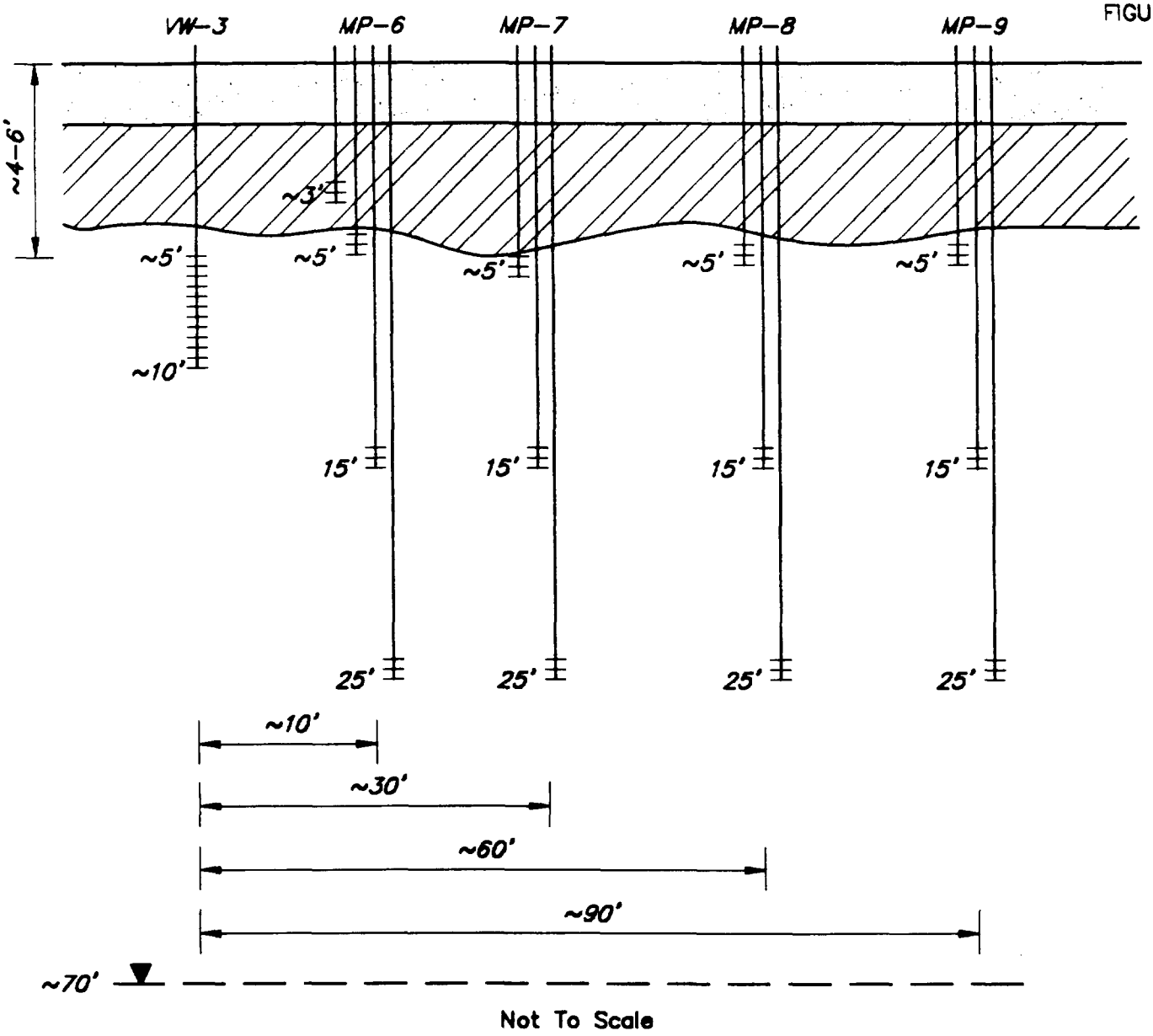
- VW-1 — Proposed Vapor Extraction Well
- MP-1 — Proposed Nested Monitoring Point
- Screened Zone Of Vapor Extraction Well Or Monitoring Probe
- Groundwater Table (Approximate)
- Cover Material (Approximate Depth And Extent)
- Waste Material (Approximate Depth And Extent)

Not To Scale

CROSS-SECTIONAL VIEW OF VW-1, VW-2, AND MP-1 THROUGH MP-5

NATIONAL PRESTO INDUSTRIES, INC. SITE
MELBY ROAD DISPOSAL SITE
EAU CLAIRE, WISCONSIN

SK49718F
D31894



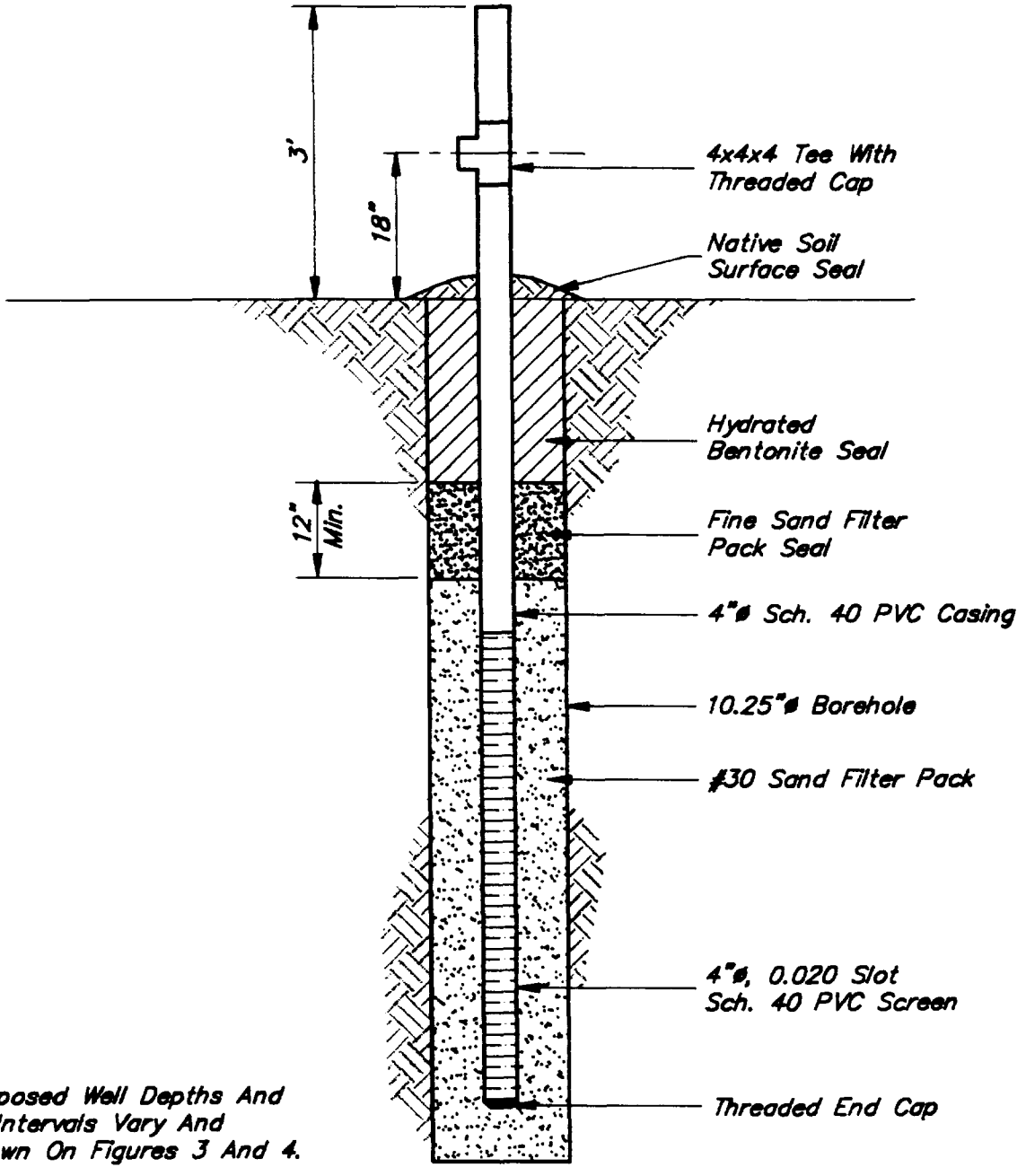
Not To Scale

LEGEND

VW-3	Proposed Vapor Extraction Well
MP-6	Proposed Nested Monitoring Point
‡	Screened Zone Of Vapor Extraction Well Or Monitoring Probe
— ▼ —	Groundwater Table (Approximate)
	Cover Material (Approximate Depth And Extent)
	Waste Material (Approximate Depth And Extent)

CROSS-SECTIONAL VIEW OF VW-3 AND MP-6 THROUGH MP-9

NATIONAL PRESTO INDUSTRIES, INC. SITE
MELBY ROAD DISPOSAL SITE
EAU CLAIRE, WISCONSIN



NOTE:

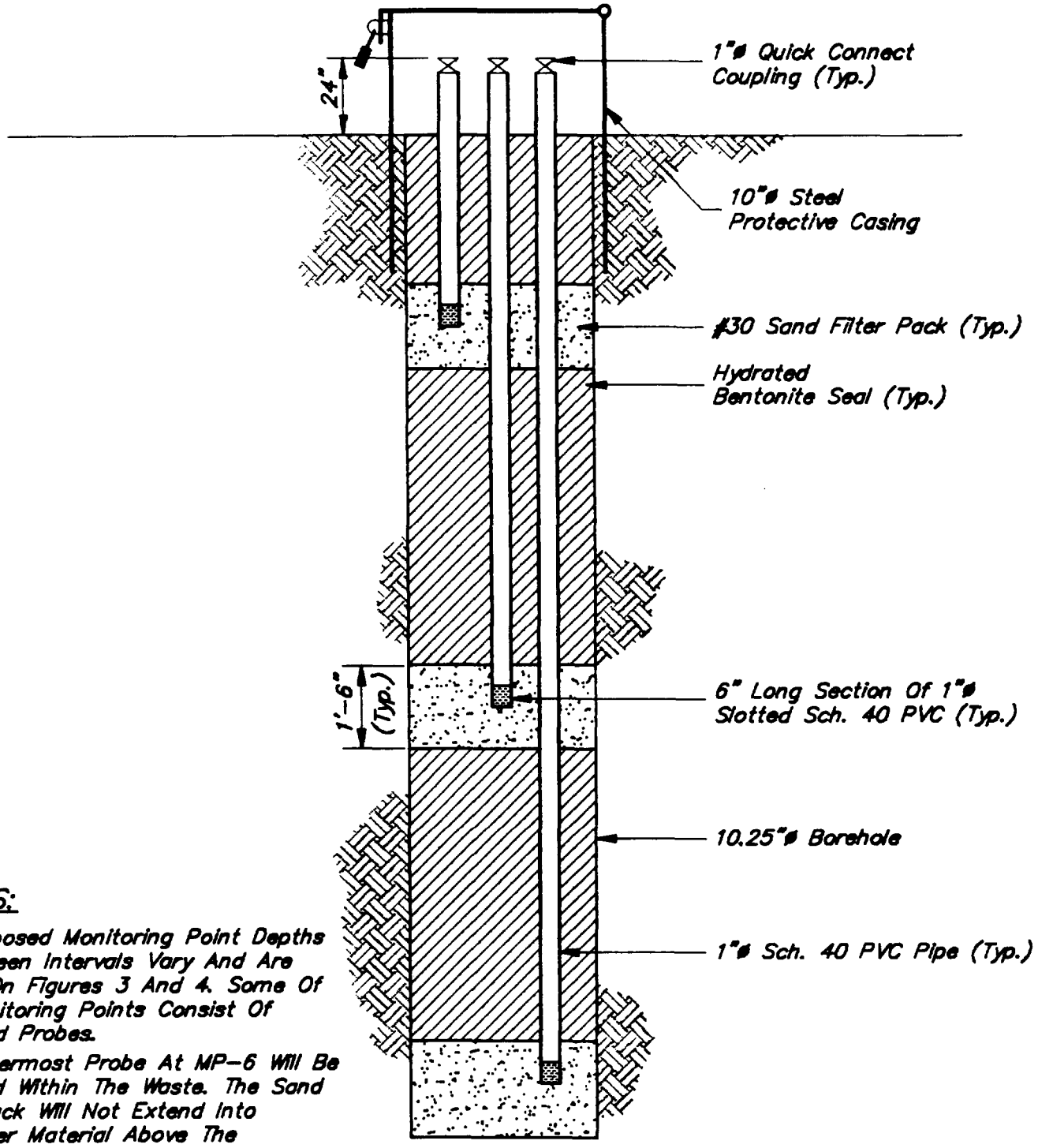
The Proposed Well Depths And Screen Intervals Vary And Are Shown On Figures 3 And 4.

Not To Scale

SOIL VAPOR EXTRACTION WELL DETAIL

NATIONAL PRESTO INDUSTRIES, INC. SITE
MELBY ROAD DISPOSAL SITE
EAU CLAIRE, WISCONSIN

SK49718C
031694



NOTES:

1. The Proposed Monitoring Point Depths And Screen Intervals Vary And Are Shown On Figures 3 And 4. Some Of The Monitoring Points Consist Of 4 Nested Probes.
2. The Uppermost Probe At MP-6 Will Be Screened Within The Waste. The Sand Filter Pack Will Not Extend Into The Cover Material Above The Waste Or The Native Soil Below.

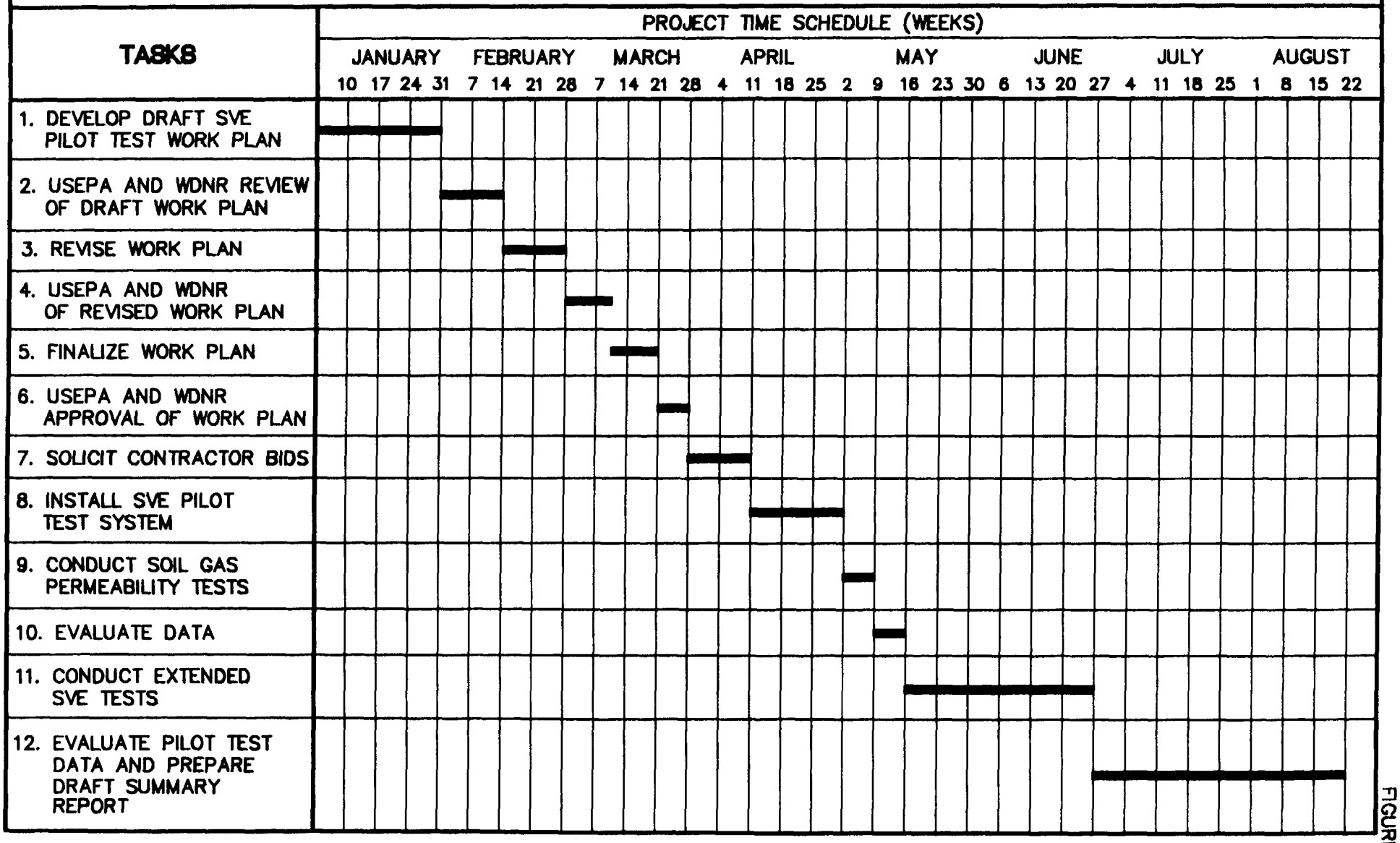
Not To Scale

NESTED SOIL GAS MONITORING POINT DETAIL

NATIONAL PRESTO INDUSTRIES, INC. SITE
MELBY ROAD DISPOSAL SITE
EAU CLAIRE, WISCONSIN

SK49718D
031694

PROPOSED SOIL VAPOR EXTRACTION PILOT TEST SCHEDULE
NATIONAL PRESTO INDUSTRIES, INC. SITE
MELBY ROAD DISPOSAL SITE
EAU CLAIRE, WISCONSIN



SK49718E
031694

eder associates

FIGURE 7

APPENDIX A

PORTABLE GAS CHROMATOGRAPH OPERATION PROCEDURES

PORTABLE GC OPERATION PROCEDURES

Preparation of Calibration Standards

Cylinders of certified calibration gas mixtures are widely used as gas standards for the Photovac Model 10S50 Portable Gas Chromatograph (GC). These mixtures are generally stable and accurate to within a ± 5 percent range. Cylinders are available in a variety of sizes. The gas standards will be purchased from Matheson Gas Products, Inc., Twinsburg, Ohio, or others.

Gas standards can also be prepared by diluting saturated headspace vapor above pure liquid compound in a static volume container containing Ultra Zero air. This method is efficient, and considerably less expensive but more time-consuming than purchasing cylinders of gas standards. The apparatus and steps required to prepare gas standards with pure chemicals are outlined below.

1. Apparatus and Reagents

   (a) Ultra Zero air
   (b) One-liter Tedlar air bag
   (c) Gas-tight syringe
   (d) Adjustable micropipette with disposable tips
   (e) 5 ml mini-vial with a Teflon faced septum cap
   (f) ANTOINE equation for estimating vapor pressure at various temperature

2. Procedure

   (a) Spike two ml of a pure compound into a glass mini-vial with a Teflon faced septum cap. Allow about 40 minutes to form an equilibrated headspace vapor above the liquid.

(b) Record the ambient temperature and use the ANTOINE equation to calculate vapor pressure of each compound:

$$\log P^\circ = A - B/(C + T)$$

where, P° = Compound vapor pressure, Kpa

T = Ambient temperature, °C, and

A, B, C are characteristic constants of the compound.

For benzene, for example, the values of A, B, and C are 6.01905, 1204.637, and 220.069, respectively.

(c) Calculate the volume of headspace vapor required to prepare a certain vapor concentration in ppmv for a known volume of Ultra Zero air diluent:

$$V_h = (101.325/P^\circ) \times C \times V_L$$

where, V_h = Volume of saturated headspace, µl

C = Desired concentration, ppmv, and

V_L = Volume of the static volume dilution container = one liter.

(d) Fill a clean one-liter Tedlar bag with the Ultra Zero air. Inject appropriate volume of the saturated vapor, as calculated in Step (c), into the Tedlar bag with a gas-tight syringe. Be careful not to touch the liquid with needle of the syringe when withdrawing the vapor from the mini-vial containing the compound. Since such precise volume cannot be measured, record exact volume injected and back calculate the final concentration.

(e) Repeat Steps (a) through (d) for all compounds of interest. Allow approximately 30 minutes for standards to reach equilibrium.

System Calibration

The limit of detection for each compound should be determined in advance. At least two successive serial dilutions of working stock are performed to bring the standard into the low ppb range. Once a limit of detection has been established, a calibration standard containing all of the compounds of interest at suitable concentrations will be prepared.

The concentration levels of compounds in the mixed standard are such that the peaks of all compounds are clearly visible during a single analysis. An off-scale peak will be adjusted in concentration so that they are in a half height of a full-scale appearance.

Instrument Set-Up

The instrument settings will be determined by the sensitivity of the detector to the compounds, the compound's elution rate, and the detection limit required. Variables that need to be controlled during the instrument set-up include carrier gas flow rate which is typically between five and 15 ml per minute, column temperature which is typically in the range of 30 to 50 °C, analysis cycle which is typically from two minutes up to one hour, signal gain setting which is typically set between 20 to 100, and retention time window which is typically set to two to ten percent. The settings for all of these parameters (except retention time window) can be printed out with each chromatogram.

The chromatogram column used in the Photovac 10S50 is a Cp-Sil5CB column. This is a wide bore capillary column coated with a two micrometer stationary phase of 100 percent dimethyl polysiloxane. Other columns are available for analyzing special groups of compounds. The carrier gas used is hydrocarbon-free (Ultra Zero) air.

Daily Operation and Maintenance

The carrier gas flow rate will be set using a dual flowmeter with Teflon tubing. After the instrument and the internal column oven have been allowed to stabilize (approximately 30 minutes), an Ultra Zero air blank will be run to determine if the column condition is acceptable. If the column appears to be contaminated, the oven temperature and the carrier gas flow rate need to be increased to purge the column until the contamination is no longer detected.

When the GC has been warmed up and a stable baseline has been achieved, 40 to 100 µl of the calibration standard headspace will be injected. The appropriate GC library will be updated with new retention times and peak areas of the compounds. A standard will be run every ten samples, or more frequently to ensure continued calibration of the portable GC.

A GC blank will be run at the start of each day's operation to ensure a steady baseline. This is done by starting GC analysis without injecting a sample. Blank or syringe blanks will also be analyzed following the completion of the standard calibration to determine if there is carry-over from previous samples and/or standards. The syringe blanks should be analyzed following all highly contaminated samples. Contaminants detected in the gas-tight syringe will be cleaned using methanol and distilled water.

Air samples are taken through Teflon tubing into a one-liter Tedlar bag. A volume of 40 to 100 µl of air is withdrawn with a gas-tight syringe and the sample is directly injected into the GC and analyzed.

Care should be taken not to inject liquid into the GC. If a sample is highly contaminated, the injecting volume can be reduced accordingly. The dilution factor can then be calculated by the ratio of injected sample volume to injected calibration volume.

Quality Control

In addition to the blank analysis and calibration analysis, duplicate analysis will be run once every 20 samples or as necessary. The calibration analysis will be performed twice a day or as frequently as necessary. The portable GC calibration will be checked at the end of each day. The retention time of each peak in the chromatogram shall be checked for peak drift to avoid misidentification.

The integrity of the gas-tight syringe will be maintained. Once the syringe plungers loosen up after prolonged use, the Teflon plunger tip will be replaced. The injection port septa in the GC will be changed regularly (typically after 20 injections) to reduce contamination and to prevent air leaking which could affect the integrity of the GC results.

References

Boublik, T., V. Fried, and E. Hala 1984. The Vapor Pressure of Pure Substances. (2nd edition), Elsevier Science Publication, The Netherlands, 1984.

PHOTOVAC Inc. 1990. Calculated Headspace Volumes for Preparation of Vapor Standards using Pure Chemicals. PHOTOVAC Technical Bulletin # 21.

APPENDIX B

PARAMETER ESTIMATION METHOD FOR SOIL GAS PERMEABILITY TEST

PARAMETER ESTIMATION METHODS FOR SOIL GAS PERMEABILITY TEST

The field drawdown method is based on Darcy's Law and equations for steady-state radial flow to or from a vent well. A full mathematical development of this method and supporting calculations are provided by Johnson et al. (1990). A computer program known as HyperVentilate™ has been developed by USEPA for storing field data and computing soil permeability, k. This program will be used to evaluate the soil gas permeability test data, and will speed the calculation and data presentation process. The two solution methods for k are presented below. The first solution is based on carefully measuring the dynamic response of the soil to a constant extraction rate. The second solution for k is based on steady-state conditions and the measurement or estimation of ROI at steady state. The limitations and recommended application of each method are presented below. Whenever possible, field data will be collected to support both solution methods, because one or both of the solution methods may be appropriate, depending on site-specific conditions.

Dynamic Method

This test method requires that air be extracted at a constant rate for a single venting well, while measuring the pressure changes at several soil gas monitoring points throughout the contaminated soil volume. The equation:

$$P' = \frac{Q}{4\pi m(k/\mu)}\left[-0.5772 - \ln\left(\frac{r^2 e\mu}{4kP_{atm}}\right) + \ln(t)\right] \qquad (1)$$

is used to describe the dynamic changes in soil gas pressure/vacuum where:

P'	=	"gauge" pressure measured at distance r from the vent well at time t (g/cm-s^2)
m	=	stratum thickness, generally the vent well screened interval (cm)
r	=	radial distance from monitoring point to vent well (cm)
k	=	soil permeability (cm^2)
μ	=	viscosity of air (1.8×10^{-4} g/cm-s at 18°C)
e	=	soil effective porosity (dimension-less)
t	=	time from the start of the test (sec)
Q	=	volumetric flow rate from the vent well (cm^3/s)
P_{atm}	=	ambient pressure (at sea level 1.013×10^6 g/cm-s^2)

Equation (1) predicts that the dynamic of P'-vs-ln(t) is a straight line with a slope of A where:

$$A = \frac{Q}{4\pi m\ (k/\mu)} \qquad (2)$$

Solving Equation (2) for k gives

$$k = \frac{Q\mu}{4A\pi m}$$

The HyperVentilate™ model is based on the dynamic method and a determination of the slope, A. This method of determining k requires accurate field measurements of Q at the vent well and P'-vs.-time at each monitoring point. It is most appropriately applied at sites with less permeable soils where change in P' occur over a longer time period (10 minutes or more to monitoring points steady state). This method can be accurate for fine sandy soils where the screened interval extends to depths of over 10 feet and when monitoring points are screened at depths of 10 ft or greater. It is less accurate for sites where a high water table or shallow contamination limits the

total depth of the vent well screen and monitoring points to less than 10 feet. In shallow and coarse-grained soils, vacuum or pressure levels reach steady state too rapidly to accurately plot P'-vs.-ln(t). Venting systems on shallow sandy sites are subject to higher vertical airflow which is not as accurately described by this one-dimensional radial flow equation.

Steady-State Method

This method for determining k can be used in situations where the dynamic method is inappropriate. This method is based on the steady-state solution to Equation (1).

$$k = \frac{Q\mu \ln\left(\frac{R_w}{ROI}\right)}{H\pi P_w\left[1 - \left(\frac{P_{atm}}{P_w}\right)^2\right]} \qquad (3)$$

where Q, m, μ, and P_{atm} have been previously defined, and

R_w = the radius of the venting well (cm)

H = screen length (cm)

ROI = the maximum radius of venting influence at steady state (cm)

P_w = the absolute pressure at the venting well ($g/cm\text{-}s^2$)

The value of ROI can be determined by actually measuring the outer limit of vacuum/pressure influence under steady-state conditions, or by plotting the vacuum/pressure at each monitoring point vs. the log of its radial distance from the vent well and extrapolating the straight line to one percent of the vacuum or pressure at the vapor extraction well. The latter method will be used to estimate the ROI value to be used in calculating k. Three-dimensional modeling will be used to determine the ROI of vapor extraction wells when developing a conceptual full-scale system.

References

Johnson, P.C., M.W. Kemblowski, and J.D. Colthart, 1990, "Quantitative Analysis for the Cleanup of Hydrocarbon-Contaminated Soils by In Situ Soil Venting", *Groundwater*, 28(3): 413-429.

Personal Communication with P.C. Johnson, March 15-17, 1994.

APPENDIX C

EXAMPLE CHAIN OF CUSTODY AND FIELD MEASUREMENT RECORD FORMS

eder associates, consulting engineers, p.c.
85 FOREST AVENUE, LOCUST VALLEY, NEW YORK 11560
8000 EXCELSIOR DRIVE, SUITE 302, MADISON, WISCONSIN 53717 1914
315 W. HURON STREET, SUITE 220/240, ANN ARBOR, MICHIGAN 48104

CHAIN OF CUSTODY RECORD

LABORATORY NAME:

PROJECT NO.

PROJECT NAME:

RESULTS TO:

INVOICE TO:

NO. OF CON-TAINERS

ANALYSIS

REMARKS

SAMPLE DESCRIPTIONS & OTHER ANALYSES

SAMPLE I.D. NO	DATE	TIME	FILTERED	FIXED	SAMPLE LOCATION / SAMPLE METHOD

Shipped Via:

Relinquished by (Signature)	Date/Time	Agent of:	Rec'd. by (Signature)	Date/Time	Agent of:
Printed Name			Printed Name		
Relinquished by (Signature)	Date/Time	Agent of:	Rec'd. by (Signature)	Date/Time	Agent of:
Printed Name			Printed Name		
Relinquished by (Signature)	Date/Time	Received for Laboratory by: (Signature)	Date/Time	Instructions:	
Printed Name		Printed Name			
Sampler (Signature)		Samplers Name (Printed)			

eder associates consulting engineers, p.c.
8000 Excelsior Drive, Suite 302, Madison, Wisconsin 53717-1914

SOIL VAPOR EXTRACTION SYSTEM MONITORING FORM

PROJECT NO.: _____ SAMPLED BY: _____

SAMPLE I.D.: _____ SAMPLING POINT: _____

SAMPLING DATE: _____ SAMPLING TIME: _____

ANALYTICAL INFORMATION

ANALYTES: _____

AIR FLOWRATE: _____

VACUUM/PRESSURE: _____

TEMPERATURE: _____

LABORATORY: _____

GENERAL COMMENTS: _____

SITE _____ TYPE OF TEST _____

DATE _____ TEST DATE _____

SAMPLER(S) _____ TIME _____

Pressure/Vacuum ("H_2O)

Distance from Vent Well (ft)						Distance from Vent Well					
Time	ln(t)	MP1	MP2	MP3	MP4	Time	ln(t)	[illegible]	[illegible]	MP7	MP8

APPENDIX D

HEALTH AND SAFETY PLAN
MELBY ROAD DISPOSAL SITE
SOIL VAPOR EXTRACTION PILOT TEST

HEALTH AND SAFETY PLAN

NATIONAL PRESTO INDUSTRIES, INC.

EAU CLAIRE, WISCONSIN

EDER PROJECT DIRECTOR: Gary A. Rozmus, P.E. (NAME) DATE _____

Senior Vice President (TITLE)

EDER PROJECT MANAGER: William Warren (NAME) DATE _____

Vice President (TITLE)

EDER SITE SAFETY OFFICER: Darrell Dallman (NAME) DATE _____

Environmental Technician (TITLE)

_____

AMENDMENTS CONTAINED IN ATTACHMENT A

AMENDMENT 1. DATE _____

AMENDMENT 2. DATE _____

AMENDMENT 3. DATE _____

CONTENTS

CONTENTS
-continued-

ATTACHMENTS

ATTACHMENT A - SITE SAFETY PLAN AMENDMENTS

ATTACHMENT B - SITE SAFETY ACKNOWLEDGEMENT FORM

ATTACHMENT C - HEAT STRESS/COLD STRESS

ATTACHMENT D - CHEMICAL HAZARDS

ATTACHMENT E - SITE MAP
Melby Road Disposal Site

TABLES

No.	Description
1-1	Health and Safety Training Records
9-1	Field Equipment/Spill Control Equipment

GLOSSARY OF ACRONYMS

ANSI	-	AMERICAN NATIONAL STANDARDS INSTITUTE
APR	-	AIR PURIFYING RESPIRATOR
ACGIH	-	AMERICAN CONFERENCE OF GOVERNMENTAL INDUSTRIAL HYGIENISTS
CFR	-	CODE OF FEDERAL REGULATIONS
CGI	-	COMBUSTIBLE GAS INDICATOR
CSEP	-	CONFINED SPACE ENTRY PERMIT
HEPA	-	HIGH EFFICIENCY PARTICULATE AIR
HNU-PID	-	HNU PHOTOIONIZATION DETECTOR
HOT ZONE	-	EXCLUSION ZONE
IDLH	-	IMMEDIATELY DANGEROUS TO LIFE & HEALTH
MREM/hr	-	MILLI-ROENTGENS EQUIVALENT IN MAN PER HOUR
NIOSH	-	NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY & HEALTH
OSHA	-	OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION
OVA	-	ORGANIC VAPOR ANALYZER
PEL	-	PERMISSIBLE EXPOSURE LIMIT
PPB	-	PARTS PER BILLION
PPE	-	PERSONAL PROTECTION EQUIPMENT
PPM	-	PARTS PER MILLION
SCBA	-	SELF-CONTAINED BREATHING APPARATUS
SOP	-	STANDARD OPERATING PROCEDURE
SPCC	-	SPILL PREVENTION CONTROLS & COUNTERMEASURES
TLV	-	THRESHOLD LIMIT VALUE
TWA	-	TIME WEIGHTED AVERAGE

STATEMENT OF COMMITMENT TO WORKER HEALTH AND SAFETY

Eder Associates (Eder) employees may be exposed to evident or potential risk from hazardous conditions. Eder's policy is to minimize the possibility of work-related injury through aware and qualified supervision, health and safety training, medical monitoring and the use of appropriate personal protective equipment. Eder has established a worker health and safety program to protect its personnel to the maximum reasonable extent. The Corporate Health and Safety Program is documented in Appendix A of the Eder Employee Handbook, which is issued to each employee.

This site-specific Health and Safety Plan (HASP) applies to Eder personnel and others at the National Presto Industries, Inc. (NPI) site where the site operations involve employee exposure or the reasonable possibility of employee exposure to safety or health hazards. This HASP describes emergency response procedures and actual and potential chemical hazards at the work site that have been identified by Eder. This HASP does not cover the hazards from operating machinery which is the responsibility of the operating contractor. This HASP provides information and guidance to contractors retained by Eder and to other parties who are outside of Eder's ability to control. Notwithstanding the intent of this HASP as site-specific hazard information and guidance, all contractors at the site are retained as independent contractors and are responsible for assuring the work site safety of their employees and others retained by them. This HASP is made available to all parties, however, Eder can not control the actions of others and all parties enter the work site with this understanding.

Eder will require that its personnel take certain safety precautions in accord with this HASP and Eder requests that others protect their personnel in a similar manner to assure work site safety. To assure work site safety, Eder may shut down the work site and request that any party leave the work site.

1.0 INTRODUCTION AND SITE ENTRY REQUIREMENTS

This document describes the health and safety guidelines developed for the NPI site to protect on-site personnel, visitors, and the public from physical harm and exposure to hazardous materials or wastes. In accordance with the Occupational Safety and Health Administration (OSHA) 29 CFR Part 1910.120 Hazardous Waste Operations and Emergency Response Final Rule, this HASP, including the Attachments, addresses potential and/or actual safety and health hazards associated with each phase of site operations, except that hazards from machinery operations are addressed by the operating contractor.

This site-specific HASP is based on information available at the time the plan was prepared. The HASP may be revised following an initial site visit by the Site Manager and Eder Site Safety Officer, and when new information is received or conditions change. A written amendment will document all changes made to the plan, and will be included in Attachment A. All amendments will be acknowledged by the Site Manager, Eder Project Manager, and Eder Site Safety Officer.

1.1 Training Requirements

All personnel entering the exclusion zone or decontamination zone (Section 6.1, Work Zones) must have completed the OSHA 29 CFR 1910.120(e) training requirements.

Documentation of Eder personnel training is maintained on file, and each Eder field personnel's record of 40-Hour OSHA Training, 8-Hour Refresher Training, and if applicable, Supervisor Training certificates will be maintained in the field office.

1.2 Medical Monitoring Requirements

All personnel (including visitors) entering the exclusion zone or decontamination zone must have completed the medical monitoring requirements under OSHA 29 CFR 1910.120(f).

Documentation of medical monitoring is the responsibility of each employer. If there are additional medical monitoring requirements for this site, evidence of compliance must also be included. Documentation of Eder personnel medical monitoring is maintained on file.

1.3 Fit-Testing Requirements

All personnel (including visitors) entering the exclusion zone or decontamination zone using a negative pressure air purifying respirator must have successfully passed a qualitative respirator fit-test in accordance with OSHA 29 CFR 1910.134 or the American National Standards Institute.

Documentation of fit-testing is the responsibility of each employer. Documentation of Eder personnel fit-testing is maintained on file.

NATIONAL PRESTO INDUSTRIES,INC. SITE
EAU CLAIRE, WISCONSIN

TABLE 1-1

HEALTH AND SAFETY TRAINING RECORDS

Eder Personnel	Attendance Date 40-Hour Health and Safety Training Course	Attendance Date 8-Hour Health and Safety Training Refresher Course	Attendance Date Supervisors Training	Date of Last Physical	Date of Last Fit Test
N. Brew	06/25/93	12/04/93	--	08/12/93	06/25/93
J. Barish	02/05/88	12/04/93	2/27/93	09/07/93	11/21/92
K. Butler	08/27/92	12/04/93	--	09/14/93	05/08/93
K. McHale	06/16/89	12/04/93	02/27/93	09/02/93	11/21/92
S. O'Brien	01/15/93	12/04/93	--	02/01/94	01/15/93
B. Pendergast	05/04/90	12/04/93	02/27/93	09/14/93	11/21/92
T. Perotto	10/16/91	12/04/93	--	01/27/94	10/12/92
V. Raykin	05/04/90	12/04/93	02/27/93	08/17/93	11/21/92
K. Savo	03/26/93	12/04/93	--	01/27/94	03/26/93
J. Valenti	09/14/90	01/27/94	02/27/93	12/02/93	01/27/94
D. Dallman	04/02/92	04/03/93	04/03/92	04/93	04/03/93
T. Miller	02/13/92	04/03/93	--	03/03/93	04/03/93
C. Donais	06/22/92	04/03/93	--	01/93	04/03/93
J. Piper	09/90	04/03/93	--	02/93	04/03/93
R. Seymour	1988	04/03/93	11/20/89	02/93	04/03/93
R. Wolske	06/93	--	--	06/93	06/93
D. Olig	03/90	04/03/93	--	03/93	03/90

1.4 Site Safety Plan Acceptance Acknowledgement

The Eder Site Safety Officer shall be responsible for informing all personnel entering the exclusion zone or decontamination zone of the contents of this plan and will request that each person sign the Safety Plan Acknowledgment Form in Attachment B. By signing the Safety Plan Acknowledgment Form, personnel recognize the hazards associated with the site and the policies and procedures that Eder will take to minimize exposure or adverse effects.

1.5 Daily Safety Meetings

Daily safety meetings will be held to ensure that all on-site personnel understand site conditions and operating procedures, to ensure that personal protective equipment is being used correctly, and to address questions and concerns that on-site personnel may have regarding health and safety. The meetings will be led by the Eder Site Safety Officer. All personnel trained and prepared to enter the exclusion and decontamination zones will attend the daily safety meetings. The initial meeting will be detailed to explain all site safety issues to all site workers, while the time allocated for subsequent meetings will be kept to a minimum.

1.6 Key Personnel

The Eder Principal in Charge for this project is Gary A. Rozmus, Senior Vice President. The Eder Project Manger is William Warren, and the Site Safety Officer is Darrell Dallman. Any changes in Eder's key project personnel will be recorded with the HASP amendments in Appendix A.

1.7 Roles and Responsibilities

The Principal in Charge is responsible for overall project administration. The Site Safety Officer will oversee daily safety issues. Each contractor (as an employer under OSHA) is responsible for the health and safety of its employees.

The Eder Site Safety Officer is also responsible for coordinating health and safety standards for all individuals on-site. The Site Safety Officer will meet the emergency response and hazardous materials handling training requirements of OSHA 29 CFR Part 1910.120, will have completed supervisors training, and will have appropriate experience pertinent to the on-site work. The Site Safety Officer has the authority to order any and all site work to be suspended based on safety concerns, and is responsible for:

1. the indoctrination of all personnel with regard to all of the information in this HASP and any other safety requirements to be observed during site operations, including, but not limited to, decontamination procedures, designation of work zones and levels of protection, air monitoring, fit testing, and emergency procedures dealing with fire and medical situations;

2. coordination with the Project Manager and Site Manager regarding site safety decisions;

3. maintenance of the designation between the exclusion, decontamination, and support zones;

4. monitoring the condition and status of on-site hazards, and maintenance and implementation of the air quality monitoring program specified in this HASP;

5. maintenance of records of safety problems encountered, mitigative actions taken, and documentation of any chemical exposures or physical injuries of workers.

Any person who observes safety concerns or potential hazards that have not been addressed in the daily safety meetings should immediately report observations/concerns to the Eder Site Safety Officer or other appropriate key personnel.

2.0 SITE BACKGROUND AND SCOPE OF WORK

Site Background

Background information on the NPI site is presented in Section 1.1 of the soil vapor extraction pilot test work plan.

Scope of Work

A soil vapor extraction (SVE) pilot test will be conducted to evaluate the feasibility and effectiveness of SVE at the Melby Road Disposal Site (MRDS).

Three MRDS locations will be tested as described in the pilot test work plan. Three vapor extraction wells and nine nested soil monitoring points will be installed. A trailer mounted vacuum blower will be used to extract vapors at each test location. Subsurface pressure drops will be recorded at the monitoring points. Vapor samples will be collected from the SVE well exhaust and the soil monitoring points in accord with the procedure and schedule described in the work plan. The vapor samples will be analyzed using a portable gas chromatograph.

SITE SAFETY PLAN AMENDMENT #____: _____

SITE NAME: _____

REASON FOR AMENDMENT: _____

_____

_____

_____

ALTERNATE PROCEDURES: _____

_____

_____

_____

_____

REQUIRED CHANGES IN PPE: _____

_____

_____

_____

_____ _____

NPI PROJECT SUPERINTENDENT (DATE)

_____ _____

EDER HEALTH AND SAFETY OFFICER (DATE)

LLV3760

3.0 HAZARD ASSESSMENT

This Hazard Assessment identifies the activity-specific hazards associated with site operations and the standard operating procedures (SOPs) that should be implemented to reduce the hazards. This section identifies general physical hazards that can be expected at most sites, and presents an analysis of documented or potential chemical hazards at the site. Every effort will be made to reduce or eliminate these hazards. Hazards that cannot be eliminated must be guarded against by use of engineering controls and/or personal protective equipment.

3.1 Activity-Specific Hazards and Standard Operating Procedures

Sample Collection

Hazards

- Inhalation of volatile vapors and particulate contaminants;
- Skin contact with contaminated soils, sediments, and water through cuts, abrasions, and dermal absorption;
- Heat stress; and
- Cold stress.

SOPs to Avoid Hazards

- Wear appropriate respiratory protection;
- Wear protective gloves during sampling;
- Monitor air in the breathing zone with OVA; and
- Ensure all site personnel are familiar with the symptoms of heat stress and cold stress outlined in Attachment C.

Sampling Equipment Decontamination

Hazards

- Inhalation of volatile vapors and mists;
- Skin contact with contaminants from splash;
- Slipping on wet surfaces;
- Heat stress; and
- Cold stress.

SOPs to Avoid Hazards

- Wear appropriate respiratory protection if deemed necessary;
- Wear protective gloves during decontamination;
- Ensure that all wash and rinsewater are properly drained from the decontamination area;
- Monitor air with OVA; and
- Ensure all site personnel are familiar with the symptoms of heat stress and cold stress outlined in Attachment C.

Operation of Heavy Equipment

The contractor will adhere to the specific guidelines for operating heavy equipment as outlined by OSHA in 29 CFR 1926.602. The drilling contractor's general guidelines will be amended to this report prior to the start of site work. The drilling contractor will be responsible for safety around the machinery.

3.2 General Site Hazards

The following discussion is provided as additional information, although not all of these hazards may be encountered at the NPI site.

Shock-Electrocution

All electrical power must have a ground fault circuit interrupter as part of the circuit. All equipment must be suitable and approved for the class of hazard. Applicable OSHA 29 CFR 1926 Subpart K standards for use of electricity shall apply.

Fall from Heights

Work in which a fall potentially exists will be performed using appropriate ladders and/or protection (i.e. body harness and lifeline). All work at this site is expected to be conducted at the ground surface.

Cold Stress

Cold stress is a function of cold, wetness and wind. A worker's susceptibility to cold stress can vary according to his/her physical fitness, degree of acclimatization to cold weather, age, and diet. Workers shall wear several layers of clothing and adequately cover extremities. Workers shall have access to break periods and warm beverages as necessary. When feasible, personnel shall be rotated and work performed during the warmer hours of the day. A heated enclosure for workers shall be provided close to the work area if conditions warrant. All personnel routinely working on-site (including the support zone) shall be familiar with the symptoms and signs, and care associated with cold stress as discussed in Attachment C of this HASP.

Heat Stress

When the temperature exceeds 70°F and personnel are wearing protective clothing, a heat stress monitoring program shall be implemented as appropriate. Employees shall have access to break periods and beverages as necessary. All personnel routinely working on-site (including the support zone) shall be familiar with the symptoms and signs, and emergency care associated with heat stress, heat exhaustion, and heat stroke as discussed in Attachment C of this HASP.

Facial Injury and Inhalation

In accordance with 29 CFR 1910.151(c), all operations involving the potential for eye injury, splash, etc., must have approved eye wash units locally available. Protective eye wear shall be donned in Level D, when appropriate. (The full-face air purifying respirator required by Level C and the pressure demand self-contained breathing apparatus mask required by Level B serve as eye protection.)

Fire

Operations involving the potential for fire hazards shall be conducted in a manner such that risk will be minimized. Non-sparking tools and fire extinguishers shall be used or available as appropriate. Sources of ignition shall be removed from work areas. When necessary, explosion-proof instruments and/or bonding and grounding will be used to prevent fire or explosion.

Overhead and underground utilities shall be identified and/or inspected prior to conducting operations involving potential contact or interference.

3.3 Chemical Hazards

The NPI site Remedial Investigation (RI) indicated the presence of VOCs at the MRDS. The most commonly found VOCs were 1,1,1-trichloroethane (TCA), trichloroethylene (TCE), tetrachloroethylene (PCE), 1,1-dichloroethylene (1,1-DCE), and 1,1-dichloroethane (1,1-DCA). Air monitoring of organic vapor concentrations during drilling using either a PID or an FID (Micro Tip/HNu or Foxoboro OVA), is required. It must be assumed that benzene is being read by the field PID instruments, since calibration will be to benzene. Polynuclear aromatic hydrocarbons (PAHs) and metals are also present in waste at the NPI site. Precautions will be taken to protect against inadvertent ingestion of contaminants during the pilot test.

A summary table of these chemicals containing pertinent health and safety information is contained in Attachment D. As additional chemicals are identified, Attachment D will be supplemented with appropriate information.

4.0 PERSONAL PROTECTIVE EQUIPMENT

The selection of personal protective equipment (PPE) shall be conducted in accordance with the site air monitoring program, OSHA 29 CFR 1910.120(c) and (g), and 1910.132. Protective equipment shall be NIOSH-approved and its use for respiratory protection shall conform to OSHA 29 CFR Part 1910.133 and 1910.134 specifications; head protection shall conform to 1910.135; eye and face protection shall conform to 1910.133; and foot protection shall conform to 1910.136.

4.1 Activity-Specific Levels of Personal Protection

The required level of PPE is specific to the activity being conducted, and is based on air monitoring results (Section 5.0) and properties of identified contaminants and contaminants expected to be encountered (Section 3.3).

The work at the MRDS will be initially performed in Level D. The air monitoring data collected during the August 1993 soil boring work conducted at the MRDS showed organic vapor readings on the order of 100 to 1000 ppm for some of the split spoon samples collected from the borings, however none of the readings in the breathing zone were sustained above background levels. Air monitoring will be conducted continuously and recorded to determine whether Level C or Level B is required, or if Level D conditions are suitable. If during drilling or sampling activities, air monitoring in the breathing zone indicates sustained VOC readings above background but less than 5 ppm above background, the field team must shut down work or upgrade PPE to Level C. If air monitoring indicates sustained VOC readings in the breathing zone at 5 ppm or more above background, the field team must shut down work or upgrade PPE to Level B. A gas chromatograph may be used to identify specific compounds present in the breathing zone. If the identified compounds have Level C PPE capability, then work can be conducted in Level C. If

this is done, then air samples for gas chromatograph analysis will be collected 4 times a day to verify that the condition is sustained, or as determined by the Site Safety Officer.

4.2 Level D

Level D PPE will be used when atmospheric conditions permit and the work precludes splashes, immersion or the potential for unexpected contact with harmful chemicals. Level D PPE consists of:

- Standard work uniform or coveralls (or tyvek, as needed);
- Steel toe and steel shank work boots;
- Hard hat;
- Gloves as needed; and
- Safety glasses as needed.

4.3 Level C

Level C PPE shall be donned when sustained concentrations of known total organic vapors in the breathing zone exceed background concentrations but are less than 5 ppm above background using a portable PID or FID. The compounds present will be determined using a gas chromatograph. The air purifying filter cartridges must be appropriate for contaminants identified or expected to be encountered. Level C PPE shall be donned when the contaminant identified has adequate warning properties and criteria for the use of APR have been met. The appropriate PPE level will be established by the Site Safety Officer. Unknowns are adequately defined as judged by the Site Safety Officer. Level C PPE consists of:

- Chemical resistant or coated tyvek coveralls;
- Steel toe and steel shank work boots;
- Chemical resistant overboots or disposable boot covers;
- Disposable inner gloves (surgical gloves);

- Disposable outer gloves;
- Full-face APR fitted with organic vapor/dust and mist filters or filters appropriate for the identified contaminants expected to be encountered;
- Hard-hat;
- Splash shield, as needed; and,
- Ankles/wrists taped with duct tape.

4.4 Level B

Level B PPE shall be donned when sustained concentrations of measured total organic vapors in the breathing zone are greater than 5 ppm above background using a portable PID or FID. Level B PPE shall be donned if the IDLH of a known contaminant is exceeded. If a contaminant is identified or is expected to be encountered for which NIOSH and/or OSHA recommend the use of a positive pressure self-contained breathing apparatus (SCBA), Level B PPE shall be donned, even though the total organic vapors in the breathing zone may not exceed background by 5 ppm. If Level B PPE is required for a task, then at least two Eder personnel shall wear Level B at all times during the performance of that task and a third person will remain out of the work zone on standby with Level B equipment should a problem arise. Level B PPE consists of:

- Chemical resistant coveralls;
- Steel toe and steel shank work boots;
- Chemical resistant over boots or disposable boot covers;
- Disposable inner gloves;
- Disposable outer gloves;
- Supplied air SCBA or airline system with 5-minute egress system;
- Hard-hat; and,
- Ankles/wrists taped.

5.0 AIR MONITORING AND ACTION LEVELS

According to 29 CFR 1910.120(h) air monitoring shall be employed to identify and quantify airborne levels of hazardous substances and health hazards.

5.1 Routine Air Monitoring Requirements

Air monitoring using a either a portable PID or FID (Micro Tip/HNu or Foxoboro OVA) and a combustible gas indicator/oxygen meter shall be used when any of the following conditions apply:

- Initial site entry;
- The possibility of an IDLH condition or flammable atmosphere has developed;
- Work begins on a different portion of the site;
- Contaminants other than those previously identified have been discovered;
- A different task or activity is initiated;

All air monitoring data will be documented in a site log book. Air monitoring instruments will be calibrated and maintained in accordance with the manufacturer's specifications.

The following site entry and monitoring guidelines regarding actions to be taken based on routine air monitoring shall be applied. These are:

- CGI readings < 10% LEL: continue.
- CGI readings of 10 to 20% LEL: proceed with caution.
- CGI readings > 20% LEL: stop work.
- Organic vapor readings in breathing zone sustained at background: continue in Level D.

- Organic vapor readings in breathing zone exceed background but are less than 5 ppm above background: Level C PPE.
- Organic vapor readings in breathing zone sustained at levels greater than 5 ppm above background: Level B PPE or stop work.

The compounds present may be determined using a gas chromatograph. If air purifying filter cartridges are appropriate for the identified contaminants, Level C may be used when the contaminants identified have adequate warning properties and criteria for the use of APR are met. If this is done, then air samples for gas chromatograph analysis must be collected 4 times a day to verify that the conditions are sustained, or as determined by the Site Safety Officer.

Real-time measurements of organic vapor concentrations will be made using a PID or a FID. Air monitoring locations will be at four locations on the perimeter of the exclusion zone and at the site boundary (one location upwind and two locations downwind). All monitoring data will be recorded in the field notebook.

Real-time air sampling can be conducted at locations in addition to those specified in this HASP as conditions warrant. For example, if sustained elevated organic vapor concentrations are measured near the work area, additional readings will be taken as the air sampling personnel moves away from the work area in the downwind direction towards the NPI site property line (the Melby Road fence line) to evaluate the dissipation of contaminant concentrations in the air.

6.0 SITE CONTROL AND STANDARD OPERATING PROCEDURES

6.1 Work Zones

The Eder Site Safety Officer shall designate an exclusion zone, a decontamination zone, and a support zone in step with the work being perfomred.

The exclusion zone is the area within which tasks requiring the OSHA 40-hour Hazardous Waste Operations and Emergency Response Operations training are carried out.

The removal of protective equipment shall occur within the designated decontamination zone. Disposable protective equipment shall be stored in receptacles kept in the decontamination zone, and non-disposable equipment will be decontaminated according to the procedures outlined in Section 7.0. All personnel and equipment will exit the exclusion zone via the decontamination zone. First aid equipment, an eye wash unit, and drinking water shall be kept in the decontamination trailer.

The support zone will be used for the command post, for vehicle parking, daily safety meetings, and supply storage. No decontamination will be permitted in the support zone. This HASP, the HASP attachments, a site map indicating the three work zones, and a telephone will be kept at the command post.

6.2 General Field Safety and Standard Operating Procedures

It is Eder's policy to practice administrative hazard control for all site areas by restricting entrance to exclusion zones to essential personnel, and by implementing SOPs.

- Personnel not specifically authorized to enter the exclusion zone will remain in the support zone.

- Prior to entering the exclusion or decontamination zones, all personnel must be familiar with emergency incident procedures (Section 9.0); the locations of site safety, first aid and communication equipment; the directions to the hospital; and the list of emergency telephone numbers.

- The "buddy system" will be used at all times by all field personnel in the exclusion zone. No one is to perform field work alone. When in Level C, visual contact or radio contact should be maintained at all times. When in Level B, visual contact should be maintained at all times, and radio contact should be maintained with the decontamination or support zone.

- Whenever possible, avoid contact with contaminated and potentially contaminated surfaces. Walk around (not through) puddles and discolored surfaces. Do not kneel on the ground or place equipment on the ground. Protect equipment from contamination.

- All personnel exiting the exclusion zone must exercise the decontamination procedures described in Section 7.0 of this HASP.

- Facial hair that interferes with respirator fit will preclude admission to the exclusion zone. Contact lenses shall not be worn in the exclusion or decontamination zones, or if the worker may be expected to enter these zones under routine or emergency situations.

- Eating, drinking, or smoking is permitted only in designated areas in the support zone.

- Each worker must be supplied with and maintain his/her own PPE.

7.0 DECONTAMINATION PROCEDURES

In general, everything that enters the exclusion zone must either be decontaminated or properly discarded upon exit from the exclusion zone. All personnel must enter and exit the exclusion zone through the decontamination area. Due to the nature of the work to be conducted, the exclusion and decontamination zones may "float". Bags used to discard disposable personal protective clothing and equipment will be carried from location to location.

All boots and other potentially contaminated garments which have come in contact with waste material and contaminated soil will be cleaned with detergent/water solution and rinsed with water in wash tubs. The wash water, rinse water and residues will be collected and properly stored until sampling results are received and final disposition of the waste can be determined. Disposable PPE, including spent respirator cartridges and canisters, will be properly bagged and disposed of. All contaminated boots, clothing, and equipment (eg. leather boots, equipment carrying straps) which cannot be decontaminated will be disposed of with the disposable garments.

The minimum measures for Level B removal and decontamination are:

- Deposit equipment on plastic drop cloths;
- Scrub outer boots and gloves with a solution of water and detergent and rinse off;
- Remove outer boots and outer gloves. Dispose of any disposable outer garments in waste receptacle provided;
- Remove tyvek/outer garment and place in receptacle provided;

- Remove inner gloves and deposit in receptacle provided;
- Remove SCBA and face piece and place on rack provided; and,
- Full shower including washing hair, face and hands.

The minimum measures for Level C removal and decontamination are:

- Deposit equipment on plastic drop cloths;
- Scrub outer boots and gloves with a solution of water and detergent and rinse off;
- Remove outer boots and outer gloves. Dispose of any disposable outer garments in receptacle provided;
- Remove tyvek/outer garment and place in receptacle provided;
- Remove first pair of inner gloves;
- Remove respirator (with "clean" inner gloves) and place on rack provided;
- Remove last pair of inner gloves and deposit in receptacle provided; and,
- Full shower including washing hair, face and hands.

The second to last item to be removed should be the APR, and the last item to be removed should be the last of several pairs of surgical gloves. Wearing several pairs of inner gloves permits layers to be removed as needed during various stages of the doffing procedure, and, in the event that the APR has inadvertently become contaminated, wearing inner gloves to remove the APR guards against bare hands contacting the APR.

8.0 CONFINED SPACE

In general, a confined space is defined as a space or work area not designed or intended for normal human occupancy, with limited means of access and poor natural ventilation. Confined space entry is not anticipated at the NPI site. In the event a confined space entry is to be necessary, the HASP will be amended and the requirements for a confined space entry will be followed, as per OSHA standard 29 CFR 1910.146.

9.0 EMERGENCY RESPONSE CONTINGENCY PLAN

It is essential that site personnel be prepared for an emergency. Emergencies can take many forms; illnesses or injuries, chemical exposure, fires, explosions, spills, leaks, releases of harmful contaminants, or sudden changes in the weather.

The list of emergency telephone numbers and directions to the hospital will by posted in the command post. Site personnel should be familiar with the emergency incident procedures, and the locations of site safety, first aid, and communication equipment.

9.1 Emergency Equipment On-Site

Private Telephones:	Eder mobile phone. Nearest residence.
Two-Way Radios:	Eder site personnel.
Emergency Alarms	On-site vehicle horns*.
First Aid Kits:	On-site Eder vehicle.
Fire Extinguisher:	On-site Eder vehicle, work zones.**

* Horns: Air horns will be supplied to personnel at the discretion of the Site Manager or Site Safety Officer.

** Work Zones - There must be a chemical fire extinguisher present in the hot zone where Level B PPE is worn.

9.2 Emergency Telephone Numbers and Hospital Information

	EMERGENCY NUMBER	NON-EMERGENCY
Eau Claire Fire Department	911	839-5012
Eau Claire Police Department	911	839-4972
Sacred Heart Hospital (Trauma Center)	839-4222	839-4222
Luther Hospital	839-3242	839-3242
(Poison Control Center)	835-1515	835-1515
National Response Center	800-424-8802	800-424-8802

Emergency Route to Local Hospitals

Sacred Heart Hospital
900 West Clairemont Avenue
Eau Claire, WI

Directions: Take Highway 53 south to Clairemont Avenue (approx 5 miles). Turn right (west) on Clairemont Avenue and continue approximately one mile to hospital.

Luther Hospital
1221 Whipple Street
Eau Claire, WI

Directions: Take Highway 53 south to Main Street. Go right (west) on Main Street to Farewell Street. Go left (south) on Farewell Street to Lake Street. Go right on Lake Street over the bridge to Fifth Avenue. Make right on 5th Avenue to Chestnut Street. Go left on Chestnut Street and hospital is on the corner.

POST A COPY OF THIS PAGE IN THE OFFICE TRAILER FIELD VEHICLE

9.3 Personnel Responsibilities During an Emergency

As the administrator of the project, the Project Manager has primary responsibility for responding to and correcting emergency situations. In the absence of the Project Manager, the Site Safety Officer shall act as the Project Manager's on-site designee. Their responsibilities include:

- Take appropriate measures to protect personnel including: exit from the exclusion zone, total evacuation and securing of the site or up-grading or down-grading the level of protective clothing and respiratory protection;

- Ensure that appropriate Federal, State and local agencies are informed, and emergency response plans are coordinated; in the event of fire or explosion, the local fire department should be summoned immediately. In the event of an air release of toxic materials, the local authorities should be informed in order to assess the need for evacuation;

- Ensure that appropriate decontamination treatment or testing for exposed or injured personnel is obtained;

- Determine the cause of the incident and make recommendations to prevent the recurrence; and,

- Ensure that all required reports have been prepared.

9.4 Medical Emergencies

Any person who becomes ill or injured in the exclusion zone must be decontaminated to the maximum extent possible. If the injury or illness is minor, full decontamination should be completed and first aid administered prior to transport. First aid should be administered while waiting for an ambulance or paramedics. Any person transporting an injured/exposed person to

a clinic or hospital for treatment should take the directions to the hospital and information on the chemical exposure.

9.5 Fire or Explosion

In the event of a fire or explosion, the fire department should be summoned immediately. Upon their arrival, the project manager or designated alternate will advise the fire commander of the location, nature and identification of the hazardous materials on-site. The contractor shall have access to stockpiled sand which will be used to extinguish fires by smothering them, prior to arrival of the fire department.

9.6 Evacuation Routes

Evacuation routes established by work area locations for this site will be highlighted on a site map and periodically reviewed during the daily safety meetings. As the work areas change, the evacuation route and map will be updated accordingly, and the new route will be reviewed during the daily safety meetings.

Under conditions of extreme emergency, evacuation should be conducted immediately and without regard for equipment. The evacuation signal will be a continuous blast of a vehicle horn, if possible, and/or by verbal/radio communication. All site personnel shall:

- Keep upwind of smoke, vapors or spill location.
- Exit through the decontamination corridor if possible.
- If evacuation via the decontamination corridor is not possible, site personnel should remove contaminated clothing once they are in a safe location and leave it near the exclusion zone or in a safe place.

- The Project Manager, Site Manager, or Site Safety Officer will conduct a head count to assure all personnel have been evacuated safely. The head count will be verified with the site and/or exclusion zone entry/exit log.

- In the event that emergency site evacuation is necessary, all personnel are to escape the emergency situation and decontaminate to the maximum extent practical.

9.7 Spill Control Procedures

In the event of a leak or a release, on site personnel will:

- Inform their supervisor immediately;

- Locate the source of the spillage and stop the flow if it can be done safely; and,

- Begin containment and recovery of the spilled materials. Equipment on-site shall be sufficient to handle any spills that may occur. Equipment shall be diked and containerized appropriately.

No guests, owner's representatives, or other non-trained on-site personnel shall respond to an emergency as outlined above, but shall immediately evacuate the site in such an event.

NATIONAL PRESTO INDUSTRIES, INC. SITE
EAU CLAIRE, WISCONSIN

TABLE 9-1

FIELD EQUIPMENT/SPILL CONTROL EQUIPMENT

Equipment	Use (Zone)
Steam Cleaner	Decontamination - interface between hot and cold zone
Mobile-Decontamination Unit Personnel Hygiene Trailer	Decontamination - field office
MicroTip	Exclusion zone - air monitoring
OVA	Exclusion zone - air monitoring
SA-CGI	Exclusion zone - air monitoring
Mobile phone	Cold zone - communication
Hand held radios	Exclusion zone - communication
Absorbent pads	Drum Sampling ARCA - Drum storage roll-off container

ATTACHMENT A

SITE SAFETY PLAN AMENDMENTS

SITE SAFETY PLAN AMENDMENT #____: _____

SITE NAME: _____

REASON FOR AMENDMENT: _____

_____

_____

_____

ALTERNATE PROCEDURES: _____

_____

_____

_____

_____

REQUIRED CHANGES IN PPE: _____

_____

_____

_____

_____ _____

NPI PROJECT SUPERINTENDENT (DATE)

_____ _____

EDER HEALTH AND SAFETY OFFICER (DATE)

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SITE SAFETY PLAN AMENDMENT #___: _____

SITE NAME: _____

REASON FOR AMENDMENT: _____

_____

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_____

ALTERNATE PROCEDURES: _____

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REQUIRED CHANGES IN PPE: _____

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_____ _____

NPI PROJECT SUPERINTENDENT (DATE)

_____ _____

EDER HEALTH AND SAFETY OFFICER (DATE)

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ATTACHMENT B

SITE SAFETY ACKNOWLEDGMENT FORM

SITE SAFETY PLAN ACKNOWLEDGMENT FORM

I have been informed and understand the procedures set forth in the HASP and Amendments for the NPI Soil Vapor Extraction Pilot Test Project.

Printed Name	Signature	Representing	Date

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ATTACHMENT C

HEAT STRESS/COLD STRESS

HEAT RELATED EMERGENCIES

Good judgment is essential. Pace yourself by knowing your limitations. Avoid over exertion. You are your best gauge for heat related emergencies. When in doubt, get out!

HEAT EXPOSURE

The human body stubbornly defends its constant core temperature of 99.6°F. To maintain this constant temperature, heat loss must equal heat gain. If heat loss exceeds heat gain, the body temperature will fall; conversely, if heat production exceeds heat loss, the temperature will rise. In a heat related emergency, the body's mechanisms for temperature regulation are overwhelmed. The body can no longer regulate core temperature, and the core temperature begins to rise. As this rise occurs, the body will begin to show the signs and symptoms of heat related emergencies. The sequence of illness may start with heat Cramps and progress into a more severe case or may go straight to Heat Stroke. The degree of illness will vary from person to person, depending on the nature of the exposure, physical conditioning and inherited traits.

PREVENTION

General

- Maintain good physical conditioning and control your blood pressure (avoid weight gain, smoking, etc.).
- Eat regularly and properly. Increase salt intake through food consumption during the hot season or hot spells and avoid the use of salt tablets.
- Regulate alcohol intake if you are going to be working in hot environments, either from ambient conditions or through the wearing of Chemical Protective Clothing.
- Obtain basic First Aid and CPR training.
- If you are on medication or have a chronic medical history, consult a physician prior to working in a hot environment.

On-Site/Scene

- If you anticipate field work, get acclimated and conditioned prior to working in high temperatures.
- Sufficient quantities of water should be consumed to help avoid heat related emergencies.

HEAT RELATED EMERGENCIES
SIGNS AND SYMPTOMS
EMERGENCY CARE

The work will involve the wearing of PPE at Level B and heat will have a great influence, slowing the work. If site related chemicals are such that splash conditions are unlikely than the site safety officer may downgrade the Level B dress to include cotton coveralls. The conditions of summer work dictate that special precautions be taken to ensure that heat related injuries are avoided. All field personnel are encouraged to drink plenty of liquids (i.e., gatorade or equivalent). This section presents signs and symptoms for heat related conditions and limitations on the work. Workers at the NPI Sites will be monitored for internal temperature hourly when temperatures are over 85°F.

Heat Rash

Also known as prickly heat, this is a condition affecting the skin. The condition occurs in situations where the skin remains wet most of the time. The sweat ducts become plugged, and a skin rash soon appears.

Signs and Symptoms

1. Skin rash over affected areas of the body.
2. Tingling or prickling sensation on the affected areas.

Emergency Care

1. Take shower after working in heat.
2. Dry the skin thoroughly.
3. Change underwear as needed.
4. Stay in cool place after work hours.
5. Avoid repeated exposure to heated environment until condition improves, when possible.

Heat Cramps

Heat cramps are muscle pains, usually in the lower extremities, the abdomen, or both, which occur secondary to profuse sweating with accompanying salt depletion. Heat cramps most often afflict people in good physical condition, who overwork in conditions of high temperature and humidity. Untreated, heat cramps may progress to heat exhaustion.

Treatment of heat cramps is aimed at eliminating the exposure and restoring the loss of salt and water.

Signs and Symptoms

1. Cramps in the extremities and abdomen which come on suddenly during vigorous activity. Heat cramps can be mild with only slight abdominal cramping and tingling in the extremities, but more commonly present intense and incapacitating pain in the abdomen and extremities.
2. Respiration rate will increase, decreasing after the pain subsides.
3. Pulse rate will increase.
4. Skin will be pale and moist.
5. Body temperature will be normal.
6. Loss of consciousness or airway maintenance are seldom problems with this condition.
7. Generalized weakness will be noted as the pain subsides.

Emergency Care

1. Move the worker to a cool environment. Have him lie down if he feels faint.

2. If the worker is not nauseated, he may be given 1 or 2 glasses of an electrolyte solution. Have the worker drink slowly. The use of salt tablets is not recommended, as they may precipitate nausea.

3. If the worker is nauseated, avoid giving anything by mouth until the nausea subsides.

4. Avoid massaging the cramping muscles. This rarely helps and may actually aggravate the pain.

5. As the salt and water level is replenished, the worker's pain will subside. He may wish to return to work, however, this is NOT recommended for a period of 12 hours. Further exertion may lead to heat exhaustion or heat stroke.

HEAT EXHAUSTION

Heat exhaustion represents a somewhat more severe response to salt and water loss, as well as an initial disturbance in the body's heat-regulating system. Like heat cramps, heat exhaustion tends to occur in persons working in hot environments. Heat exhaustion is likely in dehydrated and hypertensive people. Untreated Heat Exhaustion may progress to Heat Stroke.

Treatment of heat exhaustion is similar in principle to that of heat cramps.

Signs and Symptoms

1. Heat Exhaustion may come on suddenly or may be present with a headache, fatigue, dizziness, nausea with occasional abdominal cramping.
2. Sweating will be profuse.
3. Pulse rate will be rapid and weak.
4. Respiration rate will be rapid and shallow.
5. The skin will be pale and clammy.
6. The body temperature will be normal or decreased.
7. The worker could be irritable and restless.
8. Monitor the worker's level of consciousness and airway.

Emergency Care

1. Move the worker to a cool environment, take off as much of his clothing as possible, and place him in a supine position with his legs elevated.

2. Sponge the worker with cool water. If you fan the worker, avoid chilling. When the body chills, the muscles generate energy. When the body shivers, this energy is released in the form of heat and actually can increase the body temperature.

3. If this is a true medical emergency, prompt intervention by Emergency Medical Services is recommended.

HEAT STROKE

Heat Stroke is caused by a severe disturbance in the body's heat-regulating mechanism and is a profound emergency, with a mortality rate ranging from 25 to 50 percent. It is most common in men over 40, especially in alcoholics. It can also occur in people of any age having too much exposure to the sun or prolonged confinement in a hot atmosphere. Heat stroke comes on suddenly. As the sweating mechanism fails, the body temperature begins to rise precipitously, reaching 106°F (41°C) or higher within 10 to 15 minutes. If the situation is not corrected rapidly, the body cells - especially the very vulnerable cells of the brain - are literally cooked, and irreversible central nervous system damage occurs.

The treatment for Heat Stroke is aimed at maintaining vital functions and causing as rapid a temperature fall as possible.

Signs and Symptoms

1. The worker's pulse will be strong and pounding.
2. The skin will be hot, dry and flushed.
3. The worker may experience headache, dizziness, and dryness of mouth.
4. Seizures and coma occur.
5. Loss of consciousness and airway maintenance problems can occur.

Emergency Care

1. Establish an open airway.

2. Move the worker to a cool environment. Take off as much clothing as possible, and place him in a semi-reclining position with the feet elevated.

3. Use any means to cool the worker. Improvise with whatever is available. A bathtub filled with cold water and ice cubes is ideal. Remember, speed is essential; delay may result in permanent brain damage. Vigorous efforts to cool the worker must continue until the body temperature is below 103°F (38.9°C).

4. This is a true medical emergency; prompt intervention by Emergency Medical Services is recommended.

These are only guidelines for the care of Heat Related Emergencies. Actual training in emergency medical care or basic first aid is recommended.

HEAT STRESS

1. Heart rate (HR) should be monitored by the radial pulse for 30 seconds as soon as possible in the resting period.

   If at the beginning of the rest period a worker's radial pulse is measured and his heart rate exceeds 100 beats per minute, the worker's next work period should be reduced by 33%. Therefore, if the original work period was one hour, the following work cycle should be reduced to 40 minutes.

2. Administering salt tablets to prevent heat stress is not recommended due to a number of reasons: (a) sweat is hypotonic, therefore, adding salt to the body would only increase the body's need for water; (b) additional salt may interfere with a worker's predisposed physical condition (i.e., high blood pressure); and (c) increasing the sodium content in the body may cause an imbalance in the body's potassium content. Unless a physician recommends the use of soil tablets, individuals naturally obtain the necessary salt in their normal diet.

3. Heat Stroke is a true medical emergency. First aid should be directed toward immediate measures to cool the body quickly, as well as seeing that the victim receives medical attention as soon as possible.

   Prior to medical treatment, remove as much clothing as possible and proceed to cool the victim's body, taking care not to overchill the victim once his temperature falls below 102°F. One of the following cooling measures should be taken: (1) sponge the bare skin with cool water; (b) apply cold packs continuously; (c) wrap the victim in a sheet soaked with water; or (d) immerse the victim in a tub of cold water, while closely monitoring the victim's level of consciousness.

4. Prior to site activity, the field TEAM leader may make arrangements for heat stress monitoring (i.e., monitoring heart rate, body temperature and body water loss) during actual site work if conditions warrant these measures. In addition, he would want to ensure that the team members have been acclimatized to the particular environmental conditions and that personnel are aware of the signs and symptoms of heat illness and have been adequately trained in first aid procedures. As field team leader, one could also make sure there is sufficient personnel on site, so as to rotate work assignments, schedule work during hours of reduced temperatures, and ensure personnel do not consume alcoholic or caffeinated beverages but rather drink moderate levels of an electrolyte solution and eat well prior to commencing site work.

5. The worker could be experiencing a condition of heat rash. Allow workers to rest and relieve the itching associated with heat rash rather than return to work too soon. Itching workers may not follow stringent decon procedures or scratch where it itches on-site and risk cross contamination.

   Keeping the skin clean and dry will reduce the incidence of heat rash. This can be accomplished by wearing cotton garments (or other materials that absorb perspiration) underneath protective clothing. Upon removal of the protective clothing, the worker should wash and dry his skin thoroughly.

6. The sense of thirst is not an adequate regulator of water replacement during heat exposure. Therefore, as a general rule, the amount of water administered should replace the amount of water lost, and it should be administered at regular intervals throughout the day. For every ½ pound of water loss, 8 ounces of water should be ingested. Water should be replaced by drinking 2-4 ounce servings during every rest period. A recommended alternative to water is an electrolyte drink split 50/50 with water.

7. Although there is no specific test given during a baseline physical that would identify a person's intolerance to heat, there are physical factors and personal habits which may indicate possible intolerance to heat, such as, whether or not an individual smokes, one's dietary habit, body weight, as well as predisposed physical conditions such as high blood pressure, heart conditions, diabetes, or one's medication, that may influence an individual's ability to tolerate excessive heat.

8. Heat cramps are caused by profuse perspiration with inadequate fluid intake and salt replacement. Heat cramps most often afflict people in good physical condition who overwork in conditions of high temperature and humidity. Heat cramps usually come on suddenly during vigorous activity. Untreated, heat cramps may progress directly to heat exhaustion or heat stroke. First aid treatment: remove victim to a cool place and give sips of salted water (1 teaspoon of salt to 1 quart of water) - 4 ounces every 15 minutes over a period of one hour. A commercial preparation, e.g., Gatorade, may be used if split 50/50 with water.

The salted water or solution should mitigate the cramps. Manual pressure should not be applied to the cramped muscles.

TABLE C-1[1]

REQUIRED FREQUENCY OF HEAT STRESS MONITORING
FOR WORKERS IN IMPERMEABLE CLOTHING

Adjusted[2] Temperature (°F)	Work Time Allowed Before Monitoring Break (min.)
90 or above	15
87.5-90	30
82.5-87.5	60
77.5-82.5	90
72.5-77.5	120

(1) Adapted from Eastern Research Group and National Institute for Occupational Safety and Health, Occupational Safety and Health Guidance Manual for Super Activities. September 26, 1984, pp. 8-75.

(2) Calculate the adjusted air temperature (Ta adj) by using this equation:

$$\text{Ta adj } °F = \text{Ta } °F + (13 \times \% \text{ sunshine})$$

Measure air temperature (Ta) with a standard thermometer, with the bulb shielded from radiant heat. Then estimate percent sunshine (100 percent sunshine = no cloud cover and a sharp, distinct shadow; 0 percent sunshine = no shadows).

TABLE C-2

Heat Stress Indicator	When to Measure	If Exceeds . . .	Action
heart rate (pulse)	beginning of rest period	110 beats per minute	shorten next work period by 33%
oral temperature	beginning of rest period	99°F (after thermometer is under tongue for 3 minutes) 100.6°F	shorten next work period by 33% prohibit work in impermeable clothing
body weight	1. before workday begins (a.m.) 2. after workday ends (p.m.)		increase fluid intake

TABLE C-3[1]

SYMPTOMS OF HEAT STRESS

Heat rash results from continuous exposure to heat or humid air.

Heat cramps are caused by heavy sweating with inadequate fluid intake. Symptoms include:

- muscle spasms.
- pains in the hands, feet, and abdomen.

Heat exhaustion occurs when body organs attempt to keep the body cool. Symptoms include:

- pale, cool, moist skin.
- heavy sweating.
- dizziness.

Heat stroke is the most serious form of heat stress. Immediate action must be taken to cool the body before serious injury and death occur. Symptoms are:

- red, hot, dry skin.
- lack of perspiration.
- nausea.
- dizziness and confusion.
- strong, rapid pulse.
- coma.

(1) Reproduced from Occupational Safety and Health Guidance Manual for Superfund Activities (see Table A-1), p. 8-79.

Cold Stress (Hypothermia)

Cold stress is a function of cold, wetness and wind. A worker's susceptibility to cold stress can vary according to his/her physical fitness, degree of acclimatization to cold weather, age, and diet.

Prevention

Institute the following steps to prevent overexposure of workers to cold:

1. Maintain body core temperature at 96.8°F or above by encouraging workers to drink warm liquids during breaks (preferably not coffee) and wear several layers of clothing. Wool is recommended since it can keep the body warm even when the wool is wet.

2. Avoid frostbite by adequately covering hands, feet, and other extremities. Clothing such as insulated gloves or mittens, earmuffs, and hat liners should be worn. To prevent contact frostbite (from touching metal and cold surfaces below 20°F), workers should wear anti-contact gloves. Tool handles and control bars should be covered with insulating material.

3. Adjust work schedules if necessary, providing adequate rest periods. When feasible, rotate personnel and perform work during the warmer hours of the day.

4. Provide a heated enclosure for workers close to their work area. Workers should remove their outer layer(s) of clothing while in the shelter to allow for sweat evaporation.

5. In the event that wind barriers are constructed around an intrusive operation (such as drilling), the enclosure must be properly vented to prevent the build-up of toxic or explosive gasses or vapors. Care must be taken to keep any heat source away from flammable substances.

6. Using a wind chill chart such as the one in Table E-4, obtain the equivalent chill temperature (ECT) based on actual wind speed and temperature. Refer to the ECT when setting up work warm-up schedules, planning appropriate clothing, etc. Workers should use warming shelters at regular intervals at or below an ECT of 20°F. For exposed skin, continuous exposure should not be permitted at or below an ECT of -25°F.

7. Workers who become immersed in water or whose clothing becomes wet (from perspiration, rain, etc.) must immediately be provided a change of dry clothing whenever the air temperature is 25.6°F or below.

8. Maintain an optimal level of worker fitness by encouraging regular exercise, proper diet, etc. If possible, acclimatize workers to site conditions for several days before work begins.

Monitoring

Personnel should be aware of the symptoms of cold stress. If the following symptoms of systemic hypothermia are noticed in any worker, he/she should immediately go the warm shelter:

- heavy, uncontrollable shivering;
- excessive fatigue or drowsiness;
- loss of coordination;
- difficulty in speaking; and,
- frostbite (see below).

Frostbite is the generic term for local injury resulting from cold. The stages of frostbite and their symptoms are as follows:

1. frostbite or incipient frostbite:

   - sudden blanching or whitening of the skin.

2. superficial frostbite:

   - waxy or white skin which is firm to the touch (tissue underneath is still resilient).

3. deep frostbite:

   - tissues are cold, pale, and solid.

TABLE C-4[1]

COOLING POWER OF WIND ON EXPOSED FLESH EXPRESSED AS AN EQUIVALENT TEMPERATURE (UNDER CALM CONDITIONS)

Estimated Wind Speed (in mps)	Actual Temperature Reading (°F)P											
	50	40	30	20	10	0	-10	-20	-30	-40	-50	-60
	Equivalent Chill Temperature (°F)											
calm	50	40	30	20	10	0	-10	-20	-30	-40	-50	-60
5	48	37	27	16	6	-5	-15	-26	-36	-47	-57	-68
10	40	28	16	4	-9	-24	-33	-46	-58	-70	-83	-95
15	36	22	9	-5	-18	-32	-45	-58	-72	-85	-99	-112
20	32	18	4	-10	-25	-39	-53	-67	-82	-96	-110	-121
25	30	16	0	-15	-29	-44	-59	-74	-88	-104	-118	-133
30	28	13	-2	-18	-33	-48	-63	-79	-94	-109	-125	-140
35	27	11	-4	-20	-35	-51	-67	-82	-98	-113	-129	-145
40	26	10	-6	-21	-37	-53	-69	-85	-100	-116	-132	-148
(Wind speeds greater than 40 mph have little additional effect.)	LITTLE DANGER In < hr with dry skin. Maximum danger of false sense of security				INCREASING DANGER Danger from freezing of exposed flesh within one minute.			GREAT DANGER Flesh may freeze within 30 seconds				
	Trenchfoot and immersion foot may occur at any point on this chart.											

Developed by U.S. Army Research Institute of Environmental Medicine, Natick, MA.

(1) Reproduced from American Conference of Governmental Industrial Hygienists, Threshold Limit Values and Biological Exposure Indices for 1985-1986, p. 01.

ATTACHMENT D

CHEMICAL HAZARDS

References:

1. Sax, N. Irving and Lewis, Richard J.
   Dangerous Properties of Industrial Materials -
   7th Edition, 1989.

2. U.S. Department of Health and Human Services.
   NIOSH Pocket Guide to Chemical Hazards, June 1990.

SYNS:

ACETIC ACID-2,6-DIMETHYL-m-DIOXAN-4-YL ESTER
ACETOMETHOXAN
4-ACETOXY-2,6-DIMETHYL-m-DIOXANE
DDOA
DIMETHOXANE
2,6-DIMETHYL-m-DIOXAN-4-OL ACETATE
2,6-DIMETHYL-m-DIOXAN-4-YL ACETATE
DIOXIN (BACTERICIDE) (OBS)
GIV GARD DXN
NCI-C56213

TOXICITY DATA:

mma-sat 5500 µg/plate

sln-dmg-par 1 pph
orl-rat TDLo: 948 g/kg/88W-I: CAR
orl-rat LD50: 1930 mg/kg

CODEN:

ENMUDM 8(Suppl 7),1,86
ENMUDM 7,677,85
JNCIAM 53,791,74

GCTB** 3-25/77

IARC Cancer Review: Animal Limited Evidence IMEMDT 15,177,77

THR: An experimental carcinogen. Moderately toxic by ingestion. See also ESTERS. When heated to decomposition it emits acrid smoke and fumes.

ABC500 ***HR: 2***

2'-ACETONAPHTHONE

CAS: 93-08-3 NIOSH: AL 2988000
mf: $C_{12}H_{10}O$ mw: 170.22

SYNS:

ORANGE CRYSTALS
β-ACETONAPHTHALENE
β-ACETYLNAPHTHALENE
2-ACETYLNAPHTHALENE
ACETONAPHTHONE
β-ACETONAPHTHONE
2-ACETONAPHTHONE
METHYL-β-NAPHTHYL KETONE
METHYL-2-NAPHTHYL KETONE
β-METHYL NAPHTHYL KETONE
1-(2-NAPHTHALENYL)ETHANONE
β-NAPHTHYL METHYL KETONE
2-NAPHTHYL METHYL KETONE

TOXICITY DATA:

skn-hmn 500 mg/24H
orl-mus LD50: 599 mg/kg

CODEN:

FCTXAV 13,681,75
MDZEAK 8,244,67

Reported in EPA TSCA Inventory.

THR: Moderately toxic by ingestion. A human skin irritant. When heated to decomposition it emits acrid smoke and fumes.

ABC750 ***HR: 2***

ACETONE

CAS: 67-64-1 NIOSH: AL 3150000
DOT: 1090
mf: C_3H_6O mw: 58.09

PROP: Colorless liquid, fragrant mint-like odor. Mp: −94.6°, bp: 56.48°, ulc: 90, flash p: 0°F (CC), lel: 2.6%, uel: 12.8%, d: 0.7972 @ 15°, autoign temp: (color) 869°F, vap press: 400 mm @ 39.5°, vap d: 2.00. Misc in water, alc, and ether.

SYNS:

ACETON (GERMAN, DUTCH, POLISH)
DIMETHYLFORMALDEHYDE
DIMETHYLKETAL
DIMETHYL KETONE
KETONE PROPANE
β-KETOPROPANE
METHYL KETONE
PROPANONE
2-PROPANONE
PYROACETIC ACID
PYROACETIC ETHER
RCRA WASTE NUMBER U002

TOXICITY DATA:

skn-rbt 500 mg/24H MLD
eye-rbt 100 mg/24H MOD
cyt-smc 200 mmol/tube
sln-smc 47600 ppm
cyt-ham: fbr 40 g/L
ihl-mam TCLo: 31500 µg/m³/24H (1-13D preg): REP
orl-man TDLo: 2857 mg/kg
orl-man TDLo: 2857 mg/kg
ivn-rat LD50: 5500 mg/kg
ihl-man TDLo: 440 µg/m³/6M
ihl-man TDLo: 10 mg/m³/6H
orl-mus LD50: 3000 mg/kg
eye-hmn 500 ppm
skn-rbt 395 mg open MLD
eye-rbt 3950 µg SEV
ihl-hmn TCLo: 500 ppm: EYE
ihl-man TCLo: 12000 ppm/4H: CNS
unk-man LDLo: 1159 mg/kg
ihl-rat LCLo: 16000 ppm/4H
ipr-rat LDLo: 500 mg/kg
ihl-mus LCLo: 110000 mg/m³/62M
ipr-mus LD50: 1297 mg/kg
orl-dog LDLo: 24 g/kg
ipr-dog LDLo: 8 g/kg
scu-dog LDLo: 5 g/kg
skn-rbt LD50: 20 g/kg
scu-gpg LDLo: 5000 mg/kg

CODEN:

28ZPAK -,42,72
28ZPAK -,42,72
HEREAY 33,457,47
ANYAA9 407,186,83
FCTOD7 22,623,84
GTPZAB 26(6),24,82

34ZIAG -,64,69
DIAEAZ 15,810,66
NPIRI* 1,1,74
GISAAA 42(8)42,77
GISAAA 42(8)42,77
PCJOAU 14,162,80
JIHTAB 25,282,43
UCDS** 5/7/70
AJOPAA 29,1363,46
JIHTAB 25,282,43
AOHYA3 16,73,73

85DCAI 2,73,70
AIHAAP 23,95,62
JPPMAB 11,150,59
AGGHAR 5,1,33

SCCUR* -,1,61
AEXPBL 18,218,1884
AEXPBL 18,218,1884
AEXPBL 18,218,1884
UCDS** 5/7/70
AGGHAR 5,1,33

On Community Right To Know List. Reported in EPA TSCA Inventory.

OSHA PEL: TWA 1000 ppm
ACGIH TLV: TWA 750 ppm; STEL 1000 ppm
DFG MAK: 1000 ppm (2400 mg/m³)
NIOSH REL: TWA 590 mg/m³

DOT Classification: Flammable Liquid, Label: Flammable Liquid

THR: Moderately toxic by various routes. A skin and severe eye irritant. Human systemic effects by inhalation: changes in EEG, changes in carbohydrate metabolism, nasal effects, conjunctiva irritation, respiratory system effects, nausea and vomiting, and muscle weakness. Human systemic effects by ingestion: coma, kidney damage, and metabolic changes. Narcotic in high concentration. In industry, no injurious effects have been reported other than skin irritation resulting from its defatting action, or headache from prolonged inhalation. A common air contaminant. Dangerous disaster hazard due to fire and explosion hazard; can react vigorously

with oxidizing materials. Potentially explosive reaction with nitric acid + sulfuric acid; bromine trifluoride; nitrosyl chloride + platinum; nitrosyl perchlorate; chromyl chloride; thiotrithiazyl perchlorate; and 2,4,6-trichloro-1,3,5-triazine + water. Reacts to form explosive peroxide products with 2-methyl-1,3-butadiene; hydrogen peroxide; and peroxomonosulfuric acid. Ignites on contact with activated carbon; chromium trioxide; dioxygen difluoride + carbon dioxide; and potassium-tert-butoxide. Reacts violently with bromoform; chloroform + alkalies; bromine; and sulfur dichloride. Incompatible with CrO; (nitric + acetic acid); NOCl; nitryl perchlorate; permonosulfuric acid; NaOBr; (sulfuric acid + potassium dichromate); (thio-diglycol + hydrogen peroxide); trichloromelamine; air; HNO_3; chloroform; and H_2SO_4. To fight fire, use CO_2, dry chemical, alcohol foam. For further information see Vol. 4, No. 3 of *DPIM Report*.

ABD000 HR: 3
ACETONE CHLOROFORM

CAS: 57-15-8 NIOSH: UC 0175000
mf: $C_4H_7Cl_3O$ mw: 177.46

PROP: Crystals, camphor odor. Mp: 97°, bp: 167°.

SYNS:
CHLORETONE
CLORTRAN
METHAFORM
SEDAFORM
β,β,β-TRICHLORO-tert-BUTYL ALCOHOL
HCP
ANHYDROUS CHLOROBUTANOL
CHLORBUTANOL
CHLORBUTOL
CHLOROBUTANOL
TRICHLORO-tert-BUTYL ALCOHOL
tert-TRICHLOROBUTYL ALCOHOL
1,1,1-TRICHLORO-2-METHYL-2-PROPANOL

TOXICITY DATA:	CODEN:
mmo-sat 20 µmol/plate	MUREAV 90,91,81
cyt-smc 10 mmol/tube	HEREAY 33,457,47
skn-rbt 850 µg MLD	XEURAQ MDDC-1715
eye-rbt 9180 µg/30S MLD	XEURAQ MDDC-1715
orl-dog LDLo: 238 mg/kg	AIPTAK 8,77,01
orl-rbt LDLo: 213 mg/kg	AIPTAK 8,77,01
par-frg LDLo: 800 mg/kg	AIPTAK 8,77,01

Reported in EPA TSCA Inventory.

THR: Poison by ingestion. Moderately toxic by parenteral route. A narcotic. A skin and eye irritant. Mutagenic data. See also CHLORAL HYDRATE, which acts similarly. Dangerous; can react with oxidizing materials. Combustible when exposed to heat or flame. When heated to decomposition it emits toxic fumes of Cl^-. See also PHOSGENE.

ABD250 HR: 3
ACETONE DIETHYL KETAL

CAS: 126-84-1 NIOSH: AL 4900000
mf: $C_7H_{16}O_2$ mw: 132.23

SYNS:
2,2-DIETHOXYPROPANE
USAF DO-44

TOXICITY DATA:	CODEN:
ipr-mus LD50: 125 mg/kg	NTIS** AD277-689

Reported in EPA TSCA Inventory.

THR: Poison by intraperitoneal route. When heated to decomposition it emits acrid smoke.

ABD500 HR: 3
ACETONE DIETHYLSULFONE

CAS: 115-24-2 NIOSH: TX 3850000
mf: $C_7H_{16}O_4S_2$ mw: 228.35

PROP: D: 1.183, mp: 127°-128°, bp: 300° (sl decomp), Sol in water, alc, and ether.

SYNS:
ACETONE BIS(ETHYL SULFONE)
2,2-BIS(ETHYLSULFONYL)PROPANE
DIETHYLSULFONDIMETHYLMETHANE
PROPANE DIETHYL SULFONE
SULFONAL
SULFONMETHANE

TOXICITY DATA:	CODEN:
unk-man LDLo: 147 mg/kg	85DCAI 2,73,70
orl-dog LDLo: 800 mg/kg	12VXA5 8,1003,68
orl-rbt LDLo: 3000 mg/kg	HBAMAK 4,1404,35
orl-gpg LDLo: 8500 mg/kg	HBAMAK 4,1404,35

THR: A human poison by unspecified route. Moderately toxic by ingestion. Mutagenic data. When heated to decomposition it emits toxic fumes of SO_x.

ABD750 HR: 3
ACETONE OIL

NIOSH: AL 6700000

DOT: 1091

PROP: (a) Standard: light, lemon-yellow. (b) Refined: almost water white. (c) Heavy: dark, orange-yellow. Bp: (a) 75-160°, (c) 80-225°. D: (a) 0.826-0.830, (b) 0.812, (c) 0.885-0.865.

DOT Classification: Flammable Liquid, Label: Flammable Liquid

THR: Dangerous fire and explosion hazard when exposed to heat or flame. Can react vigorously with oxidizing materials. Some carcinogenic activity. To fight fire, use CO_2, dry chemical.

ABE000 HR: 3
ACETONE PEROXIDE

PROP: Liquid. The trimeric form is crystalline. Mp: 97°.
THR: No toxicity data. See PEROXIDES, ORGANIC. Flammable by spontaneous chemical reaction; can react vigorously with reducing materials. The trimeric form is shock-sensitive and static-electricity-sensitive and may detonate.

pounds. Reacts explosively with aniline at 240°C/7.6 bar. Can react vigorously with oxidizing materials. To fight fire, use water, CO_2, water mist or spray, dry chemical. See also ANILINE. For further information, see Vol. 4, No. 4 of *DPIM Report*.

BBL250 ***HR: 3***

BENZENE

CAS: 71-43-2 NIOSH: CY 1400000

DOT: 1114

mf: C_6H_6 mw: 78.12

PROP: Clear, colorless liquid. Mp: 5.51°, bp: 80.093°-80.094°, flash p: 12°F (CC), d: 0.8794 @ 20°, autoign temp: 1044°F, lel: 1.4%, uel: 8.0%, vap press: 100 mm @ 26.1°, vap d: 2.77, ulc: 95-100.

SYNS:

6)ANNULENE	CYCLOHEXATRIENE
BENZEEN (DUTCH)	FENZEN (CZECH)
BENZEN (POLISH)	MINERAL NAPHTHA
BENZIN (OBS.)	MOTOR BENZOL
BENZINE (OBS.)	NCI-C55276
BENZOL (DOT)	NITRATION BENZENE
BENZOLE	PHENE
BENZOLENE	PHENYL HYDRIDE
BENZOLO (ITALIAN)	PYROBENZOL
BICARBURET OF HYDROGEN	PYROBENZOLE
CARBON OIL	RCRA WASTE NUMBER U019
COAL NAPHTHA	

TOXICITY DATA:	CODEN:
skn-rbt 15 mg/24H open MLD	AIHAAP 23,95,62
eye-rbt 88 mg MOD	AMIHAB 14,387,56
eye-rbt 2 mg/24H SEV	28ZPAK -,23,72
skn-rbt 500 mg/24H MOD	28ZPAK -,23,72
slt-dmg-orl 11250 µmol/L	PMRSDJ 5,325,85
oms-hmn:lym 5 µmol/L	CNREA8 45,2471,85
mma-mus:emb 2500 mg/L	PMRSDJ 5,639,85
cyt-ham:lng 550 mg/L	PMRSDJ 5,427,85
sln-ham:lvr 62500 µg/L	PMRSDJ 5,397,85
ihl-rat TCLo:670 mg/m³/24H (15D pre/1-22D preg):REP	HYSAAV 33,327,68
ihl-rat TCLO:50 ppm/24H (7-14D preg):TER	JHEMA2 24,363,80
ihl-rat TCLO:150 ppm/24H (7-14D preg):TER	JHEMA2 24,363,80
ihl-man TCLo:200 mg/m³/78W-I:CAR,BLD	EJCAAH 7,83,71
ihl-hmn TCLo:10 ppm/8H/10Y-I:CAR,BLD	TRBMAV 37,153,78
orl-rat TDLo:52 g/kg/52W-I:CAR	MELAAD 70,352,79
ihl-rat TCLo:1200 ppm/6H/10W-I:ETA	PAACA3 25,75,84
orl-mus LD50:18250 mg/kg/2Y-C:CAR	NTPTR* NTP-TR-289,86
ihl-mus TCLo:300 ppm/6H/16W-I:ETA	TXAPA9 75,358,84
skn-mus TDLo:1200 g/kg/49W-I:NEO	BJCAAI 16,275,62
ipr-mus TDLo:1200 mg/kg/8W-I:NEO	TXAPA9 82,19,86
scu-mus TDLo:600 mg/kg/17W-I:ETA	KRANAW 9,403,32
par-mus TDLo:670 mg/kg/19W-I:ETA	KLWOAZ 12,109,33
ihl-hmn TC:150 ppm/15M/8Y-I:CAR,BLD	BLOOAW 52,285,78
orl-rat TD:52 g/kg/1Y-I:CAR	AJIMD8 4,589,83
orl-rat TD:10 g/kg/52W-I:CAR	MELAAD 70,352,79
ihl-hmn TC:150 ppm/15M/8Y-I:CAR,BLD	NEJMAG 271,872,64
ihl-man TC:150 ppm/11Y-I:CAR,BLD	BLUTA9 28,293,74
ihl-mus TC:1200 ppm/6H/10W-I:ETA	PAACA3 25,75,84
ihl-hmn LCLo:2 pph/5M	TABIA2 3,231,33
orl-hmn TDLo:130 mg/kg:CNS,GIT	AHYGAJ 31,336,1897
ihl-hmn LCLo:20000 ppm/5M	29ZUA8 -,-,53
ihl-hmn TCLo:210 ppm:CNS,GIT	27ZXA3 -,341,63
ihl-man TCLo:150 ppm/1Y-I:MET,BLD	BLUTA9 28,293,74
ihl-hmn TCLo:100 ppm:CNS,GIT,SKN	INMEAF 17,199,48
ihl-hmn LCLo:65 mg/m³/5Y:BLD	ARGEAR 44,145,74
orl-rat LD50:3400 mg/kg	NPIRI* 1,5,74
ihl-rat LC50:10000 ppm/7H	28ZRAQ -,113,60
ipr-rat LD50:2890 µg/kg	36YFAG -,302,77
orl-mus LD50:4700 mg/kg	HYSAAV 32,349,67
ihl-mus LC50:9980 ppm	JIHTAB 25,366,43
skn-mus LD50:48 mg/kg	NPIRI* 1,5,74
ipr-mus LD50:990 µg/kg	AGGHAR 18,109,60
orl-dog LDLo:2000 mg/kg	HBAMAK 4,1313,35
ihl-dog LCLo:146000 mg/m³	HBTXAC 1,324,56
ihl-cat LCLo:170000 mg/m³	HBTXAC 1,324,56
ivn-rbt LDLo:88 mg/kg	JTEHD6 -(Suppl-2),45,77
ipr-gpg LDLo:527 mg/kg	HBTXAC 1,42,56
scu-frg LDLo:1400 mg/kg	HBAMAK 4,1313,35
ihl-mam LCLo:20000 ppm/5M	AEPPAE 138,65,28

IARC Cancer Review: Human Limited Evidence IMEMDT 7,203,74; Animal Inadequate Evidence IMEMDT 7,-203,74; IARC Cancer Review: Animal Limited Evidence IMEMDT 29,93,82; Human Sufficient Evidence IMEMDT 29,93,82; NTP Carcinogenesis Studies (gavage); Clear Evidence: mouse, rat NTPTR* NTP-TR-289,86. EPA Genetic Toxicology Program. Reported in EPA TSCA Inventory. On Community Right To Know List.

OSHA PEL: TWA 1 ppm/8H; Pk 5 ppm/15M

ACGIH TLV: TWA 10 ppm (suspected human carcinogen); BEI (total phenol in urine at end of shift) 50 mg/L recommended as a mean value

DFG TRK: 8 ppm (26 mg/m³)

NIOSH REL: CL 1 ppm/60M

DOT Classification: Flammable Liquid, Label: Flammable Liquid

THR: A human poison by inhalation. An experimental poison by skin contact, intraperitoneal, intravenous and possibly other routes. Moderately toxic by ingestion and subcuta-

ieous routes. A severe eye and moderate skin irritant. Human systemic effects by inhalation and ingestion: euphoria, somnolence, changes in REM sleep, changes in motor activity, nausea or vomiting, reduced number of blood platelets, other unspecified blood effects, dermatitis, and fever. A human carcinogen which produces myeloid leukemia and lymphomas by inhalation. An experimental carcinogen, neoplastigen, tumorigen, and teratogen. Other experimental animal reproductive effects. Human mutagenic data. A narcotic. In industry, inhalation is the primary route of chronic benzene poisoning. Poisoning by skin contact has been reported. Recent (1987) research indicates that effects are seen at less than 1 ppm. Exposures needed to be reduced to 0.1 ppm before no toxic effects were observed. Elimination is chiefly through the lungs. A common air contaminant.

A dangerous fire hazard when exposed to heat or flame. Explodes on contact with diborane; bromine pentafluoride; permanganic acid; peroxomonosulfuric acid; and peroxodisulfuric acid. Forms sensitive, explosive mixtures with iodine pentafluoride; silver perchlorate; nitryl perchlorate; nitric acid; liquid oxygen; ozone; arsenic pentafluoride + potassium methoxide (explodes above 30°C). Ignites on contact with sodium peroxide + water; dioxygenyl tetrafluoroborate; iodine heptafluoride; and dioxygen difluoride. Vigorous or incandescent reaction with hydrogen + Raney nickel (above 210°C); uranium hexafluoride; and bromine trifluoride. Can react vigorously with oxidizing materials, such as Cl_2; CrO_3; O_2; $NClO_4$; O_3; perchlorates; ($AlCl_3$ + $FClO_4$); (H_2SO_4 + permanganates); K_2O_2; ($AgClO_4$ + acetic acid); Na_2O_2. Moderate explosion hazard when exposed to heat or flame. Use with adequate ventilation. To fight fire, use foam, CO_2, dry chemical. For further information, see Vol. 4, No. 6 of *DPIM Report*.

Poisoning occurs most commonly via inhalation of the vapor, although benzene can penetrate the skin and cause poisoning. Locally, benzene has a comparatively strong irritating effect, producing erythema and burning, and, in more severe cases, edema and even blistering. Exposure to high concentrations of the vapor (3000 ppm or higher) may result from failure of equipment or spillage. Such exposure, while rare in industry, may cause acute poisoning, characterized by the narcotic action of benzene on the central nervous system. The anesthetic action of benzene is similar to that of other anesthetic gases, consisting of a preliminary stage of excitation followed by depression and, if exposure is continued, death through respiratory failure. The chronic, rather than the acute form, of benzene poisoning is important in industry. It is a recognized leukemogen. There is no specific blood picture occurring in cases of chronic benzol poisoning. The bone marrow may be hypoplastic, normal, or hyperplastic, the changes reflected in the peripheral blood. Anemia, leucopenia, macrocytosis, reticulocytosis, thrombocytopenia, high color index, and prolonged bleeding time may be present. Cases of myeloid leukemia have been reported. For the worker, repeated blood examinations are necessary, including hemoglobin determinations, white and red cell counts and differential smears. Where a worker shows a progressive drop in either red or white cells, or where the white count remains low, 5,000/mm^3 or the red count < 4.0 million/mm^3, on two successive monthly examinations, he should be immediately removed from benzene exposure. Elimination is chiefly through the lungs, when fresh air is breathed. The portion that is absorbed is oxidized, and the oxidation products are combined with sulfuric and glycuronic acids and eliminated in the urine. This may be used as a diagnostic sign. Benzene has a definite cumulative action, and exposure to a relatively high concentration is not serious from the point of view of causing damage to the blood-forming system, provided the exposure is not repeated. In acute poisoning, the worker becomes confused and dizzy, complains of tightening of the leg muscles and of pressure over the forehead, then passes into a stage of excitement. If allowed to remain exposed, he quickly becomes stupefied and lapses into coma. In non-fatal cases, recovery is usually complete with no permanent disability. In chronic poisoning the onset is slow, with the symptoms vague; fatigue, headache, dizziness, nausea and loss of appetite, loss of weight and weakness are common complaints in early cases. Later, pallor, nosebleeds, bleeding gums, menorrhagia, petechiae and purpura may develop. There is great individual variation in the signs and symptoms of chronic benzene poisoning.

BBL500 ***HR: 2***

BENZENEACETALDEHYDE

CAS: 122-78-1 NIOSH: CY 1420000

mf: C_8H_8O mw: 120.16

PROP: Oily, colorless liquid which polymerizes and grows more viscous on standing. Odor similar to lilac and hyacinth. Has been crystallized, mp: 33-34°, d:(25/25) 1.023-1.030, bp: (10) 78°, n (20/D) 1.524-1.528. Slily sol in water. Sol in alc, ether. One part is sol in two parts of 80% alc forming a clear solution.

SYNS:

HYACINTHIN
PAA
PHENYLACETALDEHYDE
PHENYLACETIC ALDEHYDE
PHENYLETHANAL
α-TOLUALDEHYDE
α-TOLUIC ALDEHYDE

TOXICITY DATA:	CODEN:
skn-hmn 2%/48H	FCTXAV 17.377.79
orl-rat LD50:1550 mg/kg	FCTXAV 17.377.79
orl-mus LD50:3890 mg/kg	FCTXAV 17.377.79
orl-gpg LD50:3890 mg/kg	FCTXAV 17.377.79

Reported in EPA TSCA Inventory.

THR: Moderately toxic by ingestion. Human skin irritant. When heated to decomposition it emits acrid smoke and irritating fumes. Used in perfumery. See also ALDEHYDES.

TOXICITY DATA:	CODEN:
eye-rbt 83 mg	AIHAAP 19,171,58
ihl-rat LC50: 4020 ppm/4H	AIHAAP 19,171,58
orl-rat LD50: 1500 mg/kg	AIHAAP 19,171,58
ipr-rat LD50: 399 mg/kg	AIHAAP 19,171,58
ihl-mus LC50: 2500 ppm/4H	AIHAAP 19,171,58

Reported in EPA TSCA Inventory.

OSHA PEL: TWA 10 ppm
ACGIH TLV: TWA 0.5 ppm
DFG MAK: 0.5 ppm (1.5 mg/m^3)
NIOSH REL: (n-Alkane Mono Thiols) CL 0.5 ppm/15M

DOT Classification: Flammable Liquid, Label: Flammable Liquid

THR: Poison by intraperitoneal route. Moderately toxic by inhalation and ingestion. An eye irritant. Dangerous fire hazard by exposure to heat, flame, sparks, or powerful oxidizers. Reacts violently with HNO_3. Incompatible with acids; acid fumes; oxidizing materials; heat; flame; sparks. To fight fire, use alcohol foam. When heated to decomposition it emits toxic SO_x. See also MERCAPTANS.

BOV000 ***HR: 3***

4-BUTANOLIDE

CAS: 96-48-0 NIOSH: LU 3500000
mf: $C_4H_6O_2$ mw: 86.10

PROP: Colorless liquid, mild odor. Mp: −44°, bp: 206°, flash p: 209°F (OC), d: 1.124 @ 25°/4°, vap d: 3.0.

SYNS:

gamma-0480	DIHYDRO-2(3H)-FURANONE
gamma-BL	4-HYDROXYBUTANOIC ACID LACTONE
BLO	γ-HYDROXYBUTYRIC ACID CYCLIC ESTER
BLON	4-HYDROXYBUTYRIC ACID γ-LACTONE
BUTYRIC ACID LACTONE	NCI-C55878
γ-BUTYROLACTONE	TETRAHYDRO-2-FURANONE
BUTYRYL LACTONE	
α-BUTYROLACTONE	
4-DEOXYTETRONIC ACID	
γ-HYDROXYBUTYROLACTONE	

TOXICITY DATA:	CODEN:
dnd-bcs 20 µL/disc	PMRSDJ 1,175,81
otr-ham:kdy 25 mg/L	PMRSDJ 1,638,81
orl-rat TDLo: 25 g/kg (20D male): REP	ARANDR 10,239,83
skn-mus TDLo: 50 g/kg/42W-I: ETA	JNCIAM 31,41,63
orl-rat LD50: 1800 mg/kg	85GMAT -,31,82
ipr-rat LD50: 1000 mg/kg	AITEAT 13,70,65
ipr-mus LD50: 1100 mg/kg	AITEAT 13,70,65
ivn-rbt LDLo: 500 mg/kg	AITEAT 13,70,65

IARC Cancer Review: Animal No Evidence IMEMDT 11,231,76. EPA Genetic Toxicology Program. Reported in EPA TSCA Inventory.

THR: Moderately toxic by ingestion, intravenous and intraperitoneal routes. An experimental tumorigen by skin contact. Experimental reproductive effects. Mutagenic data. Less acutely toxic than β-propiolactone. Combustible when exposed to heat or flame; can react with oxidizing materials. To fight fire, use foam, alcohol foam, CO_2, dry chemical. When heated decomposition it emits acrid and irritating fumes. For further information, see gamma Butyrolactone, Vol. 1, No. 3 of *DPIM Report*.

BOV250 ***HR: 3***

2-BUTANONE

CAS: 78-93-3 NIOSH: EL 6475000
DOT: 1193/1232
mf: C_4H_8O mw: 72.12

$$CH_3CO{\cdot}CH_2CH_3$$

PROP: Colorless liquid, acetone-like odor. Bp: 79.57°, fp: −85.9°, lel: 1.8%, uel: 11.5%, flash p: 22°F (TOC), d: 0.80615 @ 20°/20°, vap press: 71.2 mm @ 20°, autoign temp: 960°F, vap d: 2.42, ULC: 85-90.

SYNS:

AETHYLMETHYLKETON (GERMAN)	MEK
BUTANONE 2 (FRENCH)	METHYL ACETONE (DOT)
ETHYL METHYL CETONE (FRENCH)	METHYL ETHYL KETONE (ACGIH)
ETHYLMETHYLKETON (DUTCH)	METILETILCHETONE (ITALIAN)
ETHYL METHYL KETONE (DOT)	METYLOETYLOKETON (POLISH)
	RCRA WASTE NUMBER U159

TOXICITY DATA:	CODEN:
eye-hmn 350 ppm	JIHTAB 25,282,43
skn-rbt 500 mg/24H MOD	JIHTAB 25,282,43
skn-rbt 402 mg/24H MLD	TXAPA9 19,276,71
skn-rbt 13780 µg/24H open MLD	AIHAAP 23,95,62
eye-rbt 80 mg	TXAPA9 19,276,71
sln-smc 33800 ppm	MUREAV 149,339,85
ihl-rat TCLo: 3000 ppm/7H (6-15D preg): REP	TXAPA9 28,452,74
ihl-rat TCLo: 1000 ppm/(6-15D preg): TER	TXAPA9 28,452,74
ihl-hmn TCLo: 100 ppm/5M: IRR	JIHTAB 25,282,43
orl-rat LD50: 2737 mg/kg	TXAPA9 19,699,71
ihl-rat LCLo: 2000 ppm/4H	JIHTAB 31,343,49
ihl-mus LC50: 40 g/m^3/2H	85GMAT -,83,82
ipr-mus LD50: 616 mg/kg	SCCUR* -,6,61
skn-rbt LD50: 13 g/kg	UCDS** 5/7/70
ipr-gpg LDLo: 2000 mg/kg	FCTXAV 15,611,77

Community Right To Know List. EPA Genetic Toxicology Program. Reported in EPA TSCA Inventory.

OSHA PEL: TWA 200 ppm
ACGIH TLV: TWA 200 ppm; STEL 300 ppm
DFG MAK: 200 ppm (590 mg/m^3)
NIOSH REL: (Ketones) TWA 590 mg/m^3

DOT Classification: Flammable Liquid, Label: Flammable Liquid

THR: Moderately toxic by ingestion, skin contact and intraperitoneal routes. Human systemic effects by inhalation: conjunctiva irritation and unspecified effects on the nose

ind respiratory system. An experimental teratogen. Experiental reproductive effects. A strong irritant. Human eye ..rritation @ 350 ppm. Affects peripheral nervous system and central nervous system. See also KETONES. Dangerus fire hazard when exposed to heat or flame. Moderately xplosive when exposed to flame. Reaction with hydrogen peroxide + nitric acid forms a heat and shock sensitive xplosive product. Ignition on contact with potassium tertutoxide. Mixture with 2-propanol will produce explosive peroxides during storage. Vigorous reaction with chloroform + alkali. Incompatible with chlorosulfonic acid: leum. To fight fire, use alcohol foam, CO_2, dry chemical. When heated to decomposition it emits acrid smoke and fumes.

IOV625 ***HR: 3***

4-BUTANONE OXIME HYDROCHLORIDE

CAS: 4154-69-2

mf: $C_4H_{10}ClNO$ mw: 123.58

SYN: 2 HYDROXYLIMINIOBUTANE CHLORIDE)

THR: Decomposes violently above 50°C. When heated to decomposition it emits toxic fumes of Cl^- and NO_x.

BOV750 ***HR: 3***

BUTAZOLIDINE SODIUM

CAS: 129-18-0 NIOSH: UQ 8300000

mf: $C_{19}H_{20}N_2O_2 \cdot Na$ mw: 331.40

SYNS:

4-BUTYL-1,2-DIPHENYL-3,5-PYRAZOLIDINEDIONE SODIUM SALT
3,5-DIOXO-1,2-DIPHENYL-4-N-BUTYLPYRAZOLIDIN SODIUM
DIPHENYLDIOXOBUTYLPYRAZOLIDINE-BUTAZOLIDINE-SODIUM
PHENYLBUTAZONE SODIUM
SODIUM BUTAZOLIDINE
SODIUM PHENYLBUTAZONE
SODIUM SALT of PHENYLBUTAZONE

TOXICITY DATA:	CODEN:
orl-wmn LDLo:16 mg/kg	AIMEAS 39.1096,53
scu-rat LD50:360 mg/kg	ARZNAD 8,229,58
orl-mus LD50:476 mg/kg	RPOBAR 2,314,70
ipr-mus LD50:169 mg/kg	RPOBAR 2,314,70
ivn-rat LD50:113 mg/kg	FRPSAX 13,922,58
scu-mus LD50:271 mg/kg	FRPSAX 12,521,57
ivn-mus LD50:94 g/kg	FRPSAX 13,922,58

THR: A human poison by ingestion. Human systemic effects by ingestion: respiratory system damage, agranulocytosis, and dermatitis. An experimental poison via subcutaneous, intravenous, and intraperitoneal routes. An anti-inflammatory drug. When heated to decomposition it emits toxic fumes of NO_x and Na_2O.

BOV800 ***HR: 3***

BUTEA FRONDOSA, seed extract

NIOSH: EM 2455000

PROP: Indian plant belonging to the family *Leguminosae* (UEBA6 11,43,73).

SYN: PALASH SEED EXTRACT

TOXICITY DATA:	CODEN:
orl-rat TDLo:250 mg/kg (1-5D preg):REP	UPPAZ 13,239,69
orl-mus TDLo:50 mg/kg (1-5D preg):REP	UPPAZ 13,239,69
orl-mus LD50:7500 mg/kg	UPPAZ 13,239,69
ipr-mus LD50:20 mg/kg	UEBA6 11,43,73

THR: Poison by intraperitoneal route. Experimental reproductive effects.

BOV825 ***HR: 3***

BUTEDRIN

CAS: 5716-20-1 NIOSH: DN 9205000

mf: $C_{24}H_{38}N_2O_4 \cdot H_2O_4S$ mw: 516.72

SYNS:

BAMETAN SULFATE
BAMETHAN SULFATE
BASCURAT
BUPATOL
BUTIBATOL
α-[(BUTYLAMINO)METHYL]-p-HYDROXYBENZYL ALCOHOL SULFATE
BUTYLNORSYMPATOL
CYCLATE
ECLERIN
GARMIAN
PERIPHETOL
ROTESAR
VASCULAT
VASCULIT
VASCUNICOL
VASKULAT

TOXICITY DATA:	CODEN:
ipr-mus LD50:210 mg/kg	NIIRDN 6,585,82
scu-mus LD50:422 mg/kg	NIIRDN 6,585,82
ivn-mus LD50:72 mg/kg	NIIRND 6,585,82

THR: Poison by intravenous and intraperitoneal routes. Moderately toxic by subcutaneous route. A vasodilator. When heated to decomposition it emits toxic fumes of SO_x and NO_x. See also SULFATES.

BOW000 ***HR: 3***

trans-2-BUTENAL

CAS: 123-73-9 NIOSH: GP 9625000

mf: C_4H_6O mw: 70.10

PROP: Water-white, mobile liquid; pungent, suffocating odor. Bp: 104°, fp: −76.0°, lel: 2.1%, uel: 15.5%, flash p: 55°F, d: 0.853 @ 20°/20°, vap d: 2.41, autoign temp: 450°F.

SYNS:

ALDEHYDE CROTONIQUE (FRENCH)
(E)-2-BUTENAL
CROTENALDEHYDE
CROTONALDEHYDE (ACGIH)
CROTONIC ALDEHYDE
1,2-ETHANEDIOL DIPROPANOATE (9CI)
ETHYLENE GLYCOL DIPROPIONATE (8CI)
ETHYLENE PROPIONATE
β-METHYL ACROLEIN
NCI-C56279
PROPYLENE ALDEHYDE
RCRA WASTE NUMBER U053
TOPANEL

TOXICITY DATA:	CODEN:
eye-hmn 45 ppm	AIHAAP 28,561,67
skn-rbt 500 mg open MLD	UCDS** 4/21/67
mmo-sat 250 µg/plate	ENMUDM 5(Suppl 1),3,83

SYNS:
(o-(2,6-DICHLOROANILINO)PHENYL)ACETIC ACID MONOSODIUM SALT
2-(2,6-DICHLOROPHENYL)AMINO)BENZENEACETIC ACID MONOSODIUM SALT
DICHRONIC
DICLOFENAC SODIUM
DICLOPHENAC SODIUM
GP 45840
KRIPLEX
VERIODIN
PROPHENATIN
SODIUM (o-(2,6-DICHLOROANILINO)PHENYL)ACETATE
SODIUM (o-((2,6-DICHLOROPHENYL)AMINO)PHENYL)ACETATE
TSUDOHMIN
VALETAN
VOLTAREN
VOLTAROL

TOXICITY DATA:	CODEN:
orl-rat TDLo: 1 mg/kg (21D preg): TER	OYYAA2 27,117,84
orl-rat TDLo: 312 mg/kg (22W male): REP	KSRNAM 6,1521,72
orl-rat TDLo: 6 mg/kg (9-14D preg): TER	KSRNAM 6,1673,72
orl-rat LD50: 76500 µg/kg	OYYAA2 16,353,78
ipr-rat LD50: 25 mg/kg	NIIRDN 6,311,82
scu-rat LD50: 83 mg/kg	IYKEDH 5,106,74
ivn-rat LD50: 117 mg/kg	IYKEDH 5,106,74
orl-mus LD50: 125 mg/kg	ARZNAD 34,280,84
ipr-mus LD50: 130 mg/kg	IYKEDH 5,106,74
scu-mus LD50: 390 mg/kg	NIIRDN 6,311,82
ivn-mus LD50: 116 mg/kg	IYKEDH 5,106,74
orl-dog LD50: 59 mg/kg	KSRNAM 6,1521,72
ivn-dog LD50: 42 mg/kg	KSRNAM 6,1521,72
orl-rbt LD50: 157 mg/kg	KSRNAM 6,1521,72

THR: Poison by ingestion, intravenous, intraperitoneal and subcutaneous routes. An experimental teratogen. Experimental reproductive effects. An anti-inflammatory agent. When heated to decomposition it emits very toxic fumes of Cl^-, Na_2O and NO_x.

DEP400 ***HR: 3***

2-DICHLOROARSINOPHENOXATHIIN

CAS: 63834-20-8 NIOSH: SP 7000000

mf: $C_{12}H_7AsCl_2OS$ mw: 345.07

SYN: TL 472

TOXICITY DATA:	CODEN:
orl-rat LDLo: 250 mg/kg	NCNSA6 5,13,53
ihl-mus LCLo: 400 mg/m³/10M	NDRC** NDCrc-132,Dec,42

Arsenic and its compounds are on the Community Right To Know List.

OSHA PEL: TWA 0.5 mg(As)/m³

THR: Poison by ingestion and inhalation. See also ARSENIC COMPOUNDS. When heated to decomposition it emits very toxic fumes of As, Cl^- and SO_x.

DEP600 ***HR: 3***

o-DICHLOROBENZENE

CAS: 95-50-1 NIOSH: CZ 4500000

DOT: 1591

mf: $C_6H_4Cl_2$ mw: 147.00

PROP: Clear liquid. Mp: −17.5°, bp: 180-183°, fp: −22°, flash p: 151°F, d: 1.307 @ 20°/20°, vap d: 5.05, autoign temp: 1198°F, lel: 2.2%, uel: 9.2%.

SYNS:
CHLOROBEN
CHLORODEN
CLOROBEN
DCB
o-DICHLORBENZENE
o-DICHLOR BENZOL
1,2-DICHLOROBENZENE
DICHLOROBENZENE, ORTHO, liquid (DOT)
DILANTIN DB
DILATIN DB
DIZENE
DOWTHERM E
NCI-C54944
ODB
ODCB
ORTHODICHLOROBENZENE
ORTHODICHLOROBENZOL
RCRA WASTE NUMBER U070
SPECIAL TERMITE FLUID
TERMITKIL

TOXICITY DATA:	CODEN:
eye-rbt 100 mg/30S rns MLD	AMIHAB 17,180,58
spm-rat-ipr 250 mg/kg	JACTDZ 4(2),224,85
ihl-rat TCLo: 200 ppm/6H (6-15D preg): TER	FAATDF 5,190,85
ipr-rat TDLo: 50 mg/kg (1D male): REP	JACTDZ 4(1),224,85
orl-rat LD50: 500 mg/kg	WRPCA2 7,135,68
ihl-rat LCLo: 821 ppm/7H	AMIHAB 17,180,58
ipr-rat LD50: 840 mg/kg	MEPAAX 20,519,69
orl-mus LD50: 4386 g/kg	YKYUA6 32,471,81
ivn-mus LDLo: 400 mg/kg	JPBAA7 44,281,37
orl-rbt LD50: 500 mg/kg	85ARAE 3,32,76/77
ivn-rbt LDLo: 250 mg/kg	JPBAA7 44,281,37
orl-gpg LDLo: 2000 mg/kg	14CYAT 2,1336,63
ihl-gpg LCLo: 800 ppm/24H	JPBAA7 44,281,37

IARC Cancer Review: Human Inadequate Evidence IMEMDT 29,213,82; Animal Inadequate Evidence IMEMDT 29,213,82. Reported in EPA TSCA Inventory. Community Right To Know List.

OSHA PEL: CL 50 ppm
ACGIH TLV: CL 50 ppm (skin)
DFG MAK: 50 ppm (300 mg/m³)

DOT Classification: ORM-A, Label: None; IMO: Poison B; Label: St. Andrews Cross

THR: Poison by ingestion and intravenous routes. Moderately toxic by inhalation and intraperitoneal routes. An eye, skin, and mucous membrane irritant. Causes liver and kidney injury. An experimental teratogen and suspected carcinogen. Experimental reproductive effects. Mutagenic data. A pesticide. Flammable when exposed to heat or flame. Can react vigorously with oxidizing materials. To fight fire, use water, foam, CO_2 dry chemical. Slow reaction with aluminum may lead to explosion during storage in a sealed aluminum container. When heated to decomposition it emits toxic fumes of Cl^-. See also BENZENE CHLORIDE and CHLORINATED HYDROCARBONS, AROMATIC.

ihl-rat TCLo: 57 mg/m³ 4H (22W pre): TER	GISAAA 39(7),25,74
orl-rat LD50: 1120 mg/kg	HYSAAV 32,349,67
orl-mus LD50: 625 mg/kg	HYSAAV 32,349,67
ihl-mus LCLo: 10 g/m³	GISAAA 20(8),19,55
skn-rbt LD50: 3890 mg/kg	UCDS** 3/23/70
unr-mam LD50: 807 mg/kg	GTPZAB 26(4),26,82

THR: Moderately toxic by ingestion, skin contact and possibly other routes. Mildly toxic by inhalation. An experimental teratogen. Other experimental reproductive effects by inhalation. When heated to decomposition it emits very toxic fumes of Cl^-. See also 1,2-DICHLOROETHANE; and CHLORINATED HYDROCARBONS, ALIPHATIC.

DFF809 ***HR: 3***

1,1-DICHLOROETHANE

CAS: 75-34-3 NIOSH: KI 0175000

DOT: 2362

mf: $C_2H_4Cl_2$ mw: 98.96

PROP: Lel: 5.6%, uel: 11.4%.

SYNS:

AETHYLIDENCHLORID (GERMAN)	1,1-DICHLORAETHAN (GERMAN)
CHLORINATED HYDROCHLORIC ETHER	1,1-DICHLORETHANE
CHLORURE d' ETHYLIDENE (FRENCH)	1,1-DICLOROETANO (ITALIAN)
CLORURO DI ETILIDENE (ITALIAN)	ETHYLIDENE CHLORIDE
1,1-DICHLOORETHAAN (DUTCH)	ETHYLIDENE DICHLORIDE
	NCI-C04535
	RCRA WASTE NUMBER U076

TOXICITY DATA:	CODEN:
ihl-rat TCLo: 6000 ppm/7H (6-15D preg): TER	TXAPA9 28,452,74
orl-mus TDLo: 185 g/kg/78 W-I: ETA	NCITR* NCI-CG-TR-66,78
orl-mus TD: 1300 g/kg/78 W-I: ETA	NCITR* NCI-CG-TR-66,78
orl-rat LD50: 725 mg/kg	HYSAAV 32,349,67

EPA TSCA Chemical Inventory. NCI Carcinogenesis Bioassay (gavage); Inadequate Studies: mouse, rat NCITR* NCI-CG-TR-66,78.

OSHA PEL: TWA 100 ppm

DOT Classification: Flammable Liquid; Label: Flammable Liquid

THR: Moderately toxic by ingestion. An experimental tumorigen and teratogen. A suspected carcinogen. When heated to decomposition it emits very toxic fumes of Cl^-. See also 1,2-DICHLOROETHANE; and CHLORINATED HYDROCARBONS, ALIPHATIC.

DFF900 ***HR: 3***

1,2-DICHLOROETHANE

CAS: 107-06-2 NIOSH: KI 0525000

DOT: 1184

mf: $C_2H_4Cl_2$ mw: 98.96

PROP: Colorless liquid, pleasant odor, sweet taste. Bp: 83.5°, ulc: 60-70, lel: 6.2%, uel: 15.9%, fp: −35.7°, flash p: 56°F, d: 1.257 @ 20°/4°, autoign temp: 775°F, vap press: 100 mm @ 29.4°, vap d: 3.35.

SYNS:

AETHYLENCHLORID (GERMAN)	sym-DICHLOROETHANE
1,2-BICHLORETHANE	1,2 DICHLOROETHANE
BICHLORURE D ETHYLENE (FRENCH)	DICHLOROETHYLENE
BORER SOL	1,2 DICLOROETANO (ITALIAN)
BROCIDE	DUTCH LIQUID
CHLORURE D'ETHYLENE (FRENCH)	DUTCH OIL
CLORURO DI ETHENE (ITALIAN)	EDC
1,2-DCE	ENT 1,656
DESTRUXOL BORER-SOL	ETHANE DICHLORIDE
1,2-DICHLOORETHAAN (DUTCH)	ETHYLEENDICHLORIDE (DUTCH)
1,2-DICHLOR-AETHAN (GERMAN)	ETHYLENE CHLORIDE
DICHLOREMULSION	ETHYLENE DICHLORIDE (ACGIH, DOT)
DI-CHLOR-MULSION	1,2-ETHYLENE DICHLORIDE
DICHLORO-1,2-ETHANE (FRENCH)	GLYCOL DICHLORIDE
α,β-DICHLOROETHANE	NCI-C00511
	RCRA WASTE NUMBER U077

TOXICITY DATA:	CODEN:
skn-rbt 600 mg open MLD	UCDS** 3/23/70
eye-rbt 63 mg SEV	UCDS** 3/23/70
mmo-sat 40 µmol/plate	CBINA8 20,1,78
msc-hmn: lym 100 mg/L	MUREAV 142,133,85
slt-mus-ipr 300 mg/kg	MUREAV 117,201,83
otr-ham: emb 200 µL/plate	EVSRBT 25,75,82
ihl-rat TCLo: 300 ppm/7H (6-15D preg): REP	BANRDU 5,149,80
orl-rat TDLo: 5286 mg/kg/69W-I: CAR	BANRDU 5,35,80
ihl-rat TCLo: 5 ppm/7H/78W-I: ETA	BANRDU 5,3,80
orl-mus TDLo: 3536 mg/kg/78W-I: CAR	BANRDU 5,35,80
ihl-mus TCLo: 5 ppm/7H/78W-I: ETA	BANRDU 5,3,80
skn-mus TDLo: 1120 g/kg/74W-I: NEO	JJIND8 63,1433,79
orl-rat TD: 38 g/kg/78W-I: CAR	NCITR* NCI-CG-TR-55,78
orl-mus TD: 76 g/kg/78W-I: CAR,TER	NCITR* NCI-CG-TR-55,78
orl-rat TD: 18 g/kg/78W-I: CAR	NCITR* NCI-CG-TR-55,78
orl-mus TD: 38 g/kg/78W-I: CAR,TER	NCITR* NCI-CG-TR-55,78
ihl-hmn TCLo: 4000 ppm/H: CNS,PNS,GIT	PCOC** -,500,66
orl-hmn TDLo: 428 mg/kg: GIT,CNS,PUL	SOMEAU 22,132,58
orl-man TDLo: 892 mg/kg: GIT,LIV	WILEAR 28,983,75
orl-hmn LDLo: 286 mg/kg: GIT,LIV	CLCEAL 86,203,47
orl-man LDLo: 714 mg/kg: CNS,CVS,PUL	KLWOAZ 48,822,70
orl-rat LD50: 670 mg/kg	FMCHA2 -,C99,83
ihl-rat LC50: 1000 ppm/7H	AMIHBC 4,482,51
scu-rat LDLo: 99 mg/kg	AMPLAO 51,346,51
orl-mus LD50: 489 mg/kg	TOXID9 1,26,81

DFH600 ***HR: 2***

),O-DI(2-CHLOROETHYL)-O-(3-CHLORO-4-METHYLCOUMARIN-7-YL) PHOSPHATE

CAS: 321-55-1 NIOSH: GN 5250000

mf: $C_{14}H_{14}Cl_3O_5P$ mw: 415.60

SYNS:

-) O-BIS(2 CHLOROETHYL)-O-(3-CHLORO-4-METHYL 7-COUMARINYL) PHOSPHATE
- CHLOROETHANOL HYDROGEN PHOSPHATE ESTER with 3-CHLORO-7 HYDROXY-4-METHYLCOUMARIN
- CHLOROETHANOL PHOSPHATE DIESTER ESTER with 3-CHLORO-7-HYDROXY-4-METHYLCOUMARIN
- CHLORO-7-HYDROXY-4-METHYLCOUMARIN BIS(2-CHLOROETHYL)PHOSPHATE
- CHLORO-4-METHYL-UMBELLIFERONE BIS(2-CHLOROETHYL) PHOSPHATE
- DI-(2-CHLOROETHYL)-3-CHLORO-4-METHYL-7-COUMARINYL PHOSPHATE
- DI-(2-CHLOROETHYL)-3-CHLORO-4-METHYLCOUMARIN-7-YL PHOSPHATE
- EUSTIDIL
- GALLOXON
- GALOXANE
- H60
- HALOXON
- HELMIRANE
- HELMIRON
- HELMIRONE
- LOXON
- LUXON
- LXON

TOXICITY DATA:	CODEN:
ihi-hmn:oth 10 mg/L	JTEHD6 10,143,82
orl-rat LD50:900 mg/kg	FAZMAE 17,108,73
pr-ckn LD50:800 mg/kg	BCPCA6 16,1183,67
orl-dom LD50:763 mg/kg	AJVRAH 41,1857,80

THR: Moderately toxic by ingestion and intraperitoneal routes. Human mutagenic data. An anthelmintic. When heated to decomposition it emits very toxic fumes of PO_x and Cl^-. See also other coumarin entries.

DFH800 ***HR: 2***

DICHLOROETHYLENE

CAS: 25323-30-2 NIOSH: KV 9250000

DOT: 1150

mf: $C_2H_2Cl_2$ mw: 96.94

TOXICITY DATA:	CODEN:
ihl-mus LCLo:76 g/m³/2H	AEXPBL 83,235,18
ihl-gpg LCLo:155 g/m³/1H	AEXPBL 83,235,18
orl-mam LDLo:2500 mg/kg	UGLAAD 121,375,59

DOT Classification: Flammable Liquid; Label: Flammable Liquid

THR: Moderately toxic by ingestion. Mildly toxic by inhalation. Flammable when exposed to heat or flame. When heated to decomposition it emits toxic fumes of Cl^-. See also 1,1-DICHLOROETHYLENE.

DFI000 ***HR: 3***

1,1-DICHLOROETHYLENE ✱

CAS: 75-35-4 NIOSH: KV 9275000

mf: $C_2H_2Cl_2$ mw: 96.94

PROP: Colorless, volatile liquid. Bp: 31.6°, lel: 7.3%, uel: 16.0%, fp: −122°, flash p: 0°F (OC), d: 1.213 @ 20°/4°, autoign temp: 1058°F.

SYNS:

- CHLORURE de VINYLIDENE (FRENCH)
- 1 DCE
- 1,1-DICHLOROETHENE
- NCI-C54262
- RCRA WASTE NUMBER U078
- SCONATEX
- VDC
- VINYLIDENE CHLORIDE (II)
- VINYLIDENE CHLORIDE (ACGIH)
- VINYLIDENE DICHLORIDE
- VINYLIDINE CHLORIDE

TOXICITY DATA:	CODEN:
mmo-sat 5 pph	MUREAV 57,141,78
mma-sat 3 pph/2H	MUREAV 58,183,78
dnd-rat-ihl 10 ppm	TXAPA9 53,357,80
dns-mus-ihl 50 ppm	TXAPA9 53,357,80
dns-mus-orl 200 mg/kg	TXCYAC 36,199,85
orl-rat TDLo:200 mg/kg (6-15D preg):TER	TXAPA9 49,189,79
ihl-rat TCLo:80 ppm/7H (6-15D preg):TER	TXAPA9 49,189,79
ihl-rat TCLo:55 ppm/6H (55D pre):REP	JTEHD6 3,965,77
ihl-rat TCLo:55 ppm/6H/52W-I:ETA	JTEHD6 4,15,78
ihl-mus TCLo:25 ppm/4H/52W-I	MELAAD 68,241,77
skn-mus TDLo:4840 mg/kg:NEO	JJIND8 63,1433,79
ihl-rat TC:150 ppm/4H/52W-I:ETA	MELAAD 68,241,77
ihl-mus TC:55 ppm/6H/13W-I:ETA	JTEHD6 7,909,81
ihl-mus TC:55 ppm/6H/52W-I:ETA	EVHPAZ 21,25,77
ihl-rat TC:55 ppm/6H/52W-I:ETA	EVHPAZ 21,25,77
ihl-rat TC:150 ppm/4H/52W-I:ETA	EVHPAZ 21,45,77
ihl-rat TC:55 ppm/6H/28W-I:ETA	JTEHD6 7,909,81
ihl-hmn TCLo:25 ppm:CNS,LIV,KID	CHINAG (11),463,76
orl-rat LD50:200 mg/kg	DCTODJ 1,63,77
ihl-rat LCLo:10000 ppm/24H	EXMPA6 20,187,74
ihl-mus LC50:98 ppm/22H	JTEHD6 3,913,77
orl-dog LDLo:5750 mg/kg	QJPPAL 7,205,34
ivn-dog LDLo:225 mg/kg	QJPPAL 7,205,34
scu-rbt LDLo:3700 mg/kg	QJPPAL 7,205,34

IARC Cancer Review: Human Inadequate Evidence IMEMDT 39,195,86; Animal Sufficient Evidence IMEMDT 19,439,79; Animal Limited Evidence IMEMDT 39,195,86; Human Inadequate Evidence IMEMDT 19,-439,79. EPA Genetic Toxicology Program. Reported in EPA TSCA Inventory. Community Right To Know List.

ACGIH TLV: TWA 5 ppm; STEL 20 ppm

THR: Poison by inhalation, ingestion and intravenous routes. Moderately toxic by subcutaneous route. An experimental carcinogen, neoplastigen, tumorigen and teratogen. Human systemic effects by inhalation: general anesthesia, liver and kidney changes. Experimental reproductive effects. Mutagenic data. See also VINYL CHLORIDE. A very dangerous fire hazard when exposed to heat or flame. Moderately explosive in the form of gas when exposed to heat or flame. It forms explosive peroxides upon exposure

to air. Potentially explosive reaction with chlorotrifluoroethylene at 180°C. Reaction with ozone forms dangerous products. Explosive reaction with perchloryl fluoride when heated above 100°C. Also can explode spontaneously. Reacts violently with chlorosulfonic acid; HNO_3; oleum. Can react vigorously with oxidizing materials. To fight fire, use alcohol foam, CO_2, dry chemical. When heated to decomposition it emits toxic fumes of Cl^-.

DFI200 ***HR: 1***

cis-DICHLOROETHYLENE

CAS: 156-59-2 NIOSH: KV 9420000

mf: $C_2H_2Cl_2$ mw: 96.94

HCCl=CHCl

PROP: Colorless liquid, pleasant odor. Mp: −80.5°, bp: 59°, lel: 9.7%, uel: 12.8%, flash p: 39°F, d: 1.2743 @ 25°/4°, vap press: 400 mm @ 41.0°, vap d: 3.34.

SYN: 1,2-DICHLOROETHYLENE

TOXICITY DATA:	CODEN:
mmo-smc 100 mmol/L	TCMUD8 4,365,84
mma-smc 40 mmol/L	TCMUD8 4,365,84
mrc-smc 100 mmol/L	TCMUD8 4,365,84
dns-rat:lvr 4300 μmol/L	CRNGDP 5,1629,84
ihl-mus LCLo:65000 mg/m³/2H	AHBAAM 116,131,36
ihl-cat LCLo:20000 mg/m³/6H	AHBAAM 116,131,36

Reported in EPA TSCA Inventory.

THR: Mildly toxic by by ingestion and inhalation. In high concentration it is irritating and narcotic. Has produced liver and kidney injury in experimental animals. A suspected carcinogen. Mutagenic data. Sometimes thought to be nonflammable, however, it is a dangerous fire hazard when exposed to heat or flame. Reaction with solid caustic alkalies or their concentrated solutions produces chloracetylene gas which ignites spontaneously in air. Reacts violently with N_2O_4; KOH; Na; NaOH. Moderate explosion hazard in the form of vapor when exposed to flame. Can react vigorously with oxidizing materials. To fight fire, use water spray, foam, CO_2, dry chemical. When heated to decomposition it emits toxic fumes of Cl^-. See also 1,1-DICHLOROETHYLENE and CHLORINATED HYDROCARBONS, ALIPHATIC. For further information, see Vol. 4, No. 3 of ***DPIM Report***.

DFI600 ***HR: 1***

trans-1,2-DICHLOROETHYLENE

CAS: 156-60-5 NIOSH: KV 9400000

mf: $C_2H_2Cl_2$ mw: 96.94

PROP: Flash p: 35.6°F, lel: 9.7%, uel: 12.8%.

SYN:

trans-ACETYLENE DICHLORIDE trans-DICHLOROETHYLENE

TOXICITY DATA:	CODEN:
ihl-hmn TCLo:4800 mg/m³/10M	AHBAAM 116,131,36
ipr-rat LD50:7536 mg/kg	TXCYAC 7,141,77
ihl-mus LCLo:75000 mg/m3/2H	AHBAAM 116,131,36
ipr-mus LD50:4019 mg/kg	TXCYAC 7,141,77
ihl-cat LCLo:43000 mg/m3/6H	AHBAAM 116,131,36

Reported in EPA TSCA Inventory.

THR: Mildly toxic to humans by inhalation. Mildly toxic experimentally by inhalation and intraperitoneal routes. A very dangerous fire hazard when exposed to heat or flame. Violent reaction with difluoromethylene dihypofluorite. Forms shock-sensitive explosive mixtures with dinitrogen tetraoxide. Reaction with solid caustic alkalies or their concentrated solutions produces chloracetylene gas which ignites spontaneously in air. Reacts violently with N_2O_4; KOH; Na; NaOH. Moderate explosion hazard in the form of vapor when exposed to flame. Can react vigorously with oxidizing materials. To fight fire, use water spray, foam, CO_2, dry chemical. When heated to decomposition it emits toxic fumes of Cl^-. See also 1,1-DICHLOROETHYLENE and CHLORINATED HYDROCARBONS, ALIPHATIC. For further information, see Vol. 4, No. 3 of ***DPIM Report***.

DFI800 ***HR: 3***

1,2-DICHLOROETHYLENE CARBONATE

CAS: 3967-55-3 NIOSH: JH 7400000

mf: $C_3H_2Cl_2O_3$ mw: 156.95

SYN: 4,5-DICHLORO-2-OXO-1,3-DIOXOLANE

TOXICITY DATA:	CODEN:
scu-mus TDLo:648 mg/kg/54W-I:ETA	JNCIAM 48,1431,72

THR: An experimental tumorigen. When heated to decomposition it emits toxic fumes of Cl^-.

DFJ000 ***HR: 3***

DICHLORO(ETHYLENEDIAMMINE)PLATINUM(II)

CAS: 14096-51-6 NIOSH: TP 2497100

mf: $C_2H_8Cl_2N_2Pt$ mw: 326.11

SYNS:

ETHYLENEDIAMINEDICHLORIDE PLATINUM (II) PLATINUM ETHYLENEDIAMMINE DICHLORIDE

TOXICITY DATA:	CODEN:
mmo-sat 2 μg/plate	MUREAV 77,45,80
mma-sat 2 μg/plate	MUREAV 77,45,80
dnd-esc 100 mmol/L	CBINA8 16,39,77
dni-hmn:oth 25 μmol/L	IJCNAW 6,207,70
oms-mam:lym 10 μmol/L	BCPCA6 23,1659,74
ipr-mus LDLo:14 mg/kg	BCPCA6 2,187,73

THR: Poison by intraperitoneal route. Human mutagenic data. See also PLATINUM COMPOUNDS. When heated to decomposition it emits very toxic fumes of Cl^- and NO_x.

TOXICITY DATA: CODEN:
ims-rat TDLo:50 mg/kg:ETA CNREA8 29,506,69

THR: An experimental tumorigen. When heated to decomposition it emits acrid smoke and irritating fumes.

EGP500 ***HR: 2***

ETHYL BENZENE

CAS: 100-41-4 NIOSH: DA 0700000
DOT: 1175
mf: C_8H_{10} mw: 106.18

PROP: Colorless liquid, aromatic odor. Misc in alcohol and ether, insol in NH_3; sol in SO_2. Bp: 136.2°, fp: −94.9°, flash p: 59°F, d: 0.8669 @ 20°/4°, autoign temp: 810°F, vap press: 10 mm @ 25.9°, vap d: 3.66, lel: 1.2%, uel: 6.8%.

SYNS:

AETHYLBENZOL (GERMAN)	ETILBENZENE (ITALIAN)
EB	ETYLOBENZEN (POLISH)
ETHYLBENZEEN (DUTCH)	NCI-C56393
ETHYLBENZOL	PHENYLETHANE

TOXICITY DATA: CODEN:

skn-rbt 15 mg/24H open MLD	AIHAAP 23,95,62
eye-rbt 100 mg	AJOPAA 29,1363,46
sce-hmn:lym 1 mmol/L	MUREAV 116,379,83
ihl-rat TCLo:97 ppm/7H (15D preg):REP	BATTL* JAN,81
ihl-rat TCLo:985 ppm/7H (1-19D preg):TER	BATTL* JAN,81
ihl-rat TCLo:96 ppm/7H (1-19D preg):TER	BATTL* JAN,81
ihl-hmn TCLo:100 ppm/8H: EYE,CNS,PUL	AIHAAP 31,206,70
orl-rat LD50:3500 mg/kg	AMIHAB 14,387,56
ihl-rat LCLo:4000 ppm/4H	AIHAAP 23,95,62
ihl-mus LCLo:50 g/m3/2H	GTPZAB 5(5),3,61
ipr-mus LD50:2272 mg/kg	ARTODN 58,106,85
skn-rbt LD50:17800 mg/kg	FCTXAV 13,803,75
ihl-gpg LCLo:10000 ppm	PHRPA6 45,1241,30

Reported in EPA TSCA Inventory. EPA Genetic Toxicology Program. Community Right To Know List.

OSHA PEL: TWA 100 ppm (skin)
ACGIH TLV: TWA 100 ppm; STEL 125 ppm; BEI: 2 g/L (mandelic acid in urine at end of shift)
DFG MAK: 100 ppm (440 mg/m^3)

DOT Classification: Flammable Liquid, Label: Flammable Liquid

THR: Moderately toxic by ingestion and intraperitoneal route. Mildly toxic by inhalation and skin contact. An experimental teratogen. Human systemic effects by inhalation: eye, sleep and pulmonary changes. An eye and skin irritant. Human mutagenic data. The liquid is an irritant to the skin and mucous membranes. A concentration of 0.1% of the vapor in air is an irritant to human eyes, and a concentration of 0.2% is extremely irritating at first, then causes dizziness, irritation of the nose and throat and a sense of constriction in the chest. Exposure of guinea pigs to 1% concentration has been reported as causing ataxia, loss of consciousness, tremor of the extremities and finally death through respiratory failure. The pathological findings were congestion of the brain and lungs with edema. No data are available regarding the effect of chronic exposure.

A very dangerous fire and explosion hazard when exposed to heat or flame; can react vigorously with oxidizing materials. To fight fire, use foam, CO_2, dry chemical. When heated to decomposition it emits acrid smoke and irritating fumes. For further information, see Vol. 2, No. 6 of *DPIM Report*.

EGQ000 ***HR: 2***

α-ETHYLBENZENEMETHANOL

CAS: 93-54-9 NIOSH: DO 5470000
mf: $C_9H_{12}O$ mw: 136.21

SYNS:

EJIBIL	PHENICOL
α-ETHYLBENZYL ALCOHOL	PHENYCHOLON
ETHYL PHENYL CARBINOL	PHENYLAETHYLCARBINOL (GERMAN)
FELICUR	1-PHENYLPROPANOL
FELITROPE	1-PHENYL-1-PROPANOL
FENICOL	1-PHENYLPROPYL ALCOHOL
α-HYDROXYPROPYLBENZENE	SH 261
LIVONAL	

TOXICITY DATA: CODEN:

orl-rat LD50:1600 mg/kg	ARZNAD 12,347,62
orl-mus LD50:500 mg/kg	AIPTAK 116,154,58
scu-mus LD50:700 mg/kg	AIPTAK 116,154,58

THR: Moderately toxic by ingestion and subcutaneous route. When heated to decomposition it emits acrid smoke and irritating fumes.

EGR000 ***HR: 2***

ETHYL BENZOATE

CAS: 93-89-0 NIOSH: DH 0200000
mf: $C_9H_{10}O_2$ mw: 150.19

PROP: Colorless, aromatic liquid. Mp: −34.6°, bp: 213.4°, flash p: >204°F, d: 1.048 @ 20°/20°, vap press: 1 mm @ 44.0°, vap d: 5.17, autoign temp: 914°F. Insol in water; misc in petroleum, alcohol, chloroform, and ether.

SYNS:

BENZOIC ETHER	ESSENCE OF NIOBE

TOXICITY DATA: CODEN:

skn-rbt 10 mg/24H open MLD	AMIHBC 10,61,54
eye-rbt 500 mg open	AMIHBC 10,61,54
orl-rat LD50:2100 mg/kg	JPETAB 84,358,45
skn-cat LDLo:10 g/kg	JPETAB 84,358,45
orl-rbt LD50:2630 mg/kg	JPETAB 84,358,45

Reported in EPA TSCA Inventory.

EHH000 ***HR: 1***

ETHYL CHLORIDE

CAS: 75-00-3 NIOSH: KH 7525000
DOT: 1037
mf: C_2H_5Cl mw: 64.52

PROP: Colorless liquid or gas; ether-like odor, sol in water at 0.45; misc in alcohol and ether, burning taste. Bp: 12.3°, lel: 3.8%, uel: 15.4%, fp: −139°, flash p: −58°F (CC), d: 0.9214 @ 0°/4°, autoign temp: 966°F, vap press: 1000 mm @ 20° vap d: 2.22.

SYNS:

AETHYLCHLORID (GERMAN)
AETHYLIS
AETHYLIS CHLORIDUM
ANODYNON
CHELEN
CHLOORETHAAN (DUTCH)
CHLORETHYL
CHLORIDUM
CHLOROAETHAN (GERMAN)
CHLOROETHANE
CHLORURE D'ETHYLE (FRENCH)
CHLORYL
CHLORYL ANESTHETIC
CLOROETANO (ITALIAN)
CLORURO DI ETILE (ITALIAN)
ETHER CHLORATUS
ETHER HYDROCHLORIC
ETHER MURIATIC
ETYLU CHLOREK (POLISH)
HYDROCHLORIC ETHER
KELENE
MONOCHLORETHANE
MURIATIC ETHER
NARCOTILE
NCI-C06224

TOXICITY DATA:	CODEN:
ihl-rat LC50: 160 g/m³/2H	85GMAT -,66,82
ihl-mus LC50: 146 g/m³/2H	85GMAT -,66,82
ihl-gpg LCLo: 40000 ppm/45M	XPHBAO 185,1,29

Reported in EPA TSCA Inventory, Community Right To Know List.

OSHA PEL: TWA 1000 ppm
ACGIH TLV: TWA 1000 ppm

DOT Classification: Flammable Liquid, Label: Flammable Liquid; Flammable Gas; Label; Flammable Gas

THR: Mildly toxic by inhalation. An irritant to skin, eyes and mucous membranes. The liquid is harmful to the eyes and can cause some irritation. In the case of guinea pigs, the symptoms attending exposure are similar to those caused by methyl chloride, except that the signs of lung irritation are not as pronounced. It gives some warning of its presence because it is irritating, but it is possible to tolerate exposure to it until one becomes unconscious. It is the least toxic of all the chlorinated hydrocarbons. It can cause narcosis, although the effects are usually transient. A priority pollutant.

A very dangerous fire hazard when exposed to heat or flame; can react vigorously with oxidizing materials. Severe explosion hazard when exposed to flame. Reacts with water or steam to produce toxic and corrosive fumes. Incompatible with potassium. To fight fire, use carbon dioxide. When heated to decomposition it emits toxic fumes of phosgene and Cl^-. See also CHLORINATED HYDROCARBONS, ALIPHATIC. For further information, see Vol. 1, No. 4 of *DPIM Report*.

EHH500 ***HR: 1***

ETHYL CHLORO BENZENE

CAS: 1331-31-3 NIOSH: CZ 0700000
mf: C_9H_9Cl mw: 140.62

PROP: Clear, colorless liquid. Mp: −62.6°, bp: 184.3°, flash p: 147°F, d: 1.05 @ 25°/25°, vap press: 1 mm @ 19.2°, vap d: 4.86.

SYN: CHLOROETHYLBENZENE

TOXICITY DATA:	CODEN:
skn-rbt 10 mg/24H open	JIHTAB 30,63,48
eye-rbt 500 mg	AJOPAA 29,1363,46
orl-rat LD50: 5000 mg/kg	JIHTAB 30,63,48
skn-rbt LD50: 18 g/kg	JIHTAB 30,63,48

THR: Mildly toxic by ingestion and skin contact. A skin and eye irritant. Flammable when exposed to heat or flame; can react vigorously with oxidizing materials. To fight fire, use foam, CO_2, dry chemical. When heated to decomposition it emits acrid smoke and irritating fumes. See also CHLORINATED HYDROCARBONS, AROMATIC, and CHLOROBENZENE.

EHI500 ***HR: 3***

7-(2-(ETHYL-2-CHLOROETHYL)AMINOETHYLAMINO)BENZ(c)ACRIDINE DIHYDROCHLORIDE

CAS: 4310-69-4 NIOSH: CU 3440000
mf: $C_{23}H_{24}ClN_3 \cdot 2ClH$ mw: 450.87

SYNS:

N'-BENZ(c)ACRIDIN-7-YL-N-(2-CHLOROETHYL)-N-ETHYL-1,2-ETHANEDIAMINE DIHYDROCHLORIDE
7-(2-(2-CHLOROETHYLETHYLAMINO)ETHYLAMINO)BENZ(c)ACRIDINE DIHYDROCHLORIDE
ICR 311

TOXICITY DATA:	CODEN:
ivn-mus TDLo: 4500 µg/kg: NEO	CNREA8 36,2423,76
ivn-mus LDLo: 4500 µg/kg	CNREA8 36,2423,76

THR: Poison by intravenous route. An experimental neoplastigen. When heated to decomposition it emits very toxic fumes of NO_x and Cl^-.

EHJ000 ***HR: 3***

7-(3-(ETHYL-2-(CHLOROETHYLAMINO)PROPYLAMINO))BENZ(c)ACRIDINE DIHYDROCHLORIDE

CAS: 4251-89-2 NIOSH: CU 3460000
mf: $C_{24}H_{26}ClN_3 \cdot 2ClH$ mw: 464.90

SYN: ICR 292

TOXICITY DATA:	CODEN:
mmo-sat 500 ng/plate	MUREAV 136,185,84
pic-esc 60 ng/plate	CNREA8 43,2819,83

HET500 ***HR: 3***

2. 6,2',4',6'-HEXANITRODIPHENYLAMINE

CAS: 131-73-7 NIOSH: JJ 9275000

mf: $C_{12}H_5N_7O_{12}$ mw: 439.24

SYNS:

BIS(2,4,6-TRINITRO-PHENYL) AMIN (GERMAN)
D
E. NITRODIFENILAMINA (ITALIAN)
HEXANITRODIFENYLAMINE (DUTCH)
HEXANITRODIPHENYLAMINE
HEXANITRODIPHENYLAMINE (FRENCH)
2,2',4,4',6,6'-HEXANITRODIPHENYLAMINE
HEXYL (GERMAN, DUTCH)

TOXICITY DATA: CODEN:

mmo-sat 228 nmol/plate MUREAV 136,209,84
ma-sat 456 nmol/plate MUREAV 136,209,84
rat TDLo: 14 g/kg/76W-C: NEO NATUAS 180,509,57

Reported in EPA TSCA Inventory.

THR: An experimental neoplastigen. Mutagenic data. A powerful and violent explosive used as a booster explosive: use is superior to TNT. It is not as good for this purpose as tetryl, but is extremely stable and much safer to handle. See also NITRO COMPOUNDS OF AROMATIC HYDROCARBONS.

HET675 ***HR: 3***

HEXANITROETHANE

CAS: 918-37-6

mf: $C_2N_6O_{12}$ mw: 300.06

THR: A powerful oxidant which explodes above 140°C. Explosive reaction with boron. Hypergolic reaction with dimethyl hydrazine or other strong organic bases. Forms powerfully explosive mixtures with nitrogen containing organic compounds (e.g., 2-nitroaniline). Upon decomposition it emits toxic fumes of NO_x. See also NITRO COMPOUNDS.

HEU000 ***HR: 2***

HEXANOIC ACID

CAS: 142-62-1 NIOSH: MO 5250000

DOT: 1706

mf: $C_6H_{12}O_2$ mw: 116.18

PROP: Oily, colorless liquid; odor of Limburger cheese. Bp: 205.0°, fp: −3.4°, flash p: 215°F (COC), d: 0.9295 @ 20°/20°, vap press: 0.18 mm @ 20°, vap d: 4.0, autoign temp: 716°F. Slightly sol in water; very sol in ethanol, ether.

SYNS:

BUTYLACETIC ACID
CAPROIC ACID
n-CAPROIC ACID
CAPRONIC ACID
HEXACID 698
n-HEXANOIC ACID
n-HEXOIC ACID
PENTIPORMIC ACID
PENTYLFORMIC ACID

TOXICITY DATA: CODEN:

skn-rbt 10 mg/24H open MLD AMIHBC 10,61,54
skn-rbt 465 mg open MLD UCDS** 11/2/71
eye-rbt 695 µg SEV AJOPAA 29,1363,46
oms-nml:oth 10 mmol/L CHROAU 40,1,73
cyt-nml:oth 10 mmol/L CHROAU 40,1,73
orl-rat LD50:3000 mg/kg JIHTAB 26,269,44
orl-mus LD50:5 g/kg 85GMAT -,32,82
ihl-mus LC50:4100 mg/m³/2H 85GMAT -,32,82
ipr-mus LD50:3180 mg/kg JPPMAB 21,85,69
scu-mus LD50:3180 mg/kg JPPMAB 21,85,69
skn-rbt LD50:630 mg/kg AMIHBC 10,61,54
skn-gpg LD50:4635 mg/kg JIHTAB 26,269,44

Reported in EPA TSCA Inventory.

DOT Classification: Corrosive Material; Label: Corrosive

THR: Moderately toxic by ingestion, skin contact, intraperitoneal, and subcutaneous routes. Mutagenic data. Corrosive. A skin and severe eye irritant. Combustible when exposed to heat or flame; can react with oxidizing materials. To fight fire, use CO_2, dry chemical, fog, mist. When heated to decomposition it emits acrid smoke and fumes.

HEU500 ***HR: 1***

HEXANOIC ACID, VINYL ESTER (MIXED ISOMERS)

NIOSH: MO 8450000

mf: $C_8H_{14}O_2$ mw: 142.22

TOXICITY DATA: CODEN:

skn-rbt 10 mg/24H open MLD AIHAAP 23,95,62
orl-rat LD50:20 g/kg AIHAAP 23,95,62
ihl-rat LCLo:4000 ppm/4H AIHAAP 23,95,62

THR: Mildly toxic by ingestion and inhalation. A skin irritant. When heated to decomposition it emits acrid smoke and fumes. See also ESTERS.

HEV000 ***HR: 3***

2-HEXANONE

CAS: 591-78-6 NIOSH: MP 1400000

mf: $C_6H_{12}O$ mw: 100.18

PROP: Clear liquid. Mp: −56.9°, bp: 127.2°, lel: 1.22%, uel: 8.0%, flash p: 95°F (OC), d: 0.830 @ 0°/4°, vap press: 10 mm @ 38.8°, vap d: 3.45, autoign temp: 991°F. Slightly sol in H_2O; sol in alc, ether.

SYNS:

BUTYL METHYL KETONE
n-BUTYL METHYL KETONE
HEXANONE-2
MBK
METHYL n-BUTYL KETONE (ACGIH)
MNBK

TOXICITY DATA: CODEN:

eye-rbt 100 mg open AMIHBC 10,61,54
ihl-rat TCLo:1000 ppm/6H (1-21D preg):TER EESADV 5,291,81
ihl-rat TCLo:2000 ppm/6H (1-21D preg):REP EESADV 5,291,81
ihl-hmn TCLo:1000 ppm: EYE,CNS,GIT NPIRI* 1,78,74

orl-rat LD50:2590 mg/kg	AMIHBC 10,61,54
ihl-rat LC50:8000 ppm/4H	NPIRI* 1,78,74
ipr-rat LDLo:914 mg/kg	RalRL# 01MAR74
orl-mus LDLo:1000 mg/kg	UCPHAQ 2,217,49
skn-rbt LD50:4800 mg/kg	NPIRI* 1,78,74
orl-gpg LDLo:914 mg/kg	RalRL# 01MAR74

Reported in EPA TSCA Inventory.

OSHA PEL: TWA 100 ppm
ACGIH TLV: TWA 5 ppm (skin)
NIOSH REL: (Ketones) TWA 4 mg/m^3

THR: Moderately toxic by ingestion and intraperitoneal routes. Mildly toxic by inhalation and skin contact. Experimental teratogenic and reproductive effects. Human systemic effects by inhalation: unspecified eye effects, headache, nausea or vomiting. An eye irritant. Dangerous fire and explosion hazard when exposed to heat or flame; can react with oxidizing materials. To fight fire, use alcohol foam, CO_2, dry chemical. See also KETONES.

HEV500 ***HR: 2***

3-HEXANONE

CAS: 589-38-8 NIOSH: MP 1576000
mf: $C_6H_{12}O$ mw: 100.18

PROP: Colorless liquid. Bp: 124°, d: 0.813 @ 21.8°/4°, flash p: 57.2°F (OC).

SYNS:
AETHYLPROPYLKETON (GERMAN) ETHYL PROPYL KETONE

TOXICITY DATA:	CODEN:
orl-rat LD50:3360 mg/kg	TXAPA9 28,313,74
ihl-rat LCLo:4000 ppm/4H	TXAPA9 28,313,74
skn-rbt LD50:3170 mg/kg	TXAPA9 28,313,74
scu-gpg LDLo:700 mg/kg	BDKS** -,-,34

Reported in EPA TSCA Inventory.

THR: Moderately toxic by ingestion, skin contact and subcutaneous routes. Mildly toxic by inhalation. A very dangerous fire hazard when exposed to heat or flame; can react vigorously with oxidizing materials. To fight fire, use foam, CO_2, dry chemical. When heated to decomposition it emits acrid smoke and fumes. See also KETONES.

HEW000 ***HR: 3***

1-HEXANOYLAZIRIDINE

CAS: 45776-10-1 NIOSH: CM 7890000
mf: $C_8H_{15}NO$ mw: 141.24

SYNS:
1-CAPROYLAZIRIDINE HEXANOYLETHYLENEIMINE
CAPROYLETHYLENEIMINE

TOXICITY DATA:	CODEN:
cyt-rat-ipr 50 mg/kg	BJPCAL 9,306,54
scu-rat TDLo:495 mg/kg/19W-I: NEO	BJPCAL 9,306,54
scu-mus TDLo:360 mg/kg/41W-I:ETA	BJPCAL 9,306,54
scu-rat TD:525 mg/kg/17W-I: NEO	BJPCAL 9,306,54

THR: An experimental neoplastigen and tumorigen. Mutagenic data. When heated to decomposition it emits toxic fumes of NO_x.

HEY000 ***HR: 3***

HEXAPYRIDINEIRON(II) TRIDECACARBONYL TETRAFERRATE(2$^-$)

CAS: 23129-50-2
mf: $C_{43}H_{30}Fe_5N_6O_{13}$ mw: 1117.9

SYN: HEXAKIS(PYRIDINE)IRON(II) TRIDECACARBONYLTETRAFERRATE(2-)

THR: Ignites spontaneously in air. When heated to decomposition it emits toxic fumes of NO_x. See also CARBONYLS.

HEY500 ***HR: 2***

HEXASODIUM TETRAPHOSPHATE

CAS: 14986-84-6 NIOSH: XF 1700000
mf: $Na_6O_{13}P_4$ mw: 469.82

SYNS:
HEXANATRIUMTETRAPOLYPHOSPHAT (GERMAN) HEXASODIUM TETRAPOLYPHOSPHATE

TOXICITY DATA:	CODEN:
orl-mus LD50:3920 mg/kg	ARZNAD 7,445,57
scu-mus LD50:875 mg/kg	ARZNAD 7,445,57

Reported in EPA TSCA Inventory.

THR: Moderately toxic by ingestion and subcutaneous routes. When heated to decomposition it emits toxic fumes of Na_2O and PO_x. See also PHOSPHATES.

HEZ000 ***HR: 3***

1,3,5-HEXATRIENE

CAS: 2235-12-3 NIOSH: MP 5425000
mf: C_6H_8 mw: 80.14

SYN: DIVINYLETHYLENE

TOXICITY DATA:	CODEN:
eye-rbt 369 mg	IHFCAY 6,1,67
orl-rat LD50:210 mg/kg	IHFCAY 6,1,67
ihl-rat LCLo:100000 ppm/15M	IHFCAY 6,1,67
skn-rbt LD50:6730 mg/kg	IHFCAY 6,1,67

Reported in EPA TSCA Inventory.

THR: Poison by ingestion. Mildly toxic by skin contact and inhalation. An eye irritant. When heated to decomposition it emits acrid smoke and fumes.

THR: A poison by ingestion, inhalation, and skin contact. A skin irritant. When heated to decomposition it emits acrid smoke and fumes. See also ACETYLENE COMPOUNDS and ALCOHOLS.

I F300 ***HR: 3***

4-HEXEN-1-YN-3-ONE

CAS: 13061-80-8 NIOSH: MQ 0350000

mf: C_6H_6O mw: 94.12

SYN: 4-HEXENE-1-YNE-3-ONE

TOXICITY DATA:	CODEN:
skn-rbt 10 mg/24H open MLD	AIHAAP 23.95.62
orl-rat LD50: 71 mg/kg	AIHAAP 23.95.62
ihl-rat LCLo: 13 ppm/4H	AIHAAP 23.95.62
skn-rbt LD50: 100 mg/kg	AIHAAP 23.95.62

THR: A poison by ingestion, inhalation, and skin contact. A skin irritant. When heated to decomposition it emits acrid smoke and fumes. See also ACETYLENE COMPOUNDS and KETONES.

FF500 ***HR: 3***

EXOBENDINE DIHYDROCHLORIDE

CAS: 50-62-4 NIOSH: DI 0230000

mf: $C_{30}H_{44}N_2O_{10}$•2ClH mw: 665.68

SYNS:

ANDIAMINE	REOXYL
N,N'-DIMETHYL-N,N'-BIS(3-(3',4',5'-TRIMETHOXYBENZOXY) PROPYL)ETHYLENEDIAMINE DIHYDROCHLORIDE	

TOXICITY DATA:	CODEN:
orl-rat LD50: 2550 mg/kg	GNRIDX 3.77.69
scu-rat LD50: 930 mg/kg	GNRIDX 3.77.69
ivn-rat LD50: 52 mg/kg	GNRIDX 3.77.69
orl-mus LD50: 682 mg/kg	GNRIDX 3.77.69
scu-mus LD50: 328 mg/kg	GNRIDX 3.77.69
ivn-mus LD50: 35200 µg/kg	GNRIDX 3.77.69

THR: Poison by subcutaneous and intravenous routes. Moderately toxic by ingestion. When heated to decomposition it emits toxic fumes of NO_x and HCl. See also ESTERS.

IFG000 ***HR: 3***

HEXOCYCLIUM

CAS: 6004-98-4 NIOSH: TM 3150000

mf: $C_{21}H_{36}N_2O_5S$ mw: 428.61

PROP: Crystals. Mp: 200-210°, sltly sol in chloroform, insol in ether, sol in H_2O.

SYNS:

4-(β-CYCLOHEXYL-β-HYDROXY-PHENETHYL)-1,1-DIMETHYL PIPERAZINIUM SULFATE	TRAL

TOXICITY DATA:	CODEN:
mmo-sat 32 µg/plate	JEPTDQ 4,345,80
orl-mus LD50: 600 mg/kg	27ZIAQ -,-,65
ipr-mus LD50: 55 mg/kg	27ZIAQ -,119,73
scu-mus LD50: 360 mg/kg	27ZIAQ -,119,73
ivn-mus LD50: 11 mg/kg	27ZIAQ -,119,73

THR: Poison by intraperitoneal, subcutaneous, and intravenous routes. Moderately toxic by ingestion. Mutagenic data. When heated to decomposition it emits very toxic fumes of NO_x and SO_x.

HFG500 ***HR: 3***

HEXONE

CAS: 108-10-1 NIOSH: SA 9275000

DOT: 1245

mf: $C_6H_{12}O$ mw: 100.18

$CH_3CO{\cdot}CH_2CH(CH_3)_2$

PROP: Clear liquid. Bp: 118°, lel: 1.4%, uel: 7.5%, flash p: 62.6°F, d: 0.803, fp: −80.2°, autoign temp: 858°F, vap press: 16 mm @ 20°, d: 3.45.

SYNS:

HEXON (CZECH)	4-METHYL-PENTAN-2-ON (DUTCH, GERMAN)
ISOBUTYL-METHYLKETON (CZECH)	2-METHYL-4-PENTANONE
ISOBUTYL METHYL KETONE	4-METHYL-2-PENTANON (CZECH)
ISOPROPYLACETONE	4-METHYL-2-PENTANONE
METHYL-ISOBUTYL-CETONE (FRENCH)	METILISOBUTILCHETONE (ITALIAN)
METHYLISOBUTYLKETON (DUTCH, GERMAN)	4-METILPENTAN-2-ONE (ITALIAN)
METHYL ISOBUTYL KETONE (ACGIH,DOT)	MIBK
METYLOIZOBUTYLOKETON (POLISH)	MIK
	RCRA WASTE NUMBER U161
	SHELL MIBK

TOXICITY DATA:	CODEN:
eye-hmn 200 ppm/15M	JIHTAB 28,262,46
skn-rbt 500 mg/24H MLD	28ZPAK -,42,72
eye-rbt 40 mg SEV	UCDS** 4/25/58
eye-rbt 500 mg/24H MLD	28ZPAK -,42,72
orl-rat LD50: 2080 mg/kg	UCDS** 4/25/58
ihl-rat LC50: 8000 ppm/4H	28ZPAK -,42,72
ipr-mus LD50: 268 mg/kg	SCCUR* -,7,61

Community Right To Know List.

OSHA PEL: TWA 100 ppm
ACGIH TLV: TWA 50 ppm; STEL 75 ppm
NIOSH REL: (Ketones) TWA 200 mg/m^3

DOT Classification: Flammable Liquid; Label: Flammable Liquid

THR: A poison by intraperitoneal route. Moderately toxic by ingestion. Mildly toxic by inhalation. Very irritating to the skin, eyes and mucous membranes. A human systemic irritant by inhalation. Narcotic in high concentration. Dangerous fire hazard when exposed to heat, flame or oxidizers. Ignites on contact with potassium-tert-butoxide. Moderately explosive in the form of vapor when exposed to heat or flame. May form explosive peroxides upon exposure to air. Can react vigorously with reducing materials.

To fight fire, use alcohol foam, CO_2, dry chemical. Incompatible with air; potassium-tert-butoxide. See also KETONES.

HFG550 ***HR: 3***

HEXOPAL

CAS: 6556-11-2 NIOSH: NM 7535400

mf: $C_{42}H_{30}N_6O_{12}$ mw: 810.71

PROP: Crystals. Mp: 254.3-254.9°. Practically insol in water; sol in dil acids.

SYNS:

DILCIT
DILEXPAL
ESANTENE
INOSITOL HEXANICOTINATE
m-INOSITOL HEXANICOTINATE
meso-INOSITOL HEXANICOTINATE
myo-INOSITOL HEXANICOTINATE
INOSITOL NIACINATE
INOSITOL NICOTINATE
HAMOVANNID
HEXANICIT
HEXANICOTINOYL INOSITOL
HEXANICOTOL
HEXA-3-PYRIDINECARBOXYLATE-myo-INOSITOL (9CI)
LINODIL
MESONEX
MESOTAL
PALOHEX

TOXICITY DATA:	CODEN:
scu-rat LD50:1180 mg/kg	NIIRDN 6,77,82
ivn-rat LD50:268 mg/kg	NIIRDN 6,77,82
ipr-mus LD50:6400 mg/kg	OYYAA2 7,149,73
ivn-mus LD50:345 mg/mg	NIIRDN 6,77,82

THR: Poison by intravenous route. Moderately toxic by subcutaneous route. When heated to decomposition it emits toxic fumes of NO_x.

HFG600 ***HR: 3***

HEXOPRENALINE DIHYDROCHLORIDE

CAS: 4323-43-7 NIOSH: DO 6349000

mf: $C_{22}H_{32}N_2O_6 \cdot 2ClH$ mw: 493.48

SYNS:

N,N'-BIS(2-(3',4'-DIHYDROXYPHENYL)-2-HYDROXYETHYL)HEXAMETHYLENEDIAMINE DIHYDROCHLORIDE
ST-1512 DIHYDROCHLORIDE

TOXICITY DATA:	CODEN:
ivn-rat TDLo:12 mg/kg (9-14D preg):TER	KSRNAM 6,983,72
orl-mus TDLo:12 mg/kg (7-12D preg):REP	KSRNAM 6,983,72
ivn-mus TDLo:1200 µg/kg (7-12D preg):TER	KSRNAM 6,983,72
orl-rat LD50:10 g/kg	OYYAA2 26,811,83
ipr-rat LD50:139 mg/kg	KSRNAM 6,1286,72
scu-rat LD50:143 mg/kg	KSRNAM 6,1286,72
ivn-rat LD50:58 mg/kg	OYYAA2 26,811,83
orl-mus LD50:2036 mg/kg	KSRNAM 6,1286,72
ipr-mus LD50:133 mg/kg	KSRNAM 6,1286,72
scu-mus LD50:110 mg/kg	KSRNAM 6,1286,72
ivn-mus LD50:88 mg/kg	KSRNAM 6,1286,72

THR: Poison by subcutaneous, intravenous and intraperitoneal routes. Moderately toxic by ingestion. An experimental teratogen. Experimental reproductive effects. When heated to decomposition it emits toxic fumes of NO_x and HCl.

HFG650 ***HR: 3***

HEXOPRENALINE SULFATE

CAS: 32266-10-7 NIOSH: DO 6350000

mf: $C_{22}H_{32}N_2O_6 \cdot H_2O_4S$ mw: 518.64

SYNS:

N,N'-BIS(2-(3',4'-DIHYDROXYPHENYL)-2-HYDROXYETHYL)HEXAMETHYLENEDIAMINE SULFATE
ST-1512 SULFATE

TOXICITY DATA:	CODEN:
orl-rat TDLo:66 mg/kg (7-17D preg):TER	OYYAA2 27,239,84
orl-mus TDLo:6 mg/kg (7-12D preg):TER	KSRNAM 6,983,72
ipr-rat LD50:145 mg/kg	NIIRDN 6,745,82
scu-rat LD50:150 mg/kg	NIIRDN 6,745,82
ipr-mus LD50:159 mg/kg	NIIRDN 6,745,82
scu-mus LD50:274 mg/kg	NIIRDN 6,745,82

THR: Poison by subcutaneous and intraperitoneal routes. An experimental teratogen. Experimental reproductive effects. When heated to decomposition it emits toxic fumes of SO_x and NO_x. See also SULFATES.

HFH500 ***HR: 3***

p-HEXOXYBENZOIC ACID-3-(2'-METHYLPIPERIDINO)PROPYL ESTER

CAS: 63916-83-6 NIOSH: DH 1450000

mf: $C_{22}H_{35}NO_3$ mw: 361.58

TOXICITY DATA:	CODEN:
scu-mus LD50:222 mg/kg	RCPRAN 15,143,54
ivn-mus LD50:23 mg/kg	RCPRAN 15,143,54

THR: Poison by subcutaneous and intravenous routes. When heated to decomposition it emits toxic fumes of NO_x. See also ESTERS.

HFI500 ***HR: 1***

HEXYL ACETATE

CAS: 142-92-7 NIOSH: AI 0875000

mf: $C_8H_{16}O_2$ mw: 144.24

PROP: Colorless liquid. D: 0.878, mp: −60.9°, bp: 171.5°, insol in water, very sol in alc and ether.

SYNS:

ACETIC ACID HEXYL ESTER
n-HEXYL ACETATE
1-HEXYL ACETATE
HEXYL ALCOHOL, ACETATE
HEXYL ETHANOATE

TOXICITY DATA:	CODEN:
orl-rat LD50:42 g/kg	TXAPA9 28,313,74

Reported in EPA TSCA Inventory.

THR: Mildly toxic by ingestion. When heated to decomposition it emits acrid smoke and fumes. See also ESTERS.

ivn-rbt LD50:36 mg/kg IJNEAQ 5,305,66
rl-qal LD50:1 g/kg AECTCV 12,355,83

EPA Genetic Toxicology Program.

THR: Poison by intraperitoneal and intravenous routes. Moderately toxic by ingestion and subcutaneous routes. An experimental teratogen. Experimental reproductive effects. Mutagenic data. A minor tranquilizer. When heated to decomposition it emits very toxic fumes of HCl and NO_x.

MDQ500 ***HR: 3***

METHAMPHETAMINE HYDROCHLORIDE

CAS: 826-10-8 NIOSH: SH 5250000
mf: $C_{10}H_{15}N{\cdot}ClH$ mw: 185.72

PROP: Crystals; bitter taste. Mp: 170-175°. Sol in H_2O, alc and chloroform; almost insol in ether.

SYNS:

DIPEX	"METH"
D-DESOXYEPHEDRINE HYDROCHLORIDE	D-N-METHYL-β-PHENYLISOPROPYLAMINE HYDROCHLORIDE
(+)-N-α-DIMETHYLPHENETHYLAMINE HYDROCHLORIDE	"SPEED"
	SYNDROX

TOXICITY DATA:	CODEN:
ivn-mus TDLo:15 mg/kg (9-11D preg):TER	TJADAB 4,131,71
ivn-rbt TDLo:6 mg/kg (12-15D preg):TER	TJADAB 4,131,71
ipr-rat LD50:25 mg/kg	27ZQAG -,346,72
scu-rat LD50:30 mg/kg	27ZQAG -,346,72
ipr-mus LD50:70 mg/kg	JPETAB 89,382,47
scu-mus LD50:180 mg/kg	27ZQAG -,346,72
ivn-mus LD50:33 mg/kg	27ZQAG -,346,72
orl-dog LD50:10 mg/kg	27ZQAG -,346,72
ivn-dog LD50:2700 µg/kg	PSEBAA 118,557,65
scu-cat LD50:50 mg/kg	27ZQAG -,346,72

THR: Poison by ingestion, intravenous, intraperitoneal, and subcutaneous routes. An experimental teratogen. Experimental reproductive effects. A powerful central nervous system stimulant. *Caution:* Excessive use may lead to tolerance and habituation. When heated to decomposition it emits very toxic fumes of HCl and NO_x. See also BENZEDRINE.

MDQ750 ***HR: 3***

METHANE

CAS: 74-82-8 NIOSH: PA 1490000
DOT: 1971/1972
mf: CH_4 mw: 16.05

PROP: Colorless, odorless, tasteless gas. Mp: −182.6°. Bp: −161.5°, lel: 5.3%, uel: 15%, fp: −183.2°. D: 0.554 @ 0°/4° (air = 1) or 0.7168 g/L, autoign temp: 650°, vap d: 0.6, flash p: −368.6°F. Sol in water, alc and ether.

SYNS:

FIRE DAMP	METHANE, REFRIGERATE LIQUID (DOT)
MARSH GAS	METHYL HYDRIDE
METHANE, COMPRESSED (DOT)	

Reported in EPA TSCA Inventory.

DOT Classification: Flammable Gas; Label: Flammable Gas

THR: A simple asphyxiant. Very dangerous fire and explosion hazard when exposed to heat or flame. Reacts violently with powerful oxidizers (e.g., bromine pentafluoride; chlorine trifluoride; chlorine; fluorine; iodine heptafluoride; dioxygenyl tetrafluoroborate; dioxygen difluoride; trioxygen difluoride; liquid oxygen; ClO_2; NF_3; OF_2). Incompatible with halogens or interhalogens; air (forms explosive mixtures). Explosive in the form of vapor when exposed to heat or flame. To fight fire, stop flow of gas, CO_2 or dry chemical. See also ARGON for a description of asphyxiants.

MDQ800 ***HR: 3***

METHANE BORONIC ANHYDRIDE-PYRIDINE COMPLEX

mf: $CH_3BO{\cdot}C_5H_5N$ mw: 120.95

THR: Ignites spontaneously in air. When heated to decomposition it emits toxic fumes of NO_x. See also ANHYDRIDES, PYRIDINE, and BORON COMPOUNDS.

MDR000 ***HR: 3***

METHANE DICHLORIDE *

CAS: 75-09-2 NIOSH: PA 8050000
DOT: 1593
mf: CH_2Cl_2 mw: 84.93

PROP: Colorless, volatile liquid. Bp: 39.8°, lel: 15.5% in O_2, uel: 66.4% in O_2, fp: −96.7°, d: 1.326 @ 20°/4°, autoign temp: 1139°F, vap press: 380 mm @ 22°, vap d: 2.93.

SYNS:

AEROTHENE MM	METHYLENE CHLORIDE (ACGIH, DOT)
CHLORURE de METHYLENE (FRENCH)	METHYLENE DICHLORIDE
DCM	METYLENU CHLOREK (POLISH)
DICHLOROMETHANE (DOT)	NCI-C50102
FREON 30	RCRA WASTE NUMBER U080
METHYLENE BICHLORIDE	SOLMETHINE

TOXICITY DATA:	CODEN:
skn-rbt 810 mg/24H SEV	JETOAS 9,171,76
eye-rbt 162 mg MOD	JETOAS 9,171,76
eye-rbt 10 mg MLD	TXCYAC 6,173,76
eye-rbt 17500 mg/m³/10M	TXCYAC 6,173,76
dni-hmn:fbr 5000 ppm/1H-C	MUREAV 81,203,81
cyt-ham:ovr 5 g/L	MUREAV 116,361,83
dni-ham:lng 5000 ppm/1H-C	MUREAV 81,203,81
sce-ham:lng 5000 ppm/1H-C	MUREAV 81,203,81
ihl-rat TCLo:4500 ppm/24H (1-17D preg):REP	TXAPA9 52,29,80
ihl-mus TCLo:1250 ppm/7H (6-15D preg):REP	TXAPA9 32,84,75
ihl-rat TCLo:3500 ppm/6H/2Y-I:CAR	FAATDF 4,30,84
ihl-mus TCLo:2000 ppm/5H/2Y-C:CAR	NTPTR* NTP-TR-306,86

ihl-rat TCLo:500 ppm/6H/2Y: ETA	TXAPA9 48,A185,79
orl-hmn LDLo:357 mg/kg: PNS,CNS	34ZIAG -,390,69
ihl-hmn TCLo:500 ppm/1Y-I: CNS,CVS	ABHYAE 43,1123,68
ihl-hmn TCLo:500 ppm/8H:CNS	SCIEAS 176,295,72
orl-rat LD50:2136 mg/kg	PPGDS* JAN81
ihl-rat LC50:88000 mg/m^3/30M	FAVUAI 7,35,75
ihl-mus LC50:14400 ppm/7H	NIHBAZ 191,1,49
ipr-mus LD50:1500 mg/kg	TXAPA9 9,139,66
scu-mus LD50:6460 mg/kg	TXAPA9 4,354,62
orl-dog LDLo:3000 mg/kg	QJPPAL 7,205,34
ihl-dog LCLo:14108 ppm/7H	NIHBAZ 191,1,49
ipr-dog LDLo:950 mg/kg	TXAPA9 10,119,67
scu-dog LDLo:2700 mg/kg	QJPPAL 7,205,34
ivn-dog LDLo:200 mg/kg	QJPPAL 7,205,34
ihl-cat LCLo:43400 mg/m^3/4.5H	AHBAAM 116,131,36
orl-rab LDLo:1900 mg/kg	HBTXAC 1,94,56
ihl-rbt LCLo:10000 ppm/7H	JIHTAB 26,8,44
scu-rbt LDLo:2700 mg/kg	QJPPAL 7,205,34
ihl-gpg LCLo:5000 ppm/2H	FLCRAP 1,197,67

IARC Cancer Review: Human Inadequate Evidence IMEMDT 41,43,86; Animal Inadequate Evidence IMEMDT 20,449,79; Animal Sufficient Evidence IMEMDT 41,43,86. NTP Carcinogenesis Studies (inhalation); Clear Evidence: mouse, rat NTPTR* NTP-TR-306,86. Reported in EPA TSCA Inventory. EPA Genetic Toxicology Program. Community Right To Know List.

OSHA PEL: TWA 500 ppm; CL 1000 ppm; Pk 2000/5M/2H

ACGIH TLV: TWA 50 ppm, Suspected Carcinogen

NIOSH REL: (To Methylene Chloride) TWA 75 ppm; Pk 500 ppm/15M

DOT Classification: Poison B; Label: St. Andrews Cross

THR: Poison by intravenous route. Moderately toxic by ingestion, subcutaneous and intraperitoneal routes. Mildly toxic by inhalation. An experimental carcinogen and tumorigen. Human systemic effects by ingestion and inhalation: paresthesia, somnolence, altered sleep time, convulsions, euphoria, and change in cardiac rate. An experimental teratogen. Experimental reproductive effects. An eye and severe skin irritant. Human mutagenic data. It is flammable in the range of 12-19% in air but ignition is difficult. It will not form explosive mixtures with air at ordinary temperatures. Mixtures in air with methanol vapor are flammable. It will form explosive mixtures with an atmosphere having a high oxygen content; in liquid O_2; N_2O_4; K; Na; NaK. Explosive in the form of vapor when exposed to heat or flame. Reacts violently with Li; NaK; potassium-tert-butoxide; (KOH + n-methyl-n-nitrosourea). It can be decomposed by contact with hot surfaces and open flame, and then yield toxic fumes which are irritating and give warning of their presence. When heated to decomposition it emits highly toxic fumes of phosgene and Cl^-. See also CHLORINATED HYDROCARBONS, ALIPHATIC.

MDR250 ***HR: 3***

METHANESULFONIC ACID

CAS: 75-75-2 NIOSH: PB 1140000

mf: CH_4O_3S mw: 96.11

PROP: Solid. D: 1.4812 @ 18°/4°, mp: 20°, bp: 167° @ 10 mm. Sol in water, alc and ether. Corrosive to iron, steel, brass, copper and lead.

SYN: WSQ 1

TOXICITY DATA:	CODEN:
orl-rat LDLo:200 mg/kg	KODAK* 21MAY71
ipr-rat LDLo:50 mg/kg	KODAK* 21MAY71
orl-qal LD50:1000 mg/kg	JRPFA4 48,371,76

Reported in EPA TSCA Inventory.

THR: Poison by ingestion and intraperitoneal routes. May be corrosive to skin, eyes and mucous membranes. Explosive reaction with ethyl vinyl ether. Incompatible with hydrogen fluoride. When heated to decomposition it emits toxic fumes of SO_x. See also SULFONATES.

MDR750 ***HR: 3***

METHANESULFONYL FLUORIDE

CAS: 558-25-8 NIOSH: PB 2975000

mf: CH_3FO_2S mw: 98.10

SYNS:

FUMETTE MSF

METHANESULPHONYL FLUORIDE

TOXICITY DATA:	CODEN:
orl-rat LD50:2 mg/kg	IAEC** 17JUN74
ihl-rat LCLo:140 mg/m^3	31ZOAD 1,287,68
ipr-rat LD50:3 mg/kg	NATUAS 173,33,54
scu-rat LD50:3500 µg/kg	28ZEAL 4,271,69
scu-mus LDLo:3500 µg/kg	31ZOAD 1,287,68
ivn-mus LD50:1 mg/kg	IAEC** 17JUN74
scu-dog LDLo:3500 µg/kg	31ZOAD 1,287,68
ivn-dog LD50:5620 µg/kg	IAEC** 17JUN74
scu-rbt LDLo:3500 µg/kg	31ZOAD 1,287,68
ivn-rbt LD50:3370 µg/kg	IAEC** 17JUN74

EPA Extremely Hazardous Substances List. Reported in EPA TSCA Inventory.

THR: Poison by ingestion, inhalation, intraperitoneal, intravenous, and subcutaneous routes. When heated to decomposition it emits very toxic fumes of F^- and SO_x. See also FLUORIDES and SULFONATES.

MDR775 ***HR: 3***

METHANETELLUROL

CAS: 25284-83-7

mf: CH_4Te mw: 143.64

THR: A poison. Ignites spontaneously in air. Explodes on contact with oxygen at room temperature. When heated to decomposition it emits toxic fumes of Te. See also TELLURIUM COMPOUNDS.

scu-mus LD50:1250 µg/kg	JPETAB 67,153,39
iv mus LD50:475 µg/kg	JPETAB 79,127,43
ip gpg LD50:10900 µg/kg	AIPTAK 144,416,63
scu-gpg LD50:4800 µg/kg	AIPTAK 144,416,63
ivn-gpg LD50:390 µg/kg	AIPTAK 144,416,63
or owd LD50:5600 µg/kg	TXAPA9 21,315,72

E.. A Extremely Hazardous Substances List.

THR: Poison by ingestion, intraperitoneal, intravenous and st cutaneous routes. When heated to decomposition it emits vc.y toxic fumes of SO_x and NO_x. See also STRYCHNINE and SULFATES.

SMP400 ***HR: 2***

S 5 557

C S: 65928-58-7 NIOSH: RC 8899500

mf: $C_{20}H_{25}NO_2$ mw: 311.46

S N: 17-α-CYANOMETHYL-17-β-HYDROXY-ESTRA-4,9(10)-DIEN-3-ONE

TOXICITY DATA:	CODEN:
scu-rat TDLo:8 mg/kg (1D preg):REP	ATSUDG 4,248,80
o mky TDLo:600 µg/kg (3D pre):REP	FESTAS 40,688,83
orl-mus LD50:4000 mg/kg	PHARAT 34,319,79
ij mus LDLo:1 g/kg	EXCEDS 81,175,83
s -mus LDLo:5000 mg/kg	PHARAT 34,319,79
orl-rbt LDLo:1 g/kg	EXCEDS 81,175,83
ipr-rbt LDLo:1500 mg/kg	EXCEDS 81,175,83

C anide and its compounds are on the Community Right To Know List. EPA Genetic Toxicology Program.

T R: Moderately toxic by ingestion, subcutaneous and intperitoneal routes. Experimental reproductive effects. When heated to decomposition it emits toxic fumes of NO_x and CN^-. See also NITRILES.

SMP500 ***HR: 3***

S YPHNIC ACID

C.S: 82-71-3 NIOSH: VH 3540000

DOT: 0219

: $C_6H_3N_3O_8$ mw: 245.12

PROP: Hexagonal, yellow crystals; astringent taste. Mp: (dry) 175.5°. Very sol in alc, ether.

SYNS:

2,4-DIHYDROXY-1,3,5-TRINITRO-BENZENE	2,4,6-TRINITRO-1,3-BENZENEDIOL
5-DIHYDROXY-2,4,6-TRINITRO-BENZENE	2,4,6-TRINITRORESORCINOL
5-HYDROXY-2,4,6-TRINITROPHE-NOL	TRINITRORESORCINOL (DOT)
2,4,6-TRINITROBENZENE-1,3-DIOL	TRINITRORESORCINOL, DRY (DOT)
	TRINITRORESORCINOL, wetted with less than 20% water (DOT)

:ported in EPA TSCA Inventory.

DOT Classification: Class A Explosive; Label: Explosive A

THR: Very explosive. Upon decomposition it emits toxic fumes of NO_x. See also NITRO COMPOUNDS OF AROMATIC HYDROCARBONS and EXPLOSIVES, HIGH.

SMQ000 ***HR: 3***

STYRENE

CAS: 100-42-5 NIOSH: WL 3675000

DOT: 2055

mf: C_8H_8 mw: 104.16

$$C_6H_5CH{=}CH_2$$

PROP: Colorless, refractive, oily liquid. Mp: −31°, bp: 146°, lel: 1.1%, uel: 6.1%, flash p: 88°F, d: 0.9074 @ 20°/4°, autoign temp: 914°F, vap d: 3.6, fp: −33°, ulc: 40-50. Very sltly sol in water; misc in alc, ether.

SYNS:

CINNAMENE	STYRENE MONOMER (ACGIH)
CINNAMENOL	STYRENE MONOMER, inhibited (DOT)
DIAREX HF 77	STYROL (GERMAN)
ETHENYLBENZENE	STYROLE
NCI-C02200	STYROLENE
PHENETHYLENE	STYRON
PHENYLETHENE	STYROPOR
PHENYLETHYLENE	VINYLBENZEN (CZECH)
STIROLO (ITALIAN)	VINYLBENZENE
STYREEN (DUTCH)	VINYLBENZOL
STYREN (CZECH)	

TOXICITY DATA:	CODEN:
skn-hmn 500 mg nse	INMEAF 17,199,48
skn-rbt 500 mg open MLD	UCDS** 12/13/63
skn-rbt 100% MOD	AMIHAB 14,387,56
eye-rbt 18 mg	AJOPAA 29,1363,46
mma-sat 1 µmol/plate	MUREAV 56,147,77
mmo-smc 1 mmol/L	BSIBAC 59,233,83
mrc-smc 1 mmol/L	BSIBAC 59,233,83
dns-hmn:lym 100 µmol/L	CRNGDP 3,681,82
dni-hmn:hla 28 mmol/L	MUREAV 93,447,82
cyt-hmn:lym 300 ppm/72H	MUREAV 58,277,78
sce-hmn:lym 500 µmol/L	ATSUDG 7,286,84
dnd-mus-ipr 10 mmol/kg	CALEDQ 21,9,83
sce-mus-ihl 46400 µg/kg/4D-I	TXAPA9 55,37,80
sce-mus-ihl 125 ppm/4D-I	APTOD9 19,A34,80
hma-mus/smc 1 g/kg	MUREAV 40,317,76
orl-rat TDLo:8600 mg/kg (1-22D preg/21D post):REP	NTOTDY 7,23,85
ihl-rat TCLo:300 ppm/7H (6-15D preg):TER	TXCYAC 11,335,78
ihl-rat TCLo:1500 µg/m³/24H (1-22D preg):TER	GISAAA 39(11),65,74
ihl-hmn LCLo:10000 ppm/30M	29ZWAE -,77,68
ihl-hmn TCLo:600 ppm:NOSE,EYE	AMIHAB 14,387,56
ihl-hmn TCLo:20 µg/m³:EYE	GISAAA 26(8),11,61
orl-rat LD50:5000 mg/kg	AMIHAB 14,387,56
ihl-rat LC50:24 g/m³/4H	GTPZAB 26(8),53,82
ipr-rat LD50:1220 mg/kg	GTPZAB 26(8),53,82
orl-mus LD50:316 mg/kg	NCILB* NCI-E-C-72-3252,73
ihl-mus LC50:21600 mg/m³/2H	GTPZAB 26(8),53,82
ipr-mus LD50:660 mg/kg	ARZNAD 19,617,69

ivn-mus LD50:90 mg/kg ARZNAD 19,617,69
ihl-gpg LCLo:12 mg/m^3/14H JIHTAB 24,295,42

IARC Cancer Review: Animal Sufficient Evidence IMEMDT 19,231,79; Human Inadequate Evidence IMEMDT 19,231,79. NCI Carcinogenesis Bioassay (gavage); Inadequate Studies: mouse, rat NCITR* NCI-CG-TR-170,79; (gavage). Reported in EPA TSCA Inventory. EPA Genetic Toxicology Program. Community Right To Know List.

OSHA PEL: TWA 100 ppm; CL 200; Pk 600/5M/3H
ACGIH TLV: TWA 50 ppm; STEL: 100 ppm (skin); BEI: mandelic acid in urine at end of shift 1 gram/L, styrene in mixed-exhaled air prior to shift 40 ppb, styrene in mixed-exhaled air during shift 18 ppm, styrene in blood end of shift 0.55 mg/L, styrene in blood prior to shift 0.02 mg/L
DFG MAK: 100 ppm (420 mg/m^3)
NIOSH REL: (Styrene) TWA 50 ppm; CL 100 ppm

DOT Classification: Flammable Liquid; Label: Flammable Liquid; Flammable or Combustible Liquid; Label: Flammable Liquid

THR: Experimental poison by ingestion, inhalation and intravenous routes. Moderately toxic experimentally by intraperitoneal route. Mildly toxic to humans by inhalation. A suspected human carcinogen. An experimental carcinogen and teratogen. Human systemic effects by inhalation: eye and olfactory changes. It can cause irritation and violent itching of the eyes @ 200 ppm, lacrimation, and severe human eye injuries. Its toxic effects are usually transient and result in irritation and possible narcosis. Experimental reproductive effects. Human mutagenic data. A human skin irritant. An experimental skin and eye irritant.

The monomer has been involved in several industrial explosions. It is a storage hazard above 32°C. A very dangerous fire hazard when exposed to flame, heat or oxidants. Explosive in the form of vapor when exposed to heat or flame. Reacts with oxygen above 40°C to form a heat-sensitive explosive peroxide. Violent or explosive polymerization may be initiated by alkali metal-graphite composites; butyllithium; dibenzoyl peroxide; other initiators (e.g., azoisobutyronitrile; di-tert-butyl peroxide). Reacts violently with chlorosulfonic acid; oleum; sulfuric acid; chlorine + iron(III) chloride (above 50°C). May ignite when heated with air + polymerizing polystyrene. Can react vigorously with oxidizing materials. To fight fire, use foam, CO_2, dry chemical. When heated to decomposition it emits acrid smoke and irritating fumes. For further information, see Vol. 6, No. 2 of *DPIM Report*.

SMQ500 *HR: 2*
STYRENE POLYMER
CAS: 9003-53-6 NIOSH: WL 6475000
mf: $(C_8H_8)_n$
DOT: 2211

SYNS:
A 3-80
AFCOLENE
ATACTIC POLYSTYRENE
BACTOLATEX
BAKELITE SMD 3500
BASF III
BEXTRENE XL 750
BICOLASTIC A 75
BUSTREN
CADCO 0115
CARINEX GP
COPAL Z
COSDEN 550
DENKA QP3
DIAREX 43G
DORVON
DOW 860
DYLENE
DYLITE F 40
ESBRITE
ESCOREZ 7404
ESTYRENE G 20
ETHENYLBENZENE HOMOPOLYMER
FOSTER GRANT 834
GEDEX
HI-STYROL
HOSTYREN S
HT-F 76
IT 40
KB (POLYMER)
KRASTEN I 4
LACQREN 550
LUSTREX
MX 5517-02
NBS 706
OWISPOL GF
PICCOLASTIC
POLIGOSTYRENE
POLYSTROL D
POLYSTYRENE
POLYSTYRENE BEADS (DOT)
POLYSTYRENE LATEX
POLYSTYROL
PRINTEL'S
REXOLITE 1422
RHODOLNE
SHELL 300
STYRAFOIL
STYRAGEL
STYRENE POLYMERS
STYROFOAM
STYROLUX
STYRON
TOPOREX 855-51
TROLITUL
UBATOL U 2001
VESTYRON
VINYLBENZENE POLYMER
VINYL PRODUCTS R 3612

TOXICITY DATA:
imp-rat TDLo:19 mg/kg:ETA
ihl-mus LC50:120 mg/m^3/10M

CODEN:
CNREA8 15,333,55
APFRAD 35,461,77

IARC Cancer Review: Animal Limited Evidence IMEMDT 19,231,79. Reported in EPA TSCA Inventory.

DOT Classification: Other Regulated Material; Label: None

THR: An experimental tumorigen by implant. When heated to decomposition it emits acrid smoke and irritating fumes. See also POLYMERS, INSOLUBLE.

SMR000 *HR: 1*
STYRENE POLYMER with 1,3-BUTADIENE
CAS: 9003-55-8 NIOSH: WL 6478000

SYNS:
AFCOLAC B 101
ANDREZ
BASE 661
1,3-BUTADIENE-STYRENE COPOLYMER
BUTADIENE-STYRENE POLYMER
1,3-BUTADIENE-STYRENE POLYMER
BUTADIENE-STYRENE RESIN
BUTAKON 85-71
DIAREX 600
DIENOL S
DOW 209
DOW LATEX 612
DST 50
DURANIT
EDISTIR RB 268
ETHENYLBENZENE POLYMER with 1,3-BUTADIENE
GOODRITE 1800X73
HISTYRENE S 6F
HYCAR LX 407
K 55E
KOPOLYMER BUTADIEN STYRENOVY (CZECH)
KRO 1
LITEX CA
LYTRON 5202

PROP: Liquid. D: 1.588 @ 20/4°, bp: 129-130°. Sol in water; misc in alc, ether.

SYNS:
NCI-C52459 RCRA WASTE NUMBER U208

TOXICITY DATA:	CODEN:
skn-rbt 500 mg/24H	AMPMAR 35,593,74
eye-rbt 100 mg SEV	AMPMAR 35,593,74
orl-mus TDLo:129 g/kg/2Y-I: CAR	NTPTR* NTP-TR-237,82
orl-mus TD:258 g/kg/2Y-I:CAR	NTPTR* NTP-TR-237,82

IARC Cancer Review: Animal Limited Evidence IMEMDT 41,87,86. NTP Carcinogenesis Bioassay (gavage); Clear Evidence: mouse NTPTR* NTP-TR-237,82; (gavage); No Evidence: rat NTPTR* NTP-TR-237,82. Reported in EPA TSCA Inventory.

THR: An experimental carcinogen. A skin and severe eye irritant. Incompatible with dinitrogen tetraoxide; 2,4-dinitrophenyl disulfide; potassium; potassium hydroxide; nitrogen tetroxide; sodium; sodium potassium alloy. When heated to decomposition it emits very toxic fumes of Cl^-. For further information, see Vol. 4, No. 3 of *DPIM Report*.

TBQ250 ***HR: 3***

1,1,2,2-TETRACHLOROETHYLENE

CAS: 127-18-4 NIOSH: KX 3850000
DOT: 1897
mf: C_2Cl_4 mw: 165.82

PROP: Colorless liquid; chloroform-like odor. Mp: −23.35°, bp: 121.20°, d: 1.6311 @ 15°/4°, vap press: 15.8 mm @ 22°, vap d: 5.83.

SYNS:
ANKILOSTIN
ANTISOL 1
CARBON BICHLORIDE
CARBON DICHLORIDE
CZTEROCHLOROETYLEN (POLISH)
DIDAKENE
DOW-PER
ENT 1,860
ETHYLENE TETRACHLORIDE
FEDAL-UN
NCI-C04580
NEMA
PERAWIN
PERCHLOORETHYLEEN, PER (DUTCH)
PERCHLOR
PERCHLORAETHYLEN, PER (GERMAN)
PERCHLORETHYLENE
PERCHLORETHYLENE, PER (FRENCH)
PERCHLOROETHYLENE (ACGIH, DOT)
PERCLENE
PERCLOROETILENE (ITALIAN)
PERCOSOLVE
PERK
PERKLONE
PERSEC
RCRA WASTE NUMBER U210
TETLEN
TETRACAP
TETRACHLOORETHEEN (DUTCH)
TETRACHLORAETHEN (GERMAN)
TETRACHLOROETHENE
TETRACHLOROETHYLENE (DOT)
TETRACLOROETENE (ITALIAN)
TETRALENO
TETRALEX
TETRAVEC
TETROGUER
TETROPIL

TOXICITY DATA:	CODEN:
skn-rbt 810 mg/24H SEV	JETOAS 9,171,76
eye-rbt 162 mg MLD	JETOAS 9,171,76
mmo-sat 50 µL/plate	NIOSH* 5AUG77
mma-sat 200 µL/plate	NIOSH* 5AUG77
dns-hmn:lng 100 mg/L	NTIS** PB82-185075
otr-rat:emb 97 µmol/L	ITCSAF 14,290,78
ihl-rat TCLo:1000 ppm/24H (14D pre/1-22D preg):TER	APTOD9 19,A21,80
ihl-rat TCLo:900 ppm/7H (7-13D preg):REP	TJADAB 19,41A,79
ihl-mus TCLo:300 ppm/7H (6-15D preg):TER	TXAPA9 32,84,75
orl-mus TDLo:195 g/kg/50W-I: CAR	NCITR* NCI-CG-TR-13,77
orl-mus TD :240 g/kg/62W-I: CAR	NCITR* NCI-CG-TR-13,77
ihl-hmn TCLo:96 ppm/7H: PNS,EYE,CNS	NTIS** PB257-185
ihl-man TCLo:280 ppm/2H: EYE,CNS	AMIHBC 5,566,52
ihl-man TCLo:600 ppm/10M: EYE,CNS	AMIHBC 5,566,52
ihl-man LDLo:2857 mg/kg: CNS,PUL	MLDCAS 5,152,72
orl-rat LD50:8850 mg/kg	NPIRI* 1,96,74
ihl-rat LCLo:4000 ppm/4H	JOCMA7 4,262,62
orl-mus LD50:8100 mg/kg	NTIS** PB257-185
ihl-mus LC50:5200 ppm/4H	APTOA6 9,303,53
ipr-mus LD50:4700 mg/kg	NTIS** PB257-185
orl-dog LDLo:4000 mg/kg	AJHYA2 9,430,29
ipr-dog LD50:2100 mg/kg	TXAPA9 10,119,67
ivn-dog LDLo:85 mg/kg	QJPPAL 7,205,34
orl-cat LDLo:4000 mg/kg	AJHYA2 9,430,29
orl-rbt LDLo:5000 mg/kg	AJHYA2 9,430,29
scu-rbt LDLo:2200 mg/kg	QJPPAL 7,205,34

IARC Cancer Review: Animal Limited Evidence IMEMDT 20,491,79. NCI Carcinogenesis Bioassay (gavage); Clear Evidence: mouse NCITR* NCI-CG-TR-13,77; (inhalation); Clear Evidence: mouse, rat NTPTR* NTP-TR-311,86; (gavage); Inadequate Studies: rat NCITR* NCI-CG-TR-13,77. Reported in EPA TSCA Inventory. EPA Genetic Toxicology Program. Community Right To Know List.

OSHA PEL: TWA 100 ppm; CL 200 ppm; Pk 300ppm/5M/3H
ACGIH TLV: TWA 50 ppm (skin); STEL 200 ppm
DFG MAK: 50 ppm (345 mg/m^3); BAT: blood 100 µg/dl
NIOSH REL: (Tetrachloroethylene) Minimize workplace exposure.

DOT Classification: Poison B; Label: St. Andrews Cross; ORM-A; Label: None

THR: Experimental poison by intravenous route. Moderately toxic to humans by inhalation with the following effects: local anesthetic, conjunctiva irritation, general anesthesia, hallucinations, distorted perceptions, coma and pulmonary changes. Moderately experimentally toxic by ingestion, inhalation, intraperitoneal and subcutaneous routes. An experimental carcinogen and teratogen. Experimental reproductive effects. Human mutagenic data. An

eye and severe skin irritant. The liquid can cause injuries to the eyes; however, with proper precautions it can be handled safely. The symptoms of acute intoxication from this material are the result of its effects upon the nervous system. Can cause dermatitis, particularly after repeated or prolonged contact with the skin. Irritates the gastrointestinal tract upon ingestion. It may be handled in the presence or absence of air, water, and light with any of the common construction materials at temperatures up to 140°C. This material is extremely stable and resists hydrolysis. A common air contaminant. Reacts violently under the proper conditions with Ba; Be; Li; N_2O_4; metals; NaOH. When heated to decomposition it emits highly toxic fumes of Cl^-. Used in commercial dry cleaning and as a degreasing solvent. See also CHLORINATED HYDROCARBONS, ALIPHATIC. For further information, see Perchloroethylene, Vol. 1, No. 2 of *DPIM Report*.

TBQ255 ***HR: 2***

TETRACHLOROETHYLENE CARBONATE

CAS: 22432-68-4

mf: $C_3Cl_4O_3$ mw: 225.84

THR: Reacts with tributylamine to form the toxic phosgene gas. When heated to decomposition it emits toxic fumes of Cl^-.

TBQ275 ***HR: 3***

TETRACHLOROETHYLENE OXIDE

CAS: 16650-10-5 NIOSH: KI 8760000

mf: C_2Cl_4O mw: 181.82

SYNS:

EPOXYPERCHLOROVINYL
PCEO
TETRACHLOROEPOXYETHANE

TOXICITY DATA:	CODEN:
otr-ham:emb 4300 µmol/L	JJIND8 69,531,82
skn-mus TDLo:300 mg/kg/66W-I:CAR	CNREA8 43,159,83
scu-mus TDLo:20 mg/kg/70W-I:ETA	CNREA8 43,159,83

THR: An experimental carcinogen and tumorigen. Mutagenic data. When heated to decomposition it emits toxic fumes of Cl^-.

TBQ300 ***HR: 3***

2,3,4,5-TETRACHLOROHEXATRIENE

NIOSH: MP 5425500

mf: $C_6H_4Cl_4$ mw: 217.90

TOXICITY DATA:	CODEN:
orl-rat LD50:370 mg/kg	85GMAT -,108,82
ihl-rat LCLo:670 mg/m³/2H	85GMAT -,108,82
orl-mus LD50:290 mg/kg	85GMAT -,108,82
ihl-mus LCLo:190 mg/m³/2H	85GMAT -,108,82

THR: Poison by inhalation and ingestion. When heated to decomposition it emits toxic fumes of Cl^-. See also CHLORINATED HYDROCARBONS, ALIPHATIC.

TBQ500 ***HR: 3***

TETRACHLOROHYDROQUINONE

CAS: 87-87-6 NIOSH: MX 7700000

mf: $C_6H_2Cl_4O_2$ mw: 247.88

SYNS: USAF DO-62

TOXICITY DATA:	CODEN:
dnd-omi 100 µmol/L	MUREAV 145,71,85
dnd-mam:lym 50 mmol/L	MUREAV 145,71,85
orl-mus LD50:500 mg/kg	ARTODN 40,63,78
ipr-mus LD50:25 mg/kg	NTIS** AD277-689

Reported in EPA TSCA Inventory.

THR: Poison by intraperitoneal route. Moderately toxic by ingestion. Mutagenic data. When heated to decomposition it emits toxic fumes of Cl^-.

TBQ750 ***HR: 3***

TETRACHLOROISOPHTHALONITRILE

CAS: 1897-45-6 NIOSH: NT 2600000

mf: $C_8Cl_4N_2$ mw: 265.90

SYNS:

BRAVO
BRAVO 6F
BRAVO-W-75
CHLOROALONIL
CHLOROTHALONIL
CHLORTHALONIL (GERMAN)
DAC 2797
DACONIL
DACONIL 2787 FLOWABLE FUNGICIDE
DACOSOIL
1,3-DICYANOTETRACHLOROBENZENE
EXOTHERM
EXOTHERM TERMIL
FORTURF
NCI-C00102
NOPCOCIDE
SWEEP
TCIN
m-TCPN
TERMIL
2,4,5,6-TETRACHLORO-3-CYANOBENZONITRILE
m-TETRACHLOROPHTHALONITRILE
TPN (pesticide)

TOXICITY DATA:	CODEN:
orl-rat TDLo:142 g/kg/80W-C:CAR	NCITR* NCI-CG-TR-41,78
orl-rat LD50:10 mg/kg	85ARAE 4,75,76
orl-mus LD50:6 g/kg	INHEAO 4,11,66
ipr-mus LD50:2500 mg/kg	INHEAO 4,11,66

IARC Cancer Review: Animal Limited Evidence IMEMDT 30,319,83. NCI Carcinogenesis Bioassay (feed); Clear Evidence: rat NCITR* NCI-CG-TR-41,78. Cyanide and its compounds are on the Community Right To Know List. Reported in EPA TSCA Inventory. EPA Genetic Toxicology Program.

THR: Moderately toxic by intraperitoneal route. Mildly toxic by ingestion. An experimental carcinogen. When heated to decomposition it emits very toxic fumes of Cl^-, NO_x, and CN^-. Used as a fungicide. See also NITRILES.

TBR000 ***HR: 3***

TETRACHLORONAPHTHALENE

CAS: 1335-88-2 NIOSH: QK 3700000

mf: $C_{10}H_4Cl_4$ mw: 265.94

TGK750 ***HR: 3***

TOLUENE

CAS: 108-88-3 NIOSH: XS 5250000

mf: C_7H_8 mw: 92.15

DOT: 1294

PROP: Colorless liquid; benzol-like odor. Mp: −95 to −94.5°, bp: 110.4°, flash p: 40°F (CC), ulc: 75-80, lel: 1.27%, uel: 7%, d: 0.866 @ 20°/4°, autoign temp: 996°F, vap press: 36.7 mm @ 30°, vap d: 3.14. Insol in water; sol in acetone; misc in absolute alc, ether, chloroform.

SYNS:

ANTISAL 1a
METHACIDE
METHYLBENZENE
METHYLBENZOL
NCI-C07272
PHENYLMETHANE
RCRA WASTE NUMBER U220
TOLUEEN (DUTCH)
TOLUEN (CZECH)
TOLUOL
TOLUOL (DOT)
TOLUOLO (ITALIAN)
TOLU-SOL

TOXICITY DATA: CODEN:

eye-hmn 300 ppm	JIHTAB 25,282,43
skn-rbt 435 mg MLD	UCDS** 7/23/70
skn-rbt 500 MOD	FCTOD7 20,563,82
eye-rbt 870 µg MLD	UCDS** 7/23/70
eye-rbt 2 mg/24H SEV	28ZPAK -,23,72
eye-rbt 100 mg/30S rns MLD	FCTOD7 20,573,82
oms-grh-ihl 562 mg/L	MUREAV 113,467,83
dns-rat:lvr 30 umol/L	SinJF# 26OCT82
cyt-rat-ihl 5400 µg/m³/16W-I	GTPZAB 25(7),33,81
cyt-rat-scu 12 g/kg/12D-I	GTPZAB 17(3),24,73
mnt-mus-orl 200 mg/kg	MUREAV 147,294,85
mnt-mus-ipr 433 µg/kg/24H	ARTODN 58,106,85
ihl-rat TCLo:1500 mg/m³/24H (1-8D preg):TER	TXCYAC 11,55,78
orl-mus TDLo:9 g/kg (6-15D preg):TER	TJADAB 19,41A,79
ihl-hmn TCLo:200 ppm:BRN,CNS,BLD	JAMAAP 123,1106,43
ihl-man TCLo:100 ppm:CNS	WEHRBJ 9,131,72
orl-rat LD50:5000 mg/kg	AMIHAB 19,403,59
ihl-rat LCLo:4000 ppm/4H	AIHAAP 30,470,69
ipr-rat LDLo:800 mg/kg	TXAPA9 1,156,59
ivn-rat LD50:1960 mg/kg	MELAAD 54,486,63
unr-rat LD50:6900 mg/kg	GISAAA 45(12),64,80
ihl-mus LC50:5320 ppm/8H	JIHTAB 25,366,43
ipr-mus LD50:1120 µg/kg	AGGHAR 18,109,60
unr-mus LD50:2000 mg/kg	GISAAA 45(12),64,80
skn-rbt LD50:12124 mg/kg	AIHAAP 30,470,69
ihl-gpg LCLo:1600 ppm	JIDHAN 10,261,28
scu-frg LDLo:920 mg/kg	AEPPAE 130,250,28

Community Right To Know List. Reported in EPA TSCA Inventory. EPA Genetic Toxicology Program.

OSHA PEL: TWA 200 ppm; CL 300; Pk 500/10M

ACGIH TLV: TWA 100 ppm; STEL 150 ppm; BEI: toluene in venous blood end of shift 1 mg/L

DFG MAK: 100 ppm (375 mg/m³); BAT: blood end of shift 340 µg/dl

NIOSH REL: (Toluene) TWA 100 ppm; CL 200 ppm/10M

DOT Classification: Flammable Liquid; Label: Flammable Liquid

THR: Poison by intraperitoneal route. Moderately toxic by intravenous, subcutaneous and possibly other routes. Mildly toxic by inhalation. An experimental teratogen. Human systemic effects by inhalation: CNS recording changes, hallucinations or distorted perceptions, motor activity changes, antipsychotic, psychophysiological test changes and bone marrow changes. Experimental reproductive effects. Mutagenic data. A human eye irritant. An experimental skin and severe eye irritant.

Toluene is derived from coal tar, and commercial grades usually contain small amounts of benzene as an impurity. Inhalation of 200 ppm of toluene for 8 hours may cause impairment of coordination and reaction time; with higher concentrations (up to 800 ppm) these effects are increased and are observed in a shorter time. In the few cases of acute toluene poisoning reported, the effect has been that of a narcotic, the workman passing through a stage of intoxication into one of coma. Recovery following removal from exposure has been the rule. An occasional report of chronic poisoning describes an anemia and leucopenia, with biopsy showing a bone marrow hypoplasia. These effects, however, are less common in people working with toluene, and they are not as severe. At 200-500 ppm, headache, nausea, eye irritation, loss of appetite, a bad taste, lassitude, impairment of coordination and reaction time are reported, but are not usually accompanied by any laboratory or physical findings of significance. With higher concentrations, the above complaints are increased and in addition, anemia, leukopenia and enlarged liver may be found in rare cases. A common air contaminant.

A very dangerous fire hazard when exposed to heat, flame or oxidizers. Explosive in the form of vapor when exposed to heat or flame. Explosive reaction with 1,3-dichloro-5,5-dimethyl-2,4-imidazolididione; dinitrogen tetraoxide; concentrated nitric acid; H_2SO_4 + HNO_3; N_2O_4; $AgClO_4$; BrF_3; UF_6. Forms an explosive mixture with tetranitromethane. Can react vigorously with oxidizing materials. To fight fire, use foam, CO_2, dry chemical. When heated to decomposition it emits acrid smoke and irritating fumes. For further information, see Vol. 7, No. 5 of *DPIM Report*.

TGL500 ***HR: 3***

TOLUENEDIAMINE

CAS: 25376-45-8 NIOSH: XS 9445000

mf: $C_7H_{10}N_2$ mw: 122.19

DOT: 1709

SYNS:

ar-METHYLBENZENEDIAMINE
DIAMINOTOLUENE
METHYLPHENYLENEDIAMINE
TOLYLENEDIAMINE

Community Right To Know List. Reported in EPA TSCA Inventory.

TIM000 **HR: 1**

1,1,2-TRICHLORO-2,2-DIFLUOROETHANE

CAS: 354-21-2 NIOSH: KI 1435000

mf: $CHCl_3F_2$ mw: 157.37

SYNS:

1,1-DIFLUORO-1,2,2-TRICHLORO-ETHANE
UCON FLUOROCARBON 122

TOXICITY DATA:	CODEN:
orl-rat LDLo:7500 mg/kg	HXPHAU 20(Pt 1),-459,66
ihl-rat LCLo:4000 ppm/4H	UCMH** 15NOV62

THR: Mildly toxic by ingestion and inhalation. When heated to decomposition it emits very toxic fumes of F^- and Cl^-. See also CHLORINATED HYDROCARBONS, ALIPHATIC and FLUORIDES.

TIM500 **HR: 1**

TRICHLORO ESTERTIN

NIOSH: WH 8240000

SYN: ESTERTRICHLOROSTANNANE

TOXICITY DATA:	CODEN:
unr-rat LD50:5500 mg/kg	TIUSAD 107,1,76

OSHA PEL: TWA 0.1 mg(Sn)/m^3
ACGIH TLV: TWA 0.1 mg(Sn)/m^3 (skin)
NIOSH REL: (Organotin Compounds) TWA 0.1 mg(Sn)/m^3

THR: When heated to decomposition it emits toxic fumes of Cl^-. See also TIN COMPOUNDS and ESTERS.

TIM750 **HR: 3**

1,1,1-TRICHLOROETHANE ✱

CAS: 71-55-6 NIOSH: KJ 2975000

DOT: 2831

mf: $C_2H_3Cl_3$ mw: 133.40

PROP: Colorless liquid. Bp: 74.1°, fp: −32.5°, flash p: none, d: 1.3376 @ 20°/4°, vap press: 100 mm @ 20.0°. Insol in water; sol in acetone, benzene, carbon tetrachloride, methanol, ether.

SYNS:

AEROTHENE TT
CHLOROETENE
CHLOROETHENE
CHLOROTHANE NU
CHLOROTHENE
CHLOROTHENE (INHIBITED)
CHLOROTHENE NU
CHLOROTHENE VG
CHLORTEN
INHIBISOL
METHYLCHLOROFORM
METHYL CHLOROFORM (ACGIH, DOT)
METHYLTRICHLOROMETHANE
NCI-C04626
RCRA WASTE NUMBER U226
SOLVENT 111
STROBANE
α-T
1,1,1-TCE
1,1,1-TRICHLOORETHAAN (DUTCH)
1,1,1-TRICHLORAETHAN (GERMAN)
TRICHLORO-1,1,1-ETHANE (FRENCH)
α-TRICHLOROETHANE
1,1,1-TRICLOROETANO (ITALIAN)
TRI-ETHANE

TOXICITY DATA:	CODEN:
eye-man 450 ppm/8H	BJIMAG 28,286,71
skn-rbt 5 g/12D-I MLD	AIHAAP 19,353,58
skn-rbt 500 mg/24H MOD	28ZPAK -,28,72
eye-rbt 100 mg MLD	AIHAAP 19,353,58
eye-rbt 2 mg/24H SEV	28ZPAK -,28,72
dnr-esc 500 mg/L	PMRSDJ 1,195,81
otr-mus:emb 20 mg/L	CALEDQ 28,85,85
orl-rat TDLo:43 mg/kg (1-22D preg/21D post):TER	TJADAB 29(2),25A,84
ihl-rat TCLo:2100 ppm/24H (14D pre/1-20D preg):TER	TOXID9 1,28,81
ihl-man LCLo:27 g/m^3/10M	JOCMA7 8,358,66
ihl-man TCLo:350 ppm:CNS	WEHSAL 10,82,73
orl-hmn TDLo:670 mg/kg:GIT	NTIS** PB257-185
ihl-hmn TCLo:920 ppm/70M:EYE,CNS	AIHAAP 19,353,58
ihl-man TCLo:200 ppm/4H:CNS	ATSUDG 5,96,82
orl-rat LD50:10300 mg/kg	NTIS** PB257-185
ihl-rat LC50:18000 ppm/4H	28ZPAK -,28,72
ipr-rat LD50:5100 mg/kg	NTIS** PB257-185
orl-mus LD50:11240 mg/kg	NTIS** PB257-185
ihl-mus LC50:3911 ppm/2H	SAIGBL 13,226,71
ipr-mus LD50:4700 mg/kg	TXAPA9 13,287,68
orl-dog LD50:750 mg/kg	FMCHA2 -,C242,83
ipr-dog LD50:3100 mg/kg	TXAPA9 10,119,67
ivn-dog LDLo:95 mg/kg	HBTXAC 5,72,59
ihl-cat LCLo:600 mg/m^3/4H	85GMAT -,38,82
orl-rbt LD50:5660 mg/kg	AIHAAP 19,353,58
skn-rbt LDLo:1 g/kg	85GMAT -,38,82
scu-rbt LDLo:500 mg/kg	HBTXAC 5,72,59
orl-gpg LD50:9470 mg/kg	AIHAAP 19,353,58

IARC Cancer Review: Animal Inadequate Evidence IMEMDT 20,515,79. NCI Carcinogenesis Bioassay (gavage); Inadequate Studies: mouse, rat NCITR* NCI-CG-TR-3,77. Community Right To Know List. Reported in EPA TSCA Inventory. EPA Genetic Toxicology Program.

OSHA PEL: TWA 350 ppm
ACGIH TLV: TWA 350 ppm; STEL 450 ppm
DFG MAK: 200 ppm (2080 mg/m^3); BAT: blood 55 μg/dl
NIOSH REL: (1,1,1-Trichloroethane) CL 350 ppm/15M

DOT Classification: ORM-A; Label: None; Poison B; Label: St Andrews Cross

THR: Poison by intravenous route. Moderately toxic by ingestion, inhalation, skin contact, subcutaneous and intraperitoneal routes. An experimental teratogen. Human systemic effects by ingestion and inhalation: conjunctiva irritation, hallucinations or distorted perceptions, motor activity changes, irritability, aggression, hypermotility, diarrhea, nausea or vomiting and other gastrointestinal changes. Experimental reproductive effects. Mutagenic data. A human skin irritant. An experimental skin and severe eye irritant. Narcotic in high concentrations. Causes a proarrhythmic activity which sensitizes the heart to epinephrine-induced arrhythmias. This sometimes will cause cardiac arrest, particularly when this material is massively inhaled as in drug abuse for euphoria.

Under the proper conditions it can undergo hazardous reactions with aluminum oxide + heavy metals; dinitrogen tetraoxide; inhibitors; metals (e.g., magnesium; aluminum; potassium; potassium-sodium alloy); sodium hydroxide; N_2O_4; oxygen. When heated to decomposition it emits toxic fumes of Cl^-. Used as a cleaning solvent, a chemical intermediate to produce vinylidene chloride, and as a propellant in aerosol cans. See also CHLORINATED HYDROCARBONS, ALIPHATIC. For further information see methyl chloroform, Vol. 2, No. 5 of *DPIM Report*.

TIN000 ***HR: 3***

1,1,2-TRICHLOROETHANE

CAS: 79-00-5 NIOSH: KJ 3150000

mf: $C_2H_3Cl_3$ mw: 133.40

PROP: Liquid: pleasant odor. Bp: 114°, fp: −35°, d: 1.4416 @ 20°/4°, vap press: 40 mm @ 35.2°.

SYNS:

ETHANE TRICHLORIDE
NCI-C04579
RCRA WASTE NUMBER U227
β-T
1,1,2-TRICHLORETHANE
β-TRICHLOROETHANE
1,2,2-TRICHLOROETHANE
TROJCHLOROETAN(1,1,2) (POLISH)
VINYL TRICHLORIDE

TOXICITY DATA:	CODEN:
skn-rbt 500 mg open MLD	UCDS** 6/28/72
skn-rbt 810 mg/24H SEV	JETOAS 9,171,76
eye-rbt 162 mg MLD	JETOAS 9,171,76
skn-gpg 1440 mg/15M	APTOA6 41,298,77
otr-mus:emb 25 mg/L	CALEDQ 28,85,85
cyt-gpg-skn 2880 µg/kg	APTOA6 41,298,77
dnd-mam:lym 1 mmol/L	TODED5 11,243,82
orl-mus TDLo:532 mg/kg (14D male):REP	DCTODJ 8,333,85
orl-mus TDLo:76 g/kg/78W-I: CAR	NCITR* NCI-CG-TR-74,78
orl-mus TD :152 g/kg/78W-I: CAR	NCITR* NCI-CG-TR-74,78
orl-rat LD50:580 mg/kg	AIHAAP 30,470,69
ihl-rat LCLo:500 ppm/8H	AIHAAP 30,470,69
orl-mus LD50:378 mg/kg	DCTODJ 8,333,85
ipr-mus LD50:494 mg/kg	TXAPA9 9,139,66
scu-mus LD50:227 mg/kg	JPETAB 123,224,58
orl-dog LDLo:500 mg/kg	AJHYA2 16,325,32
ipr-dog LD50:450 mg/kg	TXAPA9 10,119,67
ivn-dog LDLo:95 mg/kg	QJPPAL 7,205,34
ihl-cat LCLo:13100 mg/m^3/4.5H	AHBAAM 116,131,36
skn-rbt LD50:3730 mg/kg	AIHAAP 30,470,69
scu-rbt LDLo:500 mg/kg	QJPPAL 7,205,34

IARC Cancer Review: Animal Limited Evidence IMEMDT 20,533,79. NCI Carcinogenesis Bioassay (gavage); No Evidence: rat NCITR* NCI-CG-TR-74,78; (gavage); Clear Evidence: mouse NCITR* NCI-CG-TR-74,78. Community Right To Know List. Reported in EPA TSCA Inventory.

OSHA PEL: TWA 10 ppm (skin)
ACGIH TLV: TWA 10 ppm (skin)
DFG MAK: 10 ppm (55 mg/m^3)

THR: Poison by ingestion, intravenous and subcutaneous routes. Moderately toxic by inhalation, skin contact, and intraperitoneal routes. An experimental carcinogen. Experimental reproductive effects. Mutagenic data. An eye and severe skin irritant. Has narcotic properties and acts as a local irritant to the eyes, nose and lungs. It may also be injurious to the liver and kidneys. Incompatible with potassium. When heated to decomposition it emits toxic fumes of Cl^-. A priority pollutant associated with EPA superfund sites. See also CHLORINATED HYDROCARBONS, ALIPHATIC and other trichloroethane entries. For further information, see Vol. 5, No. 3 of *DPIM Report*.

TIN500 ***HR: 3***

TRICHLOROETHANOL

CAS: 115-20-8 NIOSH: KM 3850000

mf: $C_2H_3Cl_3O$ mw: 149.40

PROP: Liquid. Mp: 17.8°, bp: 150° @ 765 mm, d: 1.54 @ 25/4°, vap press: 1 mm @ 20°, vap d: 5.16.

SYNS:

TRICHLORETHANOL
2,2,2-TRICHLOROETHANOL
TRICHLOROETHYL ALCOHOL
2,2,2-TRICHLOROETHYL ALCOHOL

TOXICITY DATA:	CODEN:
mmo-asn 5 µL/plate/2H	CBINA8 30,9,80
sln-asn 10240 µmol/L	MUREAV 155,105,85
sce-hmn:lym 178 g/L	TOERD9 3,63,81
orl-rat LDLo:500 mg/kg	CRAA7 17,258,38
ipr-rat LDLo:300 mg/kg	JPETAB 63,453,38
orl-mus LDLo:500 mg/kg	CRAAA7 17,258,38
ivn-mus LD50:201 mg/kg	28ZPAK -,78,72
ivn-rbt LDLo:50 mg/kg	JPETAB 63,453,38
rec-rbt LDLo:500 mg/kg	CRAA7 17,258,38

EPA Genetic Toxicology Program. Reported in EPA TSCA Inventory.

THR: Poison by intravenous and intraperitoneal routes. Moderately toxic by ingestion and rectal routes. Human mutagenic data. Explosive reaction with concentrated sodium hydroxide solutions. When heated to decomposition it emits toxic fumes of Cl^-. Used as an hypnotic and anesthetic. See also CHLORINATED HYDROCARBONS, ALIPHATIC.

TIN750 ***HR: 3***

TRICHLOROETHENYLSILANE

CAS: 75-94-5 NIOSH: VV 6125000

DOT: 1305

mf: $C_2H_3Cl_3Si$ mw: 161.49

PROP: Fuming liquid. Bp: 90.6°, d: 1.265 @ 25/25°, flash p: 16°F.

SYNS:

SILANE, VINYL TRICHLORO (-150
TRICHLORO(VINYL)SILANE
TRICHLOROVINYL SILICANE
UNION CARBIDE A-150
VINYLSILICON TRICHLORIDE
VINYL TRICHLOROSILANE (DOT)
VINYL TRICHLOROSILANE, INHIBITED (DOT)

ivn-rat LD50:24 mg/kg	YACHDS 12(Suppl 6),969.84
orl-mus LD50:325 mg/kg	YACHDS 12(Suppl 6),969.84
scu-mus LD50:284 mg/kg	YACHDS 12(Suppl 6),969.84
ivn-mus LD50:28 mg/kg	YACHDS 12(Suppl 6),969.84
orl-dog LD50:405 mg/kg	YACHDS 12(Suppl 6),969.84
ivn-dog LD50:9200 µg/kg	YACHDS 12(Suppl 6),969.84
orl-rbt LD50:425 mg/kg	YACHDS 12(Suppl 6),969.84

THR: Poison by ingestion, subcutaneous and intravenous routes. When heated to decomposition it emits toxic fumes of NO_x and HCl.

XGA725 ***HR: 3***

XILOBAM

CAS: 50528-97-7 NIOSH: YT 8850000

mf: $C_{14}H_{19}N_3O$ mw: 245.36

SYNS:

N-(2,6-DIMETHYLPHENYL)-N'-(1-METHYL-2-PYRROLIDINYLIDENE)UREA	MCN-3113
	1-(1-METHYL-2-PYRROLIDINYLIDENE)-3-(2,6-XYLYL)UREA

TOXICITY DATA:	CODEN:
orl-rat LD50:830 mg/kg	AIPTAK 233,326,78
ipr-rat LD50:128 mg/kg	AIPTAK 233,326,78
orl-mus LD50:320 mg/kg	JMCMAR 21,1044,78
ipr-mus LD50:110 mg/kg	AIPTAK 233,326,78

THR: Poison by ingestion and intraperitoneal routes. When heated to decomposition it emits toxic fumes of NO_x.

XGS000 ✱ ***HR: 2***

XYLENE

CAS: 1330-20-7 NIOSH: ZE 2100000

DOT: 1307

mf: C_8H_{10} mw: 106.18

PROP: A clear liquid. Bp: 138.5°, flash p: 100°F (TOC), d: 0.864 @ 20°/4°, vap press: 6.72 mm @ 21°. Composition: as nonaromatics 0.07%, toluene 14%, ethyl benzene 19.27%, p-xylene 7.84%, m-xylene 65.01%, o-xylene 7.63%, C9 and aromatics 0.04% (TXAPA9 33,543,75).

SYNS:

DIMETHYLBENZENE	VIOLET 3
KSYLEN (POLISH)	XILOLI (ITALIAN)
METHYL TOLUENE	XYLENEN (DUTCH)
NCI-C55232	XYLOL (DOT)
RCRA WASTE NUMBER U239	XYLOLE (GERMAN)

TOXICITY DATA:	CODEN:
eye-hmn 200 ppm	JIHTAB 25,282,43
skn-rbt 100% MOD	AMIHAB 14,387,56
skn-rbt 500 mg/24H MOD	28ZPAK -,24,72
eye-rbt 87 mg MLD	AMIHAB 14,387,56
eye-rbt 5 mg/24H SEV	28ZPAK -,24,72
cyt-smc 1 mmol/tube	HEREAY 33,457,47
ihl-rat TCLo:1000 mg/m³/24H (9-14D preg):TER	TXCYAC 11,55,78
orl-mus TDLo:31 mg/kg (6-15D preg):REP	JTEHD6 9,97,82
ihl-mus TCLo:2000 ppm/6H (6-12D preg):TER	TJADAB 28,22A,83
ihl-hmn TCLo:200 ppm:NOSE,EYE,PUL	JIHTAB 25,282,43
ihl-man LCLo:10000 ppm/6H	BMJOAE 3,442,70
orl-rat LD50:4300 mg/kg	AMIHAB 14,387,56
ihl-rat LC50:5000 ppm/4H	NPIRI* 1,123,74
scu-rat LD50:1700 mg/kg	NPIRI* 1,123,74
ipr-mus LD50:1548 mg/kg	AGGHAR 18,109,60
ipr-gpg LDLo:2000 mg/kg	AIHAAP 35,21,74
ipr-mam LDLo:2000 mg/kg	AJHYA2 7,276,27

Reported in EPA TSCA Inventory. EPA Genetic Toxicology Program. Community Right To Know List.

OSHA PEL: TWA 100 ppm

ACGIH TLV: TWA 100 ppm; STEL 150 ppm; BEI: methyl hippuric acids in urine end of shift 1.5 g/g creatinine

DFG MAK: (all isomers) 100 ppm (440 mg/m³); BAT: blood end of shift 150 µg/dl, urine 2 g/l

NIOSH REL: (Xylene) TWA 100 ppm; CL 200 ppm/10M

DOT Classification: Flammable Liquid; Label: Flammable Liquid; Flammable or Combustible Liquid; Label: Flammable Liquid

THR: Moderately toxic by intraperitoneal and subcutaneous routes. Mildly toxic by ingestion and inhalation. An experimental teratogen. Human systemic effects by inhalation: olfactory changes, conjunctiva irritation and pulmonary changes. Experimental reproductive effects. Mutagenic data. A human eye irritant. An experimental skin and severe eye irritant. Some temporary corneal effects are noted, as well as some conjunctival irritation by instillation (adding drops to the eyes one at a time). Irritation can start at 200 ppm. A very dangerous fire hazard when exposed to heat or flame; can react with oxidizing materials. To fight fire, use foam, CO_2, dry chemical. When heated to decomposition it emits acrid smoke and irritating fumes. See also other xylene entries. For further information, see Vol. 6, No. 4 of *DPIM Report*.

XHA000 ***HR: 3***

m-XYLENE

CAS: 108-38-3 NIOSH: ZE 2275000

DOT: 1307

mf: C_8H_{10} mw: 106.18

PROP: Colorless liquid. Mp: −47.9°, bp: 139°, lel: 1.1%, uel: 7.0%, flash p: 77°F, d: 0.864 @ 20/4°, vap press: 10 mm @ 28.3°, vap d: 3.66, autoign temp: 986°F. Insol in water; misc with alc, ether and some organic solvents.

Chemical name, structure/formula, CAS and RTECS Nos., and DOT ID and guide Nos.	Synonyms, trade names, and conversion factors	Exposure limits (TWA unless noted otherwise)	IDLH	Physical description	Chemical and physical properties: MW, BP, SOL, FI.P, IP, Sp.Gr, flammability	Chemical and physical properties: VP, FRZ, UEL, LEL	Incompatibilities and reactivities	Measurement method (See Table 1)
Acetaldehyde CH_3CHO 75 07 0 AB1925000 1089 26	Acetic aldehyde, Ethanal, Ethyl aldehyde 1 ppm = 1 83 mg/m³	NIOSH Ca See Appendix A OSHA 100 ppm (180 mg/m³) ST 150 ppm (270 mg/m³)	Ca [10,000 ppm]	Colorless liquid or gas (above 69°F) with a pungent, fruity odor	MW 44 1 BP 69 F Sol Miscible FI P 36 F IP 10 22 eV Sp Gr 0 79 Class IA Flammable Liquid	VP 740 mm FRZ 190°F UEL 60% LEL 4 0%	Strong oxidizers, acids, bases, alcohols, ammonia & amines, phenols, ketones, HCN, H₂S [Note Prolonged contact with air may cause formation of peroxides that may explode and burst containers; easily undergoes polymerization]	XAD 2*, Toluene GC/FID, III [#2538]
Acetic acid CH_3COOH 64 19 7 AF1225000 1842 29 (soln) 2790 60 (10 80% acid) 2789 29 (80% acid)	Acetic acid (aqueous), Ethanoic acid, Glacial acetic acid (pure compound), Methanecarboxlyic acid [Note Can be found in concentrations of 5-8% in vinegar] 1 ppm = 2 50 mg/m³	NIOSH 10 ppm (25 mg/m³) ST 15 ppm (37 mg/m³) OSHA 10 ppm (25 mg/m³)	1000 ppm	Colorless liquid or crystals with a sour, vinegar like odor [Note Pure compound is a solid below 62°F Often used in an aqueous solution]	MW 60 1 BP 244 F Sol Miscible FI P 102°F IP 10 66 eV Sp Gr 1 05 Class II Combustible Liquid	VP 11 mm FRZ 62°F UEL (200°F) 19 9% LEL 4 0%	Strong oxidizers (especially chromic acid, sodium peroxide & nitric acid) strong caustics [Note Corrosive to metals]	Char, HCOOH, GC/FID, III [#1603]
Acetic anhydride $(CH_3CO)_2O$ 108 24 7 AK1925000 1715 39	Acetic acid anhydride, Acetic oxide, Acetyl oxide, Ethanoic anhydride 1 ppm = 4 24 mg/m³	NIOSH/OSHA C 5 ppm (20 mg/m³)	1000 ppm	Colorless liquid with a strong, pungent, vinegar like odor	MW 102 1 BP 282°F Sol 12% FI P 120 F IP 10 00 eV Sp Gr 1 08 Class II Combustible Liquid	VP 4 mm FRZ 99°F UEL 10 3% LEL 2 7%	Water, alcohols, strong oxidizers (especially chromic acid), amines, strong caustics [Note Corrosive to iron, steel & other metals. Reacts with water to form acetic acid]	Bub, Reagent, Vis, III [#3506]
Acetone CH_3COCH_3 67 64 1 AL3150000 1090 26	Dimethyl ketone, Ketone propane, 2 Propanone 1 ppm = 2 42 mg/m³	NIOSH 250 ppm (590 mg/m³) OSHA 750 ppm (1800 mg/m³) ST 1000 ppm (2400 mg/m³)	20,000 ppm [Note Enforcement of the OSHA TWA for "doffers" in the cellulose acetate fiber industry was stayed on 9/5/89 until 9/1/90, further the OSHA STEL does NOT apply to that industry]	Colorless liquid with a fragrant, mint-like odor	MW 58 1 BP 133°F Sol Miscible FI P 0°F IP 9 69 eV Sp Gr 0 79 Class IB Flammable Liquid	VP 180 mm FRZ -140 F UEL 13% LEL 2 5%	Oxidizers, acids	Char, CS_2, GC/FID, III [#1300 Ketones I]

Personal protection and sanitation (See Table 3)		Recommendations for respirator selection — maximum concentration for use (MUC) (See Table 4)	Health hazards				
			Route	Symptoms (See Table 5)	First aid (See Table 6)		Target organs (See Table 5)
Clothing Goggles Wash Change Remove Provide	Repeat Any poss Prompt wet N R Immed wet (flamm) Eyewash	NIOSH ¥ SCBAF PD,PP/SAF PD,PP ASCBA Escape GMFOV/SCBAE	Inh Ing	Eye, nose, throat irrit; conj, cough, CNS depres, eye, skin burns, derm, delayed pulm edema, [carc]	Eye Skin Breath Swallow	Irr immed Water flush prompt Resp support Medical attention immed	Resp sys, skin, kidneys
Clothing Goggles Wash Change Remove Provide	Any poss >50%/Repeat 10 49% Any poss Immed contam >50% Prompt 10 49% N R Immed non imperv contam >50%/Prompt non imperv contam 10 49% Eyewash (>5%)/Quick drench (>50%)	NIOSH/OSHA 250 ppm: SA CF[b]/PAPROV[b] 500 ppm: CCRFOV/SCBAF/SAF GMFOV/PAPRTOV[b] 1000 ppm: SAF,PD,PP § SCBAF PD,PP/SAF PD,PP ASCBA Escape GMFOV/SCBAE	Inh	Conj, lac, irrit nose throat, phar edema, chronic bron; burns eyes, skin, skin sens, dental erosion, black skin; hyperkeratosis	Eye Skin Breath Swallow	Irr immed Water flush immed Resp support Medical attention immed	Resp sys, skin, eyes, teeth
Clothing Goggles Wash Change Remove Provide	Reason prob Any poss Immed contam N R Immed non imperv contam Eyewash, quick drench	NIOSH/OSHA 125 ppm: SA CF[b]/PAPROV[b] 250 ppm: CCRFOV/SCBAF/SAF/GMFOV/PAPRTOV[b] 1000 ppm: SAF,PD,PP § SCBAF PD,PP/SAF PD,PP ASCBA Escape GMFOV/SCBAE	Inh Ing Con	Conj, lac, corneal edema, opac, photo, nasal, phar irrit; cough, dysp, bron; skin burns, vesic, sens derm	Eye Skin Breath Swallow	Irr immed Water flush immed Resp support Medical attention immed	Resp sys, eyes, skin
Clothing Goggles Wash Change Remove	Repeat Reason prob Prompt wet N R Immed wet (flamm)	NIOSH 1000 ppm: CCROV*/PAPROV*/SA*/SCBA* 6250 ppm: SA CF* 12,500 ppm: GMFOV/SCBAF/SAF 20,000 ppm: SAF,PD,PP § SCBAF PD,PP/SAF PD,PP ASCBA Escape GMFOV/SCBAE	Inh Ing Con	Irrit eyes, nose, throat, head, dizz; derm	Eye Skin Breath Swallow	Irr immed Soap wash immed Resp support Medical attention immed	Resp sys, skin

Acetone

Chemical name, structure/formula, CAS and RTECS Nos., and DOT ID and guide Nos.	Synonyms, trade names, and conversion factors	Exposure limits (TWA unless noted otherwise)	IDLH	Physical description	Chemical and physical properties MW, BP, SOL Fl.P, IP, Sp.Gr, flammability	 VP, FRZ UEL, LEL	Incompatibilities and reactivities	Measurement method (See Table 1)
Barium (soluble compounds as Ba) 1 $Ba(NO_3)_2$ 2 $BaCl_2$ 1 10022-31-8/ CQ9625000 2 10361-37-2/ CQ8750000 1446-42 (Barium nitrate)	1 Barium nitrate, Barium dinitrate 2 Barium chloride, Barium dichloride Synonyms of other soluble compounds vary depending upon the specific compound	NIOSH/OSHA 0.5 mg/m³	1100 mg/m³	Barium nitrate & Barium chloride are white odorless solids	MW: 261.4/ 208.3 BP: Decomposes /2840°F Sol: 9/38% Fl.P: NA/? IP: ?/? Sp.Gr: 3.24/3.86 $Ba(NO_3)_2$: Noncombustible Solid $BaCl_2$: Combustible Solid	VP: Low/Low MLT: 1098/ 1765°F UEL: NA/? LEL: NA/?	Acids, oxidizers [Note: Contact of barium nitrate with combustible material may cause fire.]	Filter, Water, AA, III [#7056]
Benzene C_6H_6 71-43-2 CY1400000 1114; 27	Benzol, Phenyl hydride 1 ppm = 3.25 mg/m³	NIOSH Ca See Appendix A 0.1 ppm ST 1 ppm OSHA [1910.1028] 1 ppm ST 5 ppm	Ca [3000 ppm] ACGIH A2	Colorless to light yellow liquid with an aromatic odor [Note: A solid below 42°F.]	MW: 78.1 BP: 176°F Sol: 0.07% Fl.P: 12°F IP: 9.24 eV Sp.Gr: 0.88 Class IB Flammable Liquid	VP: 75 mm FRZ: 42°F UEL: 7.9% LEL: 1.3%	Strong oxidizers, many fluorides & perchlorates, nitric acid [Note: Measurements may also be made with a portable GC using NIOSH #3700 (III).]	Char, CS_2, GC/FID, III [#1500, Hydrocarbons]
Benzidine $NH_2C_6H_4C_6H_4NH_2$ 92-87-5 DD9625000 1885; 53	4,4'-Bianiline, 4,4'-Biphenyldiamine, 1,1'-Biphenyl-4,4'-diamine, 4,4'-Diaminobiphenyl, p-Diaminodiphenyl	NIOSH Ca See Appendix A OSHA [1910.1010] See Appendix B ACGIH A1 [skin]	Ca	Grayish yellow, reddish gray, or white crystalline powder	MW: 184.3 BP: 752°F Sol(54°F): 0.04% Fl.P: ? IP: ? Sp.Gr: 1.25 Combustible Solid, but difficult to burn	VP: Low MLT: 239°F UEL: ? LEL: ?	None reported	Filter, Si gel, Reagent, HPLC/UVD, III [#5509]
Benzoyl peroxide $(C_6H_5CO)_2O_2$ 94-36-0 DM8575000 2085/2086/2087; 49 2088/2089/2090; 49	Benzoperoxide, Dibenzoyl peroxide	NIOSH/OSHA 5 mg/m³	7000 mg/m³	Colorless to white crystals or a granular powder with a faint benzaldehyde-like odor	MW: 242.2 BP: ? Sol: <1% Fl.P: ? IP: ? Sp.Gr(77°F): 1.33 Combustible Solid (easily ignited and burns very rapidly)	VP: <1 mm MLT: 217°F UEL: ? LEL: ?	Combustible substances (wood, paper, etc.), acids, alkalis, alcohols, amines, ethers [Note: Containers may explode when heated. Extremely explosion-sensitive to shock, heat, and friction.]	Filter, Diethyl ether, HPLC/UVD, III [#5009]

Personal protection and sanitation (See Table 3)		Recommendations for respirator selection — maximum concentration for use (MUC) (See Table 4)	Health hazards				
			Route	Symptoms (See Table 5)	First aid (See Table 6)		Target organs (See Table 5)
Recommendations vary depending upon the specific compound		NIOSH/OSHA 5 mg/m³: DMXSQ/SA/SCBA 12.5 mg/m³: PAPRDM/SA:CF 25 mg/m³: HiEF/PAPRTHiE/SAT:CF/SCBAF/SAF 250 mg/m³: SAF:PD,PP § SCBAF:PD,PP/SAF:PD,PP:ASCBA Escape: HiEF:SCBAE	Inh Ing Con	Upper resp irrit; gastroenteritis; musc spasm; slow pulse, extrasystoles, hypokalemia; irrit eyes, skin, skin burns	Eye: Skin: Breath: Swallow	Irr immed Water flush immed Resp support Medical attention immed	Heart, CNS, skin, resp sys, eyes
Clothing Goggles Wash Change Remove	Repeat Reason prob Prompt wash soap N.R. Immed wet (flamm)	NIOSH ¥ SCBAF:PD,PP/SAF:PD,PP:ASCBA Escape: GMFOV:SCBAE	Inh Abs Ing Con	Irrit eyes, nose, resp sys, gidd, head, nau staggered gait, fig, anor, lass, derm, bone marrow depres, [carc]	Eye Skin Breath Swallow	Irr immed Soap wash prompt Resp support Medical attention immed	Blood, CNS, skin, bone marrow, eyes, resp sys
Clothing Goggles Wash Change Remove Provide	Any poss Any poss Immed contam/daily After work if any poss contam Immed contam Eyewash, quick drench	NIOSH ¥ SCBAF:PD,PP/SAF:PD,PP:ASCBA Escape: HiEF/SCBAE	Inh Abs Ing Con	Hema, secondary anemia from hemolysis; acute cystitis; acute liver disorders, derm; painful and irregular urination, [carc]	Eye Skin Breath Swallow	Irr immed (15 min) Soap wash immed Resp support Medical attention immed	Bladder, kidneys, liver, skin, blood
Clothing Goggles Wash Change Remove	Repeat Reason prob Prompt contam After work if reason prob contam Prompt non-imperv contam	NIOSH/OSHA 50 mg/m³: DMXSQ*/SA*/SCBA* 125 mg/m³: PAPRDM*/SA:CF* 250 mg/m³: HiEF/SCBAF/SAF/PAPRTHiE* 7000 mg/m³: SAF:PD,PP § SCBAF:PD,PP/SAF:PD,PP:ASCBA Escape: HiEF/SCBAE	Inh Ing Con	Irrit skin, eyes, muc memb; sens derm	Eye: Skin: Swallow	Irr immed Soap wash prompt Medical attention immed	Skin, resp sys, eyes

Benzoyl peroxide

Chemical name, structure/formula, CAS and RTECS Nos., and DOT ID and guide Nos.	Synonyms, trade names, and conversion factors	Exposure limits (TWA unless noted otherwise)	IDLH	Physical description	Chemical and physical properties MW, BP, SOL Fl.P, IP, Sp.Gr, flammability	 VP, FRZ UEL, LEL	Incompatibilities and reactivities	Measurement method (See Table 1)
Bromine Br_2 7726-95-6 EF9100000 1744-59	Molecular bromine 1 ppm = 6.64 mg/m³	NIOSH/OSHA 0.1 ppm (0.7 mg/m³) ST 0.3 ppm (2 mg/m³)	10 ppm	Dark reddish brown fuming liquid with suffocating, irritating fumes	MW: 159.8 BP: 139°F Sol: 4% Fl.P: NA IP: 10.55 eV Sp.Gr: 3.12 Noncombustible Liquid but accelerates the burning of combustibles	VP: 172 mm FRZ: 19°F UEL: NA LEL: NA	Combustible organics (sawdust, wood, cotton, straw, etc.), aluminum, readily oxidizable materials, ammonia, hydrogen, acetylene, phosphorus, potassium, sodium [Note: Corrodes iron, steel, stainless steel & copper.]	Bub. none IC OSHA [#ID108]
Bromoform $CHBr_3$ 75-25-2 PB5600000 2515-58	Methyl tribromide, Tribromomethane 1 ppm = 10.51 mg/m³	NIOSH/OSHA 0.5 ppm (5 mg/m³) [skin]	Unknown	Colorless to yellow liquid with a chloroform-like odor [Note: A solid below 47°F.]	MW: 252.8 BP: 301°F Sol: 0.1% Fl.P: NA IP: 10.48 eV Sp.Gr: 2.89 Noncombustible Liquid	VP: 5 mm FRZ: 47°F UEL: NA LEL: NA	Lithium, sodium, potassium, calcium, aluminum, zinc, magnesium, strong caustics, acetone [Note: Gradually decomposes, acquiring yellow color; air & light accelerate decomposition.]	Char. CS_2 GC/FID, III [#1003, Halogenated Hydrocarbons]
1,3-Butadiene CH_2=CHCH=CH_2 106-99-0 EI9275000 1010-17 (inhibited)	Biethylene, Bivinyl, Butadiene Divinyl, Erythrene, Vinylethylene 1 ppm = 2.25 mg/m³	NIOSH Ca See Appendix A Reduce exposure to lowest feasible concentration OSHA 1000 ppm (2200 mg/m³)	Ca [20,000 ppm] [LEL] ACGIH A2, 10 ppm (22 mg/m³)	Colorless gas with a mild aromatic or gasoline-like odor [Note: A liquid below 24°F.]	MW: 54.1 BP: 24°F Sol: Insoluble Fl.P: NA (Gas) <0°F (Liquid) IP: 9.07 eV Sp.Gr: 0.65 (Liquid at 24°F) Flammable Gas Class IA Flammable Liquid	VP: >1 atm FRZ: 164°F UEL: 12.0% LEL: 2.0%	Phenol, chlorine dioxide, copper, crotonaldehyde [Note: May contain inhibitors (such as tri-butylcatechol) to prevent self-polymerization. May form explosive peroxides upon exposure to air.]	Char(2), CH_2Cl_2 GC/FID, III [#1024]
2-Butanone $CH_3COCH_2CH_3$ 78-93-3 EL6475000 1193-1232-26	Ethyl methyl ketone, MEK, Methyl acetone, Methyl ethyl ketone 1 ppm = 3.00 mg/m³	NIOSH/OSHA 200 ppm (590 mg/m³) ST 300 ppm (885 mg/m³)	3000 ppm	Colorless liquid with a moderately sharp, fragrant, mint- or acetone-like odor	MW: 72.1 BP: 175°F Sol: 28% Fl.P: 16°F IP: 9.54 eV Sp.Gr: 0.81 Class IB Flammable Liquid	VP: 71 mm FRZ: 123°F UEL (200°F): 11.4% LEL (200°F): 1.4%	Strong oxidizers, amines, ammonia, inorganic acids, caustics, copper, isocyanates, pyridines	Ambersorb, CS_2 GC/FID, III [#2500]

Personal protection and sanitation (See Table 3)		Recommendations for respirator selection — maximum concentration for use (MUC) (See Table 4)	Health hazards				
			Route	Symptoms (See Table 5)	First aid (See Table 6)		Target organs (See Table 5)
Clothing Goggles Wash Change Remove Provide	Any poss Any poss Immed contam N R Immed contam Eyewash, quick drench	NIOSH/OSHA 2 5 ppm SA:CF:/PAPRS:[c] 5 ppm CCRFS:/GMFS:/SCBAF SAF PAPRTS:[c] 10 ppm SAF PD,PP § SCBAF PD,PP/SAF PD,PP ASCBA Escape GMFS/SCBAE	Inh Ing Con	Dizz, head, lac, epis, cough, feeling of oppression, pulm edema, pneu, abdom pain, diarr, *measle like eruptions*; severe burns eyes, skin	Eye Skin Breath Swallow	Irr immed Soap wash immed Resp support Medical attention *immed*	Resp sys, eyes CNS
Clothing Goggles Wash Change Remove	Repeat Reason prob Prompt contam N R Prompt non impery contam	NIOSH/OSHA 12 5 ppm SA:CF:/PAPROV[c] 25 ppm CCRFOV/GMFOV/SCBAF/SAF PAPRTOV[c] 1000 ppm SAF PD,PP § SCBAF PD,PP SAF PD,PP ASCBA Escape GMFOV SCBAE	Inh Abs Ing	Irrd eyes, resp sys, CNS depression, liver damage	Eye Skin Breath Swallow	Irr immed Soap wash prompt Resp support Medical attention immed	Skin, liver, kidneys, resp sys, CNS
Clothing Goggles Wash Change Remove	*Prevent skin freezing* Reason prob Immed wet N R Immed wet (flamm)	NIOSH ¥ SCBAF PD,PP/SAF PD,PP ASCBA Escape GMFS SCBAE	Inh Con	Irrd eyes, nose, throat, drow, li head, frostbite (carc)	Eye Skin Breath	Irr immed Water flush immed Resp support	Eyes, resp sys CNS
Clothing Goggles Wash Change Remove Provide	Repeat Reason prob N R N R Prompt non impery contam Eyewash	NIOSH/OSHA 1000 ppm PAPROV[c] CCRFOV 3000 ppm GMFOV/SA:CF[c]/SCBAF/SAF § SCBAF PD,PP/SAF PD,PP ASCBA Escape GMFOV/SCBAE	Inh Ing Con	Irrd eyes, nose, head, dizz, vomit	Eye Skin Breath Swallow	Irr immed Water wash immed Fresh air Medical attention *immed*	CNS, lungs

? Butanone

Chemical name, structure/formula, CAS and RTECS Nos., and DOT ID and guide Nos.	Synonyms, trade names, and conversion factors	Exposure limits (TWA unless noted otherwise)	IDLH	Physical description	Chemical and physical properties MW, BP, SOL Fl.P, IP, Sp.Gr, flammability	 VP, FRZ UEL, LEL	Incompatibilities and reactivities	Measurement method (See Table 1)
Dibutyl phosphate $(C_4H_9O)_2(OH)PO$ 107 66 4 TB9605000	Dibutyl acid o phosphate, di n-Butyl hydrogen phosphate, Dibutyl phosphoric acid 1 ppm = 8 74 mg/m³	NIOSH/OSHA 1 ppm (5 mg/m³) ST 2 ppm (10 mg/m³)	125 ppm	Pale amber, odorless liquid	MW 210 2 BP 212°F (Decomposes) Sol Insoluble Fl P ? IP ? Sp Gr 1 06 Combustible Liquid	VP 1 mm (approx) FRZ ? UEL ? LEL ?	Strong oxidizers	Filter, CH_3CN, GC/FPD III [#5017]
Dibutylphthalate $C_6H_4(COOC_4H_9)_2$ 84 74 2 TI0875000	DBP; Dibutyl 1,2 benzene dicarboxylate; Di n-butyl phthalate 1 ppm = 11 57 mg/m³	NIOSH/OSHA 5 mg/m³	9300 mg/m³	Colorless to faint yellow, oily liquid with a slight aromatic odor	MW 278 3 BP 644°F Sol(77°F) 0 5% Fl P 315 F IP ? Sp Gr 1 05 Class IIIB Combustible Liquid	VP <0 01 mm FRZ 31°F UEL ? LEL(456 F) 0 5%	Nitrates, strong oxidizers, alkalis & acids, liquid chlorine	Filter, CS_2, GC/FID III [#5020]
o Dichlorobenzene $C_6H_4Cl_2$ 95 50 1 CZ4500000 1591 58	o DCB; 1,2 Dichlorobenzene; ortho-Dichlorobenzene, o Dichlorobenzol 1 ppm = 6 11 mg/m³	NIOSH/OSHA C 50 ppm (300 mg/m³)	1000 ppm	Colorless to pale yellow liquid with a pleasant, aromatic odor [herbicide]	MW 147 0 BP 357°F Sol 0 01% Fl P 151°F IP 9 06 eV Sp Gr 1 30 Class IIIA Combustible Liquid	VP 1 mm FRZ 1 F UEL 9 2% LEL 2 2%	Strong oxidizers, aluminum, acids, acid fumes, chlorides	Char, CS_2, GC/FID, III [#1003, Halogenated Hydrocarbons]
p Dichlorobenzene $C_6H_4Cl_2$ 106 46 7 CZ4550000 1592 58	p DCB; 1,4 Dichlorobenzene, para-Dichlorobenzene, Dichlorocide	NIOSH Ca See Appendix A OSHA 75 ppm (450 mg/m³) ST 110 ppm (675 mg/m³)	Ca [1000 ppm]	Colorless or white crystalline solid with a mothball-like odor, [insecticide]	MW 147 0 BP 345°F Sol 0 008% Fl P 150°F IP 8 98 eV Sp Gr 1 25 Combustible Solid, but may take some effort to ignite.	VP(77°F) 0 4 mm MLT 128 F UEL ? LEL ?	Oxidizers	Char, CS_2, GC/FID, III [#1003, Halogenated Hydrocarbons]

Personal protection and sanitation (See Table 3)		Recommendations for respirator selection — maximum concentration for use (MUC) (See Table 4)	Health hazards				
			Route	Symptoms (See Table 5)	First aid (See Table 6)		Target organs (See Table 5)
Clothing: Reason prob Goggles: Reason prob Wash: Prompt contam Change: N R Remove: Prompt non-imperv contam Provide: Quick drench		NIOSH/OSHA 10 ppm: SA/SCBA 25 ppm: SA:CF 50 ppm: SCBAF/SAF/SAT:CF 125 ppm: SA:PD,PP §: SCBAF:PD,PP/SAF:PD,PP ASCBA Escape: GMFOV/HiE:SCBAE	Inh Ing Con	Irrit resp sys, skin; head	Eye: Skin: Breath: Swallow:	Irr immed Soap wash prompt Resp support Medical attention immed	Resp sys, skin
Clothing: N R Goggles: Reason prob Wash: N R Change: N R Remove: N R		NIOSH/OSHA 50 mg/m³: DMF 125 mg/m³: PAPRDM[£]/SA:CF[¥] 250 mg/m³: HiEF/SCBAF/SAF 9300 mg/m³: SAF:PD,PP §: SCBAF:PD,PP/SAF:PD,PP ASCBA Escape: HiEF/SCBAE	Inh Ing Con	Irrit upper resp tract, stomach	Eye: Skin: Breath: Swallow:	Irr immed Wash regularly Resp support Medical attention immed	Resp sys, GI tract
Clothing: Repeat Goggles: Reason prob Wash: Prompt contam Change: N R Remove: Prompt non-imperv contam		NIOSH/OSHA 1000 ppm: PAPROV[£]/CCRFOV §: SCBAF:PD,PP/SAF:PD,PP:ASCBA Escape: GMFOV/SCBAE	Inh Abs Ing Con	Irrit nose, eyes, liver, kidney damage; skin blister	Eye: Skin: Breath: Swallow:	Irr immed Soap wash prompt Resp support Medical attention immed	Liver, kidneys, skin, eyes
Clothing: Repeat Goggles: Reason prob Wash: Daily (reason prob) Change: N R Remove: N R		NIOSH ¥: SCBAF:PD,PP/SAF:PD,PP:ASCBA Escape: GMFOV/SCBAE	Inh Ing Con	Head; eye irrit; swell periorb; profuse rhinitis; anor; nau; vomit; low wgt; jaun; cirr; [carc] in animals: liver, kidney damage	Eye: Skin: Breath: Swallow:	Irr immed Soap wash Resp support Medical attention immed	Liver, resp sys, eyes, kidneys, skin

p-Dichlorobenzene

Chemical name, structure/formula, CAS and RTECS Nos., and DOT ID and guide Nos.	Synonyms, trade names, and conversion factors	Exposure limits (TWA unless noted otherwise)	IDLH	Physical description	Chemical and physical properties MW, BP, SOL Fl.P, IP, Sp.Gr, flammability	 VP, FRZ UEL, LEL	Incompatibilities and reactivities	Measurement method (See Table 1)
3,3' Dichlorobenzidine (and its salts) $C_6H_3ClNH_2C_6H_3ClNH_2$ 91 94 1 DD0525000	4,4'-Diamino-3,3'-dichlorobiphenyl; Dichlorobenzidine base; o,o' Dichlorobenzidine; 3,3' Dichlorobiphenyl 4,4' diamine; 3,3 Dichloro-4,4'-biphenyldiamine; 3,3' Dichloro 4,4' diamino biphenyl	NIOSH Ca See Appendix A OSHA [1910 1007] See Appendix B ACGIH A2 [skin]	Ca	Gray to purple crystalline solid	MW 253 1 BP 788°F Sol Almost Insoluble Fl P ? IP ?	VP ? MLT 271°F UEL ? LEL ?	None reported	Filter/ Si gel, Reagent, HPLC/UVD, III [#5509]
Dichlorodifluoromethane CCl_2F_2 75 71 8 PA8200000	Difluorodichloromethane, Fluorocarbon 12, Freon® 12, Halon® 122, Propellant 12, Refrigerant 12	NIOSH/OSHA 1000 ppm (4950 mg/m³)	50,000 ppm	Colorless gas with an ether-like odor at extremely high concentrations [Note Shipped as a liquefied compressed gas]	MW 120 9 BP -22°F Sol(77°F) 0 03% Fl P NA IP 11 75 eV	VP >1 atm FRZ -252°F UEL NA LEL NA	Chemically active metals such as sodium, potassium calcium, powdered aluminum, zinc & magnesium	Char(2), CH_2Cl_2 GC/FID III [#1018]
1028 12	1 ppm = 5 03 mg/m³				Nonflammable Gas			
1,3 Dichloro-5,5-dimethylhydantoin $C_5H_6Cl_2N_2O_2$ 118 52 5 MU0700000	Dactin, DDH, Halane	NIOSH/OSHA 0 2 mg/m³ ST C 4 mg/m³	Unknown	White powder with a chlorine-like odor	MW 197 0 BP ? Sol 0 2% Fl P 346°F IP ? Sp Gr 1 5 Combustible Solid	VP ? MLT 270°F UEL ? LEL ?	Water, strong acids, easily oxidized materials such as ammonia salts & sulfides	None available
1,1 Dichloroethane $CHCl_2CH_3$ 75 34 3 KI0175000	Asymmetrical dichloroethane; Ethylidene chloride; 1,1 Ethylidene dichloride	NIOSH/OSHA 100 ppm (400 mg/m³)	4000 ppm	Colorless, oily liquid with a chloroform-like odor	MW 99 0 BP 135°F Sol 0 6% Fl P(oc) 22°F IP 11 06 eV Sp Gr 1 18 Class IB Flammable Liquid	VP(77°F) 230 mm FRZ -143°F UEL ? LEL 5 6%	Strong oxidizers, strong caustics	Char, CS_2, GC/FID, III [#1003, Halogenated Hydrocarbons]
2362 27	1 ppm = 4 12 mg/m³							

Personal protection and sanitation (See Table 3)		Recommendations for respirator selection — maximum concentration for use (MUC) (See Table 4)	Health hazards				
			Route	Symptoms (See Table 5)	First aid (See Table 6)		Target organs (See Table 5)
Clothing:	Any poss	NIOSH	Inh	Allergic skin reaction,	Eye:	Irr immed (15 min)	Bladder, liver,
Goggles:	Any poss	¥: SCBAF:PD,PP/SAF:PD,PP:ASCBA	Abs	sens, derm; head, dizz;	Skin:	Soap wash immed	lung, skin, GI
Wash:	Immed contam/daily	Escape: HiEF/SCBAE	Ing	caustic burns; frequent	Breath:	Resp support	tract
Change:	After work if any poss contam		Con	urination, dysuria; hema; GI upsets; upper resp infection; [carc]	Swallow:	Medical attention immed	
Remove:	Immed contam						
Provide:	Eyewash, quick drench						
Clothing:	Prevent wet or freezing	NIOSH/OSHA	Inh	Dizz, tremors,	Eye:	Irr immed	CVS, PNS
Goggles:	Reason prob	10,000 ppm: SA/SCBA	Con	unconsciousness, card arrhy, card arrest	Skin:	Water flush immed	
Wash:	N.R.	25,000 ppm: SA:CF			Breath:	Resp support	
Change:	N.R.	50,000 ppm: SCBAF/SAF					
Remove:	Immed wet (flamm)	§: SCBAF:PD,PP/SAF:PD,PP:ASCBA					
		Escape: GMFOV/SCBAE					
Clothing:	Repeat	NIOSH/OSHA	Inh	Irrit eyes, muc memb,	Eye:	Irr immed	Resp sys, eyes
Goggles:	Any poss	2 mg/m³: SA/SCBA	Ing	resp sys	Skin:	Soap wash prompt	
Wash:	Prompt contam	5 mg/m³: SA:CF/SCBAF/SAF	Con		Breath:	Resp support	
Change:	After work if reason prob contam	§: SCBAF:PD,PP/SAF:PD,PP:ASCBA			Swallow:	Medical attention immed	
Remove:	Prompt non-imperv contam	Escape: GMFSHiE/SCBAE					
Provide:	Eyewash						
Clothing:	Repeat	NIOSH/OSHA	Inh	CNS depres; skin irrit;	Eye:	Irr immed	Skin, liver,
Goggles:	Reason prob	1000 ppm: SA/SCBA	Ing	liver, kidney damage	Skin:	Soap flush prompt	kidneys
Wash:	Immed wet	2500 ppm: SA:CF	Con		Breath:	Resp support	
Change:	N.R.	4000 ppm: SCBAF/SAF			Swallow:	Medical attention immed	
Remove:	Immed wet (flamm)	§: SCBAF:PD,PP/SAF:PD,PP:ASCBA					
		Escape: GMFOV/SCBAE					

1,1-Dichloroethane

Chemical name, structure/formula, CAS and RTECS Nos., and DOT ID and guide Nos.	Synonyms, trade names, and conversion factors	Exposure limits (TWA unless noted otherwise)	IDLH	Physical description	Chemical and physical properties MW, BP, SOL Fl.P, IP, Sp.Gr, flammability	 VP, FRZ UEL, LEL	Incompatibilities and reactivities	Measurement method (See Table 1)
Ethyl acrylate CH_2=$CHCOOC_2H_5$ 140 88 5 AT0700000 1917 27	Ethyl acrylate (inhibited). Ethyl ester of acrylic acid. Ethyl propenoate 1 ppm = 4 16 mg/m³	NIOSH Ca See Appendix A OSHA 5 ppm (20 mg/m³) ST 25 ppm (100 mg/m³) [skin]	Ca [2000 ppm]	Colorless liquid with an acrid odor	MW 100 1 BP 211°F Sol 2% Fl P 48 F IP ? Sp Gr 0 92 Class IB Flammable Liquid	VP 29 mm FRZ 96 F UEL 14% LEL 1 4%	Oxidizers, peroxides, polymerizers, strong alkalis, moisture, chlorosulfonic acid [Note Polymerizes readily unless an inhibitor such as hydroquinone is added]	Char, CS_2, GC/FID III [#1450 Esters I]
Ethylamine $CH_3CH_2NH_2$ 75 04 7 KH2100000 1036 68	Aminoethane. Ethylamine (anhydrous). Monoethylamine 1 ppm = 1 87 mg/m³	NIOSH OSHA 10 ppm (18 mg/m³)	4000 ppm	Colorless gas or water-white liquid (below 62°F) with an ammonia like odor [Note Shipped as a liquefied compressed gas]	MW 45 1 BP 62°F Sol Miscible Fl P 1 F IP 8 86 eV Sp Gr 0 69 (Liquid) Flammable Gas Class IA Flammable Liquid	VP >1 atm FRZ 114°F UEL 14 0% LEL 3 5%	Strong acids, strong oxidizers, copper, tin & zinc in presence of moisture, cellulose nitrate	Si gel, H_2SO_4, GC/FID II(3) [#S144]
Ethyl benzene $CH_3CH_2C_6H_5$ 100 41 4 DA0700000 1175 26	Ethylbenzol Phenylethane 1 ppm = 4 41 mg/m³	NIOSH/OSHA 100 ppm (435 mg/m³) ST 125 ppm (545 mg/m³)	2000 ppm	Colorless liquid with an aromatic odor	MW 106 2 BP 277 F Sol 0 01% Fl P 55 F IP 8 76 eV Sp Gr 0 87 Class IB Flammable Liquid	VP(79°F) 10 mm FRZ 139 F UEL 6 7% LEL 1 0%	Strong oxidizers	Char, CS_2, GC/FID, III [#1501, Aromatic Hydro carbons]
Ethyl bromide CH_3CH_2Br 74 96 4 KH6475000 1891 58	Bromoethane 1 ppm = 4 53 mg/m³	NIOSH See Appendix D OSHA 200 ppm (890 mg/m³) ST 250 ppm (1110 mg/m³)	3500 ppm	Colorless to yellow liquid with an ether like odor [Note A gas above 101 F]	MW 109 0 BP 101°F Sol 0 9% Fl P <4°F IP 10 29 eV Sp Gr 1 46 Class IB Flammable Liquid	VP(70°F) 400 mm FRZ 182°F UEL 8 0% LEL 6 8%	Chemically active metals such as sodium, potassium, calcium, powdered aluminum, zinc & magnesium	Char, 2 Propanol, GC/FID, III [#1011]

Personal protection and sanitation (See Table 3)		Recommendations for respirator selection — maximum concentration for use (MUC) (See Table 4)	Route	Symptoms (See Table 5)	Health hazards First aid (See Table 6)		Target organs (See Table 5)
Clothing: Goggles: Wash: Change: Remove:	Repeat Reason prob Prompt wet N R Immed wet (flamm)	NIOSH ¥: SCBAF:PD,PP/SAF:PD,PP:ASCBA Escape: GMFOV/SCBAE	Inh Abs Ing Con	Irrit eyes, resp sys, skin; [carc]	Eye: Skin: Breath: Swallow:	Irr immed Water flush immed Resp support Medical attention immed	Resp sys, eyes, skin
Clothing: Goggles: Wash: Change: Remove: Provide:	Reason prob Any poss Immed contam N R Immed wet/Immed non-imperv contam Eyewash, quick drench	NIOSH/OSHA 250 ppm: SA:CF[‡]/PAPRS[‡] 500 ppm: CCRFS/GMFS/SCBAF/SAF 4000 ppm: SAF:PD,PP §: SCBAF:PD,PP/SAF:PD,PP:ASCBA Escape: GMFS/SCBAE	Inh Abs Ing Con	Irrit eyes; burns skin; resp irrit; derm	Eye: Skin: Breath: Swallow:	Irr immed Water flush immed Resp support Medical attention immed	Resp sys, eyes, skin
Clothing: Goggles: Wash: Change: Remove:	Repeat Reason prob Prompt contam N R Immed wet (flamm)	NIOSH/OSHA 1000 ppm: PAPROV*/SA*/SCBA*/CCROV* 2000 ppm: GMFOV/SCBAF/SAF §: SCBAF:PD,PP/SAF:PD,PP:ASCBA Escape: GMFOV/SCBAE	Inh Ing Con	Irrit eyes, muc memb; head; derm; narco, coma	Eye: Skin: Breath: Swallow:	Irr immed Water flush prompt Resp support Medical attention immed	Eyes, upper resp sys, skin, CNS
Clothing: Goggles: Wash: Change: Remove:	Repeat Reason prob Prompt wet N R Immed wet (flamm)	OSHA 2000 ppm: SA/SCBA 3500 ppm: SA:CF/SCBAF/SAF §: SCBAF:PD,PP/SAF:PD,PP:ASCBA Escape: GMFOV/SCBAE	Inh Ing Con	Irrit eyes, resp sys, skin; CNS depres; pulm edema, liver, kidney disease; card arrhy; card arrest	Eye: Skin: Breath: Swallow:	Irr immed Soap flush prompt Resp support Medical attention immed	Skin, liver, kidneys, resp sys, CVS, CNS

Ethyl bromide

Chemical name, structure/formula, CAS and RTECS Nos., and DOT ID and guide Nos.	Synonyms, trade names, and conversion factors	Exposure limits (TWA unless noted otherwise)	IDLH	Physical description	Chemical and physical properties: MW, BP, SOL, FI.P, IP, Sp.Gr, flammability	Chemical and physical properties: VP, FRZ, UEL, LEL	Incompatibilities and reactivities	Measurement method (See Table 1)
Ethyl butyl ketone $CH_3CH_2CO[CH_2]_3CH_3$ 106 35 4 MJ5250000	Butyl ethyl ketone, 3 Heptanone	NIOSH/OSHA 50 ppm (230 mg/m³)	3000 ppm	Colorless liquid with a powerful, fruity odor	MW 114 2 BP 298°F Sol 1% FI P(oc) 115 F IP 9 02 eV	VP 4 mm FRZ 38 F UEL ? LEL ?	Oxidizers acetaldehyde, perchloric acid	Char, Methanol/ CS_2, GC/FID, III [#1301 Ketones II]
	1 ppm = 4 75 mg/m³				Sp Gr 0 82 Class II Combustible Liquid			
Ethyl chloride CH_3CH_2Cl 75 00 3 KH7525000	Chloroethane, Hydrochloric ether, Monochloroethane, Muriatic ether	NIOSH See Appendix D Handle with caution in the workplace. OSHA 1000 ppm (2600 mg/m³)	20,000 ppm	Colorless gas or liquid (below 54°F) with a pungent, ether like odor [Note Shipped as a liquefied compressed gas]	MW 64 5 BP 54°F Sol 0 6% FI P NA (Gas) IP 10 97 eV	VP >1 atm FRZ 218°F UEL 15 4% LEL 3 8%	Chemically active metals such as sodium, potassium, calcium, powdered aluminum, zinc & magnesium, oxidizers, water or steam [Note Reacts with water to form hydrochloric acid]	Char(2), CS_2, GC/FID, III [#2519]
1037 27	1 ppm = 2 68 mg/m³				Sp Gr 0 92 (Liquid at 32 F) Flammable Gas Class IA Flammable Liquid			
Ethylene chlorohydrin CH_2ClCH_2OH 107 07 3 KK0875000	2 Chloroethanol, 2 Chloroethyl alcohol, Ethylene chlorhydrin	NIOSH/OSHA C 1 ppm (3 mg/m³) [skin]	10 ppm	Colorless liquid with a faint, ether-like odor	MW 80 5 BP 262 F Sol Miscible FI P 140 F IP 10 90 eV	VP 5 mm FRZ 90 F UEL 15 9% LEL 4 9%	Strong oxidizers, strong caustics, water or steam	Char(pet), 2 Propanol/ CS_2, GC/FID, III [#2513]
1135 55	1 ppm = 3 35 mg/m³				Sp Gr 1 20 Class IIIA Combustible Liquid			
Ethylenediamine $NH_2CH_2CH_2NH_2$ 107 15 3 KH8575000	1,2 Diaminoethane, 1,2 Ethanediamine, Ethylenediamine (anhydrous)	NIOSH/OSHA 10 ppm (25 mg/m³)	2000 ppm	Colorless, viscous liquid with an ammonia like odor [Note A solid below 47°F] [fungicide]	MW 60 1 BP 241°F Sol Miscible FI P 93°F IP 8 60 eV	VP 11 mm FRZ 47°F UEL 14 4% LEL 4 2%	Strong acids & oxidizers, carbon tetrachloride & other chlorinated organic compounds, carbon disulfide [Note Corrosive to metals]	XAD 2*, DMF, HPLC/UVD, III [#2540]
1604 29	1 ppm = 2 50 mg/m³				Sp Gr 0 91 Class IC Flammable Liquid			

Personal protection and sanitation (See Table 3)		Recommendations for respirator selection — maximum concentration for use (MUC) (See Table 4)	Health hazards				
			Route	Symptoms (See Table 5)	First aid (See Table 6)		Target organs (See Table 5)
Clothing Goggles Wash Change Remove	Repeat Reason prob Prompt contam N R Prompt non imperv contam	NIOSH/OSHA 500 ppm: CCROV*/SA*/SCBA* 1000 ppm: PAPROV*/CCRFOV 1250 ppm: SA:CF* 2500 ppm: GMFOV/SCBAF/SAF 3000 ppm: SAF:PD,PP §: SCBAF:PD,PP/SAF:PD,PP ASCBA Escape: GMFOV/SCBAE	Inh Ing Con	Irrit eyes, muc memb; head; narco; coma; derm	Eye: Skin: Breath: Swallow	Irr immed Water flush Resp support Medical attention immed	Eyes, skin, resp sys
Clothing Goggles Wash Change Remove	Repeat Reason prob N R N R Immed wet (flamm)	OSHA 10,000 ppm: SA*/SCBA* 20,000 ppm: SA:CF*/SCBAF/SAF §: SCBAF:PD,PP/SAF:PD,PP ASCBA Escape: GMFOV/SCBAE	Inh Abs Ing Con	Inco; inebriate; abdom cramps; card arrhy; card arrest; liver; kidney damage	Eye: Skin Breath: Swallow	Irr immed Water flush prompt Resp support Medical attention immed	Liver, kidneys, resp sys, CVS
Clothing Goggles Wash Change Remove Provide	Any poss Any poss Immed contam N R Immed non imperv contam Eyewash; quick drench	NIOSH/OSHA 10 ppm: SCBA*/SA* §: SCBAF:PD,PP/SAF:PD,PP ASCBA Escape: GMFOV/SCBAE	Inh Abs Ing Con	Irrit muc memb; nau, vomit; verti; inco; numb; vis dist; head; thirst; delirium; low BP, collapse; shock; coma	Eye Skin Breath Swallow	Irr immed Water flush immed Resp support Medical attention immed	Resp sys, liver, kidneys, CNS, skin, CVS
Clothing Goggles Wash Change Remove Provide	Any poss Any poss Immed contam daily After work if any poss contam Immed wet/Immed non imperv contam Eyewash (>5%); quick drench	NIOSH/OSHA 250 ppm: SA:CF[ξ]/PAPRS[ξ] 500 ppm: CCRFS/GMFS/SCBAF/SAF 2000 ppm: SAF:PD,PP §: SCBAF:PD,PP/SAF:PD,PP ASCBA Escape: GMFS/SCBAE	Inh Abs Ing Con	Nasal irrit; primary irrit; sens derm; irrit resp sys; asthma; liver; kidney damage	Eye Skin Breath Swallow	Irr immed Water flush immed Resp support Medical attention immed	Resp sys, liver, kidneys, skin

Ethylenediamine

Chemical name, structure/formula, CAS and RTECS Nos., and DOT ID and guide Nos.	Synonyms, trade names, and conversion factors	Exposure limits (TWA unless noted otherwise)	IDLH	Physical description	Chemical and physical properties MW, BP, SOL Fl.P, IP, Sp.Gr, flammability	 VP, FRZ UEL, LEL	Incompatibilities and reactivities	Measurement method (See Table 1)
Hexachloroethane Cl_3CCCl_3 67-72-1 KI4025000 9037 53	Carbon hexachloride, Perchloroethane	NIOSH Ca See Appendix A 1 ppm (10 mg/m³) [skin] OSHA 1 ppm (10 mg/m³) [skin]	Ca [300 ppm]	Colorless crystals with a camphor-like odor.	MW: 236.7 BP: Sublimes Sol(72°F): 0.005% Fl.P: NA IP: 11.22 eV Sp.Gr: 2.09 Noncombustible Solid	VP: 0.2 mm MLT: 368°F (Sublimes) UEL: NA LEL: NA	Alkalis, metals such as zinc, cadmium, aluminum, hot iron & mercury	Char., CS_2, GC/FID, III [#1003, Halogenated Hydrocarbons]
Hexachloronaphthalene $C_{10}H_2Cl_6$ 1335-87-1 QJ7350000	Halowax® 1014	NIOSH/OSHA 0.2 mg/m³ [skin]	2 mg/m³	White to light yellow solid with an aromatic odor.	MW: 334.9 BP: 650-730°F Sol: Insoluble Fl.P: NA IP: ? Sp.Gr: 1.78 Noncombustible Solid	VP: <1 mm MLT: 279°F UEL: NA LEL: NA	Strong oxidizers	Filter, Hexane, GC/ECD, II(2) [#S100]
n-Hexane $CH_3[CH_2]_4CH_3$ 110-54-3 MN9275000 1208 27	Hexane, Hexyl hydride, Normal-hexane 1 ppm = 3.58 mg/m³	NIOSH/OSHA 50 ppm (180 mg/m³)	5000 ppm	Colorless liquid with a gasoline-like odor.	MW: 86.2 BP: 156°F Sol: 0.002% Fl.P: -7°F IP: 10.18 eV Sp.Gr: 0.66 Class IB Flammable Liquid	VP(77°F): 150 mm FRZ: -219°F UEL: 7.5% LEL: 1.1%	Strong oxidizers	Char., CS_2, GC/FID, III [#1500, Hydrocarbons]
2-Hexanone $CH_3CO(CH_2)_3CH_3$ 591-78-6 MP1400000 1 ppm = 4.17 mg/m³	Butyl methyl ketone, MBK, Methyl butyl ketone, Methyl n-butyl ketone	NIOSH 1 ppm (4 mg/m³) OSHA 5 ppm (20 mg/m³)	5000 ppm	Colorless liquid with an acetone-like odor.	MW: 100.2 BP: 262°F Sol: 2% Fl.P: 77°F IP: 9.34 eV Sp.Gr: 0.81 Class IC Flammable Liquid	VP(77°F): 4 mm FRZ: -71°F UEL: 8% LEL: ?	Strong oxidizers	Char., CS_2, GC/FID, III [#1300, Ketones I]

Personal protection and sanitation (See Table 3)		Recommendations for respirator selection — maximum concentration for use (MUC) (See Table 4)	Health hazards				
			Route	Symptoms (See Table 5)	First aid (See Table 6)		Target organs (See Table 5)
Clothing Goggles Wash Change Remove	Repeat N R Prompt contam daily After work if reason prob contam Prompt non imperv contam	NIOSH ¥ SCBAF PD,PP/SAF PD,PP ASCBA Escape GMFOV/SCBAE	Inh Abs Ing Con	Irrit eyes, [carc]	Eye Skin Breath Swallow	Irr immed Soap wash immed Resp support Medical attention immed	Eyes
Clothing Goggles Wash Change Remove	Any poss molt Repeat liq sol Reason prob fumes Any poss molt Reason prob liq Prompt contam daily After work if reason prob contam Immed wet molt Prompt non imperv contam liq	NIOSH/OSHA 2 mg m³ SA* SCBA* § SCBAF PD,PP/SAF PD,PP ASCBA Escape GMFOV SCBAE	Inh Abs Ing Con	Acne form derm, nau, conf, jaun, coma	Eye Skin Breath Swallow	Irr immed Soap wash prompt Resp support Medical attention immed	Liver, skin
Clothing Goggles Wash Change Remove	Repeat Reason prob Prompt contam N R Immed wet (flamm)	NIOSH/OSHA 500 ppm SA*/SCBA* 1250 ppm SA CF* 2500 ppm SAT CF*/SCBAF/SAF 5000 ppm SAF PD,PP § SCBAF PD,PP/SAF PD,PP ASCBA Escape GMFOV SCBAE	Inh Ing Con	Irrit head, nau, head, numb extremities, musc weak, irrit eyes, nose, derm, chemical pneu, gidd	Eye Skin Breath Swallow	Irr immed Soap wash immed Resp support Medical attention immed	Skin, eyes, resp sys
Clothing Goggles Wash Change Remove	Reason prob Reason prob Prompt contam N R Immed wet (flamm)	NIOSH 10 ppm SA SCBA 25 ppm SA CF 50 ppm SCBAF/SAF SAT CF 2000 ppm SAF PD,PP § SCBAF PD,PP/SAF PD,PP ASCBA Escape GMFOV SCBAE	Inh Abs Ing Con	Irrit eyes, nose, peri neur weak, pares, derm, head, drow	Eye Skin Breath Swallow	Irr immed Soap wash immed Resp support Medical attention immed	CNS, skin, resp sys

2 Hexanone

Chemical name, structure/formula, CAS and RTECS Nos., and DOT ID and guide Nos.	Synonyms, trade names, and conversion factors	Exposure limits (TWA unless noted otherwise)	IDLH	Physical description	Chemical and physical properties MW, BP, SOL Fl.P, IP, Sp.Gr, flammability	 VP, FRZ UEL, LEL	Incompatibilities and reactivities	Measurement method (See Table 1)
Methyl chloroform CH_3CCl_3 71 55 6 KJ2975000 2831 74	Chlorothene, 1,1,1-Trichloroethane, 1,1,1 Trichloroethane (stabilized) 1 ppm = 5 55 mg/m³	NIOSH C 350 ppm (1900 mg/m³) [15 min] OSHA 350 ppm (1900 mg/m³) ST 450 ppm (2450 mg/m³)	1000 ppm	Colorless liquid with a mild, chloroform like odor	MW 133 4 BP 165°F Sol 0 4% Fl P None IP 11 00 eV Sp Gr 1 34 Noncombustible Liquid however the vapor will burn	VP 100 mm FRZ -23 F UEL 12 5% LEL 7 5%	Strong caustics, strong oxidizers, chemically-active metals such as zinc, aluminum, magnesium powders, sodium & potassium, water [Note Reacts slowly with water to form hydrochloric acid]	Char, CS_2, GC/FID, III [#1003, Halogenated Hydrocarbons]
Methylcyclohexane $CH_3C_6H_{11}$ 108 87 2 GV6125000 2296 27	Cyclohexylmethane, Hexahydrotoluene 1 ppm = 4 08 mg/m³	NIOSH/OSHA 400 ppm (1600 mg/m³)	10 000 ppm	Colorless liquid with a faint, benzene like odor	MW 98 2 BP 214°F Sol Insoluble Fl P 25°F IP 9 85 eV Sp Gr 0 77 Class IB Flammable Liquid	VP(72 F) 43 mm FRZ 196 F UEL 6 7% LEL 1 2%	Strong oxidizers	Char CS_2, GC/FID, III [#1500, Hydrocarbons]
Methylcyclohexanol $CH_3C_6H_{10}OH$ 25639 42 3 GW0175000 2617 26	Hexahydrocresol, Hexahydromethylphenol 1 ppm = 4 75 mg/m³	NIOSH/OSHA 50 ppm (235 mg/m³)	10 000 ppm	Straw-colored liquid with a weak odor like coconut oil	MW 114 2 BP 311-356°F Sol 4% Fl P 154°F IP ? Sp Gr 0 92 Class IIIA Combustible Liquid	VP(86°F) 2 mm FRZ 58 F UEL ? LEL ?	Strong oxidizers	Char, CH_2Cl_2, GC/FID, II(4) [#S374]
o-Methylcyclohexanone $CH_3C_6H_9O$ 583 60 8 GW1750000 2297 26	2 Methylcyclohexanone 1 ppm = 4 66 mg/m³	NIOSH/OSHA 50 ppm (230 mg/m³) ST 75 ppm (345 mg/m³ [skin]	2500 ppm	Colorless liquid with a weak peppermint like odor	MW 112 2 BP 325°F Sol Insoluble Fl P 118°F IP ? Sp Gr 0 93 Class II Combustible Liquid	VP 1 mm (approx) FRZ 7°F UEL ? LEL ?	Strong oxidizers	Porapak, Acetone, GC/FID, III [#2521]

Personal protection and sanitation (See Table 3)		Recommendations for respirator selection — maximum concentration for use (MUC) (See Table 4)	Health hazards				
			Route	Symptoms (See Table 5)	First aid (See Table 6)		Target organs (See Table 5)
Clothing: Goggles: Wash: Change: Remove:	Repeat Reason prob Prompt wet N.R. Prompt non-imperv wet	NIOSH/OSHA 1000 ppm: SA*/SCBA* §: SCBAF:PD,PP/SAF:PD,PP ASCBA Escape: GMFOV/SCBAE	Inh Ing Con	Head, lass, CNS depres, poor equi; irrit eyes; derm; card arrhy	Eye: Skin: Breath: Swallow:	Irr immed Soap wash prompt Resp support Medical attention immed	Skin, CNS, CVS, eyes
Clothing: Goggles: Wash: Change: Remove:	Repeat Reason prob Prompt wet N.R. Immed wet (flamm)	NIOSH/OSHA 4000 ppm: SA/SCBA 10,000 ppm: SA:CF/SCBAF/SAF §: SCBAF:PD,PP/SAF:PD,PP:ASCBA Escape: GMFOV/SCBAE	Inh Ing Con	Lt head, drow; skin, nose, throat irrit	Eye: Skin: Breath: Swallow:	Irr immed Soap wash prompt Resp support Medical attention immed	Resp sys, skin
Clothing: Goggles: Wash: Change: Remove:	Repeat Reason prob Prompt contam N.R. Prompt non-imperv contam	NIOSH/OSHA 500 ppm: SA*/SCBA* 1250 ppm: SA:CF* 2500 ppm: SCBAF:SAF 10,000 ppm: SAF:PD,PP §: SCBAF:PD,PP/SAF:PD,PP:ASCBA Escape: GMFOV/SCBAE	Inh Abs Ing Con	Head; irrit eyes, upper resp sys; in animals: narco; liver, kidney damage	Eye: Skin: Breath: Swallow:	Irr immed Soap wash prompt Resp support Medical attention immed	Resp sys, skin, eyes; in animals: CNS, liver, kidneys
Clothing: Goggles: Wash: Change: Remove:	Repeat Reason prob Prompt contam N.R. Prompt non-imperv contam	NIOSH/OSHA 500 ppm: SA*/SCBA* 1250 ppm: SA:CF* 2500 ppm: SCBAF/SAF §: SCBAF:PD,PP/SAF:PD,PP:ASCBA Escape: GMFOV/SCBAE	Inh Abs Ing Con	In animals: narco; irrit eyes, muc memb; derm	Eye: Skin: Breath: Swallow:	Irr immed Soap wash prompt Resp support Medical attention immed	In animals: resp sys, liver, kidneys, skin

o Methylcyclohexanone

Chemical name, structure/formula, CAS and RTECS Nos., and DOT ID and guide Nos.	Synonyms, trade names, and conversion factors	Exposure limits (TWA unless noted otherwise)	IDLH	Physical description	Chemical and physical properties MW, BP, SOL Fl.P, IP, Sp.Gr, flammability	 VP, FRZ UEL, LEL	Incompatibilities and reactivities	Measurement method (See Table 1)
Methylene bisphenyl isocyanate $CH_2(C_6H_4NCO)_2$ 101 68 8 NQ9350000 2489 53	4,4' Diphenylmethane diisocyanate; MDI; Methylene bis(4 phenyl isocyanate; Methylene di-p-phenylene ester of isocyanic acid	NIOSH 0.05 mg/m³ (0.005 ppm) C 0.2 mg/m³ (0.020 ppm) [10 min] OSHA C 0.2 mg/m³) (0.02 ppm)	100 mg/m³	White to light yellow, odorless flakes [Note: A liquid above 99°F.]	MW: 250.3 BP: 342°F Sol: 0.2% Fl P(oc): 396°F IP: ? Sp.Gr(122°F): 1.19 Combustible Solid	VP(104°F) 0.001 mm MLT 99°F UEL: ? LEL: ?	Strong alkalis, acids, alcohol	Bub; Acetylate; HPLC/UVD; III [#5521]
Methylene chloride CH_2Cl_2 75 09 2 PA8050000 1593 74	Dichloromethane; Methylene dichloride 1 ppm = 3.53 mg/m³	NIOSH Ca See Appendix A Reduce exposure to lowest feasible concentration OSHA 500 ppm C 1000 ppm 2000 ppm (5 min max peak in any 2 hrs)	Ca [5000 ppm] ACGIH A2; 50 ppm (175 mg/m³)	Colorless liquid with a chloroform-like odor. [Note: A gas above 104°F.]	MW: 84.9 BP: 104°F Sol: 2% Fl P: ? IP: 11.32 eV Sp.Gr: 1.33 Combustible Liquid	VP: 350 mm FRZ: -139°F UEL: 22% LEL: 14%	Strong oxidizers, caustics, chemically active metals such as aluminum, magnesium powders, potassium & sodium, concentrated nitric acid	Char(2); CS_2; GC/FID; III [#1005]
Methyl formate $HCOOCH_3$ 107 31 3 LQ8925000 1243 26	Methyl ester of formic acid; Methyl methanoate 1 ppm = 2.50 mg/m³	NIOSH/OSHA 100 ppm (250 mg/m³) ST 150 ppm (375 mg/m³)	5000 ppm	Colorless liquid with a pleasant odor [Note: A gas above 89°F.]	MW: 60.1 BP: 89°F Sol: 30% Fl P: -2°F IP: 10.82 eV Sp.Gr: 0.98 Class IA Flammable Liquid	VP: 476 mm FRZ: -148°F UEL: 23% LEL: 4.5%	Strong oxidizers [Note: Reacts slowly with water to form methanol & formic acid.]	Carbo B(2); Ethyl acetate; GC/FID; II(5) [#S291]
5-Methyl-3-heptanone $CH_3CH_2CO(CH_2)_4CH_3$ 541 85 5 MJ7350000 2271 26	Amyl ethyl ketone; Ethyl amyl ketone 1 ppm = 5.33 mg/m³	NIOSH/OSHA 25 ppm (130 mg/m³)	3000 ppm	Colorless liquid with a pungent odor	MW: 128.2 BP: 315°F Sol: Insoluble Fl P: 138°F IP: ? Sp.Gr: 0.82 Class II Combustible Liquid	VP: 2 mm FRZ: -70°F UEL: ? LEL: ?	Strong oxidizers	Char; Methanol/ CS_2; GC/FID; III; [#1301, Ketones II]

Personal protection and sanitation (See Table 3)		Recommendations for respirator selection — maximum concentration for use (MUC) (See Table 4)	Health hazards				
			Route	Symptoms (See Table 5)	First aid (See Table 6)		Target organs (See Table 5)
Clothing: Goggles: Wash: Change: Remove:	Reason prob Any poss Prompt contam After work if reason prob contam Prompt non-imperv contam	NIOSH 2 mg/m³: SA*/SCBA* 5 mg/m³: SA:CF* 10 mg/m³: SCBAF/SAF 100 mg/m³: SCBAF:PD,PP §: SCBAF:PD,PP/SAF:PD,PP:ASCBA Escape: GMFOVHiE/SCBAE	Inh Ing Con	Irrit eyes, nose, throat; cough, pulm secretions, chest pain, dysp; asthma	Eye: Skin: Breath: Swallow:	Irr immed Soap wash immed Resp support Medical attention immed	Resp sys, eyes
Clothing: Goggles: Wash: Change: Remove:	Repeat Reason prob Prompt wet N.R. Prompt non-imperv wet	NIOSH ¥: SCBAF:PD,PP/SAF:PD,PP:ASCBA Escape: GMFOV/SCBAE	Inh Ing Con	Ftg, weak, sleepiness, h-head, limbs numb, tingle, nau, irrit eyes, skin, [carc]	Eye: Skin: Breath: Swallow:	Irr immed Soap wash prompt Resp support Medical attention immed	Skin, CVS, eyes, CNS
Clothing: Goggles: Wash: Change: Remove:	Repeat Reason prob Prompt wet N.R. Immed wet (flamm)	NIOSH/OSHA 1000 ppm: SA*/SCBA* 2500 ppm: SA:CF* 5000 ppm: SCBAF/SAF §: SCBAF:PD,PP/SAF:PD,PP:ASCBA Escape: GMFOV/SCBAE	Inh Abs Ing Con	Eye, nose irrit; chest oppression, dysp; vis dist; CNS depres; in animals: pulm edema	Eye: Skin: Breath: Swallow:	Irr immed Soap wash immed Resp support Medical attention immed	Eyes, resp sys, CNS
Clothing: Goggles: Wash: Change: Remove:	Any poss Reason prob Prompt wet N.R. Prompt non-imperv wet	NIOSH/OSHA 250 ppm: SA*/SCBA* 625 ppm: SA:CF*/PAPROV* 1000 ppm: CCRFOV 1250 ppm: GMFOV/SCBAF/SAF 3000 ppm: SAF:PD,PP §: SCBAF:PD,PP/SAF:PD,PP:ASCBA Escape: GMFOV/SCBAE	Inh Ing Con	Irrit eyes, muc memb; head, narco, coma; derm	Eye: Skin: Breath: Swallow:	Irr immed Water flush Resp support Medical attention immed	Eyes, skin, resp sys, CNS

5-Methyl-3-heptanone

Chemical name, structure/formula, CAS and RTECS Nos., and DOT ID and guide Nos.	Synonyms, trade names, and conversion factors	Exposure limits (TWA unless noted otherwise)	IDLH	Physical description	Chemical and physical properties: MW, BP, SOL, Fl.P, IP, Sp.Gr, flammability	Chemical and physical properties: VP, FRZ, UEL, LEL	Incompatibilities and reactivities	Measurement method (See Table 1)
Styrene $C_6H_5CH{=}CH_2$ 100 42 5 WL3675000 2055 27 (inhibited)	Ethenyl benzene, Phenylethylene, Styrene monomer, Styrol, Vinyl benzene 1 ppm = 4 33 mg/m³	NIOSH/OSHA 50 ppm (215 mg/m³) ST 100 ppm (425 mg/m³)	5000 ppm	Colorless to yellow, oily liquid with a sweet, floral odor.	MW 104 2 BP 293°F Sol Slight Fl P 88°F IP 8 40 eV Sp Gr 0 91 Class IC Flammable Liquid	VP 5 mm FRZ 23°F UEL 7 0% LEL 1 1%	Oxidizers, catalysts for vinyl polymers, peroxides, strong acids, aluminum chloride [Note May polymerize if contaminated or subjected to heat Usually contains an inhibitor such as tert-butylcatechol]	Char, CS_2, GC/FID, III [#1501, Aromatic Hydrocarbons]
Sulfur dioxide SO_2 7446 09 5 WS4550000 1079 16	Sulfurous acid anhydride, Sulfurous oxide, Sulfur oxide 1 ppm = 2 66 mg/m³	NIOSH/OSHA 2 ppm (5 mg/m³) ST 5 ppm (10 mg/m³)	100 ppm	Colorless gas with a characteristic, irritating, pungent odor [Note A liquid below 14°F Shipped as a liquefied compressed gas]	MW 64 1 BP 14°F Sol 10% Fl P NA IP 12 30 eV Nonflammable Gas	VP >1 atm FRZ 104°F UEL NA LEL NA	Powdered and alkali metals such as sodium & potassium, water, ammonia, aluminum [Note Reacts with water to form sulfuric acid]	Filters(2), $NaHCO_3$/Na_2CO_3, IC, III [#6004]
Sulfuric acid H_2SO_4 7664 93 9 WS5600000 1830 39 (51 95% acid) 1831 39 (fuming) 1832 39 (spent)	Battery acid, Hydrogen sulfate, Oil of vitriol, Sulfuric acid (aqueous) 1 ppm = 4 08 mg/m³	NIOSH/OSHA 1 mg/m³	80 mg/m³	Colorless to dark brown, oily, odorless liquid [Note Pure compound is a solid below 51 F Often used in an aqueous solution]	MW 98 1 BP 554°F Sol Miscible Fl P NA IP ? Sp Gr 1 84 (96 98% acid) Noncombustible Liquid, but capable of igniting finely divided combustible materials	VP(295°F) 1 mm FRZ 51 F UEL NA LEL NA	Organic materials, chlorates, carbides, fulminates, water, powdered metals [Note Reacts violently with water with evolution of heat Corrosive to metals]	Si gel, $NaHCO_3$/Na_2CO_3, IC, III [#7903, Inorganic Acids]
Sulfur monochloride S_2Cl_2 10025 67 9 WS4300000 1828 39	Sulfur chloride, Sulfur subchloride, Thiosulfurous dichloride 1 ppm = 5 61 mg/m³	NIOSH/OSHA C 1 ppm (6 mg/m³)	10 ppm	Light amber to yellow-red, oily liquid with a pungent, nauseating, irritating odor	MW 135 0 BP 280°F Sol Decomposes Fl P 245°F IP 9 40 eV Sp Gr 1 68 Class IIIB Combustible Liquid	VP 7 mm FRZ 107°F UEL ? LEL ?	Peroxides, oxides of phosphorous, organics, water [Note Decomposes violently in water to form hydrochloric acid, sulfur dioxide, sulfur, sulfite, thiosulfate, and hydrogen sulfide Corrosive to metals]	None available

Personal protection and sanitation (See Table 3)		Recommendations for respirator selection — maximum concentration for use (MUC) (See Table 4)	Health hazards				
			Route	Symptoms (See Table 5)	First aid (See Table 6)		Target organs (See Table 5)
Clothing	Repeat	NIOSH/OSHA	Inh	Irrit eyes, nose, drow,	Eye	Irr immed	CNS, resp sys,
Goggles	Reason prob	500 ppm: CCROV*/SA*/SCBA*	Ing	weak, unsteady gait;	Skin	Water flush	eyes, skin
Wash	Prompt contam	1000 ppm: CCRFOV/PAPROV*	Con	narco, defatting derm	Breath	Resp support	
Change	N R	1250 ppm: SA:CF*			Swallow	Medical attention immed	
Remove	Immed wet (flamm)	2500 ppm: GMFOV/SCBAF/SAF					
		5000 ppm: SAF:PD,PP					
		§: SCBAF:PD,PP/SAF:PD,PP ASCBA					
		Escape: GMFOV/SCBAE					
Clothing	Prevent skin freezing	NIOSH/OSHA	Inh	Irrit eyes, nose, throat,	Eye	Irr immed	Resp sys, skin,
Goggles	Any poss	20 ppm: CCRS*/SA*/SCBA*	Con	rhin, choking, cough;	Skin	Water flush immed	eyes
Wash	N R	50 ppm: PAPRS*/SA:CF*		reflex bronchoconstriction,	Breath	Resp support	
Change	N R	100 ppm: CCRFS/GMFS/PAPRTS*/		eye, skin burns			
Remove	Immed wet	SCBAF/SAF/SAF:CF*					
Provide	Eyewash	§: SCBAF:PD,PP/SAF:PD,PP ASCBA					
		Escape: GMFS/SCBAE					
Clothing	Any poss >1% Repeat <1%	NIOSH/OSHA	Inh	Eye, nose, throat irrit,	Eye	Irr immed	Resp sys, eyes,
Goggles	Any poss	25 mg/m³: PAPRAGHiE[f]/SA:CF[f]	Ing	pulm edema, bron;	Skin	Water flush immed	skin, teeth
Wash	Immed contam	50 mg/m³: CCRFAGHiE/SCBAF/SAF/	Con	emphy; conj, stomatis;	Breath	Resp support	
Change	N R	GMFAGHiE		dental erosion; trachbronc,	Swallow	Medical attention	
Remove	Immed non imperv contam	80 mg/m³: SAF:PD,PP		skin, eye burns; derm		immed	
Provide	>1% Eyewash, quick drench	§: SCBAF:PD,PP/SAF:PD,PP ASCBA					
		Escape: GMFAGHiE/SCBAE					
Clothing	Any poss	NIOSH/OSHA	Inh	Lac, cough, burn eyes,	Eye	Irr immed	Resp sys, skin,
Goggles	Any poss	10 ppm: PAPRS[f]/CCRFS/GMFS/	Con	skin, pulm edema	Skin	Water flush immed	eyes
Wash	Immed contam	SCBAF/SAF	Ing		Breath	Resp support	
Change	N R	§: SCBAF:PD,PP/SAF:PD,PP ASCBA			Swallow	Medical attention immed	
Remove	Immed non imperv contam	Escape: GMFS/SCBAE					
Provide	Eyewash, quick drench						

Sulfur monochloride

Chemical name, structure/formula, CAS and RTECS Nos., and DOT ID and guide Nos.	Synonyms, trade names, and conversion factors	Exposure limits (TWA unless noted otherwise)	IDLH	Physical description	Chemical and physical properties: MW, BP, SOL, Fl.P, IP, Sp.Gr, flammability	Chemical and physical properties: VP, FRZ, UEL, LEL	Incompatibilities and reactivities	Measurement method (See Table 1)
1,1,2,2-Tetrachloroethane $CHCl_2CHCl_2$ 79-34-5 KI8575000 1702 55	Acetylene tetrachloride, Symmetrical tetrachloroethane 1 ppm = 7.00 mg/m³	NIOSH Ca See Appendix A 1 ppm (7 mg/m³) [skin] OSHA 1 ppm (7 mg/m³) [skin]	Ca [150 ppm]	Colorless to pale-yellow liquid with a pungent, chloroform-like odor	MW: 167.9 BP: 296°F Sol: 0.3% Fl.P: NA IP: 11.10 eV Sp.Gr(77°F): 1.59 Noncombustible Liquid	VP(86°F): 9 mm FRZ: -33 F UEL: NA LEL: NA	Chemically active metals, strong caustics, fuming sulfuric acid [Note: Degrades slowly when exposed to air.]	Char(pet); CS_2; GC/FID; III [#1019]
Tetrachloroethylene $Cl_2C=CCl_2$ 127-18-4 KX3850000 1897 74	Perchlorethylene, Perchloroethylene, Perk, Tetrachlorethylene 1 ppm = 6.89 mg/m³	NIOSH Ca See Appendix A Minimize workplace exposure concentrations, limit number of workers exposed OSHA 25 ppm (170 mg/m³)	Ca [500 ppm]	Colorless liquid with a mild, chloroform-like odor	MW: 165.8 BP: 250°F Sol(77°F): 0.02% Fl.P: NA IP: 9.32 eV Sp.Gr: 1.62 Noncombustible Liquid	VP: 14 mm FRZ: 2°F UEL: NA LEL: NA	Strong oxidizers, chemically-active metals such as lithium, beryllium & barium, caustic soda, sodium hydroxide; potash	Char; CS_2; GC/FID; III [#1003, Halogenated Hydrocarbons]
Tetrachloronaphthalene $C_{10}H_4Cl_4$ 1335-88-2 QK3700000	Halowax®, Nibren wax, Seekay wax	NIOSH/OSHA 2 mg/m³ [skin]	Unknown	Colorless to pale-yellow solid with an aromatic odor	MW: 265.9 BP: 593-680°F Sol: Insoluble Fl.P(oc): 410°F IP: ? Sp.Gr: 1.59-1.65 Combustible Solid	VP: <1 mm FRZ: 360°F UEL: ? LEL: ?	Strong oxidizers	Filter/Bub, none; GC/FID; II(2) [#S130]
Tetraethyl lead (as Pb) $Pb(C_2H_5)_4$ 78-00-2 TP4550000 1649 56	Lead tetraethyl, TEL 1 ppm = 13.45 mg/m³	NIOSH/OSHA 0.075 mg/m³ [skin]	40 mg/m³	Colorless liquid (unless dyed red, orange, or blue) with a pleasant, sweet odor. [Note: Main usage is in anti-knock additives for gasoline.]	MW: 323.5 BP: 228°F (Decomposes) Sol: Insoluble Fl.P: 200°F IP: 11.10 eV Sp.Gr: 1.65 Class IIIB Combustible Liquid	VP: 0.2 mm FRZ: -202°F UEL: ? LEL: 1.8%	Strong oxidizers, sulfuryl chloride, rust, potassium permanganate [Note: Decomposes slowly at room temperature and more rapidly at higher temperatures.]	XAD-2, Pentane; GC/PID; III [#2533]

Personal protection and sanitation (See Table 3)		Recommendations for respirator selection — maximum concentration for use (MUC) (See Table 4)	Health hazards				
			Route	Symptoms (See Table 5)	First aid (See Table 6)		Target organs (See Table 5)
Clothing:	Any poss	NIOSH	Inh	Nau, vomit, abdom pain;	Eye:	Irr immed	Liver, kidneys,
Goggles:	Any poss	¥: SCBAF:PD,PP/SAF:PD,PP:ASCBA	Abs	tremor fingers; jaun,	Skin:	Soap wash prompt	CNS
Wash:	Immed contam	Escape: GMFOV/SCBAE	Ing	enlarged tend liver; derm;	Breath:	Resp support	
Change:	N.R.		Con	monocy, kidney damage	Swallow:	Medical attention immed	
Remove:	Immed non-imperv contam						
Provide:	Eyewash, quick drench						
Clothing:	Repeat	NIOSH	Inh	Irrit eyes, nose, throat;	Eye:	Irr immed	Liver, kidneys,
Goggles:	Reason prob	¥: SCBAF:PD,PP/SAF:PD,PP:ASCBA	Ing	nau; flush face, neck;	Skin:	Soap wash prompt	eyes, upper resp
Wash:	Prompt contam	Escape: GMFOV/SCBAE	Con	verti, dizz, inco; head,	Breath:	Resp support	sys, CNS
Change:	N.R.			som; skin eryt; liver	Swallow:	Medical attention	
Remove:	Prompt non-imperv contam			damage, [carc]		immed	
Clothing:	Any poss molt/Repeat liq sol	NIOSH/OSHA	Inh	Acne-form derm; head,	Eye:	Irr immed	Liver, skin
Goggles:	Any poss molt/Reason prob liq-sol	20 mg/m³: SCBAF/SAF	Abs	ftg, anor, verti; jaun,	Skin:	Soap wash immed	
Wash:	Prompt contam	$: SCBAF:PD,PP/SAF:PD,PP:ASCBA	Ing	liver inj	Breath:	Resp support	
Change:	After work if any poss contam	Escape: GMFOVHiE/SCBAE	Con		Swallow:	Medical attention immed	
Remove:	Immed non-imperv contam molt/ Prompt non-imperv contam sol						
Clothing:	Any poss >0.1%	NIOSH/OSHA	Inh	Insom, lass, anxiety;	Eye:	Irr immed	CNS, CVS,
Goggles:	Reason prob	0.75 mg/m³: SA/SCBA	Abs	tremor, hyper-reflexia,	Skin:	Soap wash immed	kidneys, eyes
Wash:	N.R.	1.875 mg/m³: SA:CF	Ing	spastic; bradycardia,	Breath:	Resp support	
Change:	After work if any poss contam >0.1%	3.75 mg/m³: SCBAF/SAF/SAT:CF	Con	hypotension, hypothermia,	Swallow:	Medical attention immed	
Remove:	Immed non-imperv contam (>0.1%)	40 mg/m³: SA:PD,PP		pallor, nau, anor, low-wgt;			
Provide:	Quick drench (>0.1%)	$: SCBAF:PD,PP/SAF:PD,PP:ASCBA		disorientation, halu,			
		Escape: GMFOV/SCBAE		psychosis, mania, convuls,			
				coma; eye irrit			

Tetraethyl lead (as Pb)

Chemical name, structure/formula, CAS and RTECS Nos., and DOT ID and guide Nos.	Synonyms, trade names, and conversion factors	Exposure limits (TWA unless noted otherwise)	IDLH	Physical description	Chemical and physical properties MW, BP, SOL Fl.P, IP, Sp.Gr, flammability	 VP, FRZ UEL, LEL	Incompatibilities and reactivities	Measurement method (See Table 1)
Tin (organic compounds as Sn)	Synonyms vary depending upon the specific organic compound.	NIOSH/OSHA 0.1 mg/m³ [skin]	Unknown	Appearance and odor vary depending upon the specific organic compound.	Properties vary depending upon the specific organic compound		Strong oxidizers	Filter/ XAD 2, HPLC; AA; III [#5504]
Titanium dioxide TiO_2 13463-67-7 XR2275000	Rutile; Titanium oxide; Titanium peroxide	NIOSH Ca See Appendix A OSHA 10 mg/m³	Ca [N.E.]	White, odorless powder.	MW: 79.9 BP: 4532 to 5432°F Sol: Insoluble Fl.P: NA IP: NA Sp.Gr: 4.26 Noncombustible Solid	VP: 0 mm (approx) MLT: 3326 to 3362°F UEL: NA LEL: NA	None reported	Filter; Acid; AA; II(3) [#S385]
Toluene $C_6H_5CH_3$ 108-88-3 XS5250000 1294 27	Methyl benzene; Methyl benzol; Phenyl methane; Toluol 1 ppm = 3.83 mg/m³	NIOSH/OSHA 100 ppm (375 mg/m³) ST 150 ppm (560 mg/m³)	2000 ppm	Colorless liquid with a sweet, pungent, benzene-like odor	MW: 92.1 BP: 232°F Sol(61°F): 0.05% Fl.P: 40°F IP: 8.82 eV Sp.Gr: 0.87 Class IB Flammable Liquid	VP(65°F) 20 mm FRZ: -139°F UEL: 7.1% LEL: 1.2%	Strong oxidizers	Char; CS_2; GC/FID; III [#1500; Hydro-carbons]
Toluene-2,4-diisocyanate $CH_3C_6H_3(NCO)_2$ 584-84-9 CZ6300000 2078 57	TDI; 2,4-TDI; 2,4-Toluene diisocyanate 1 ppm = 7.24 mg/m³	NIOSH Ca See Appendix A 0.005 ppm (0.04 mg/m³) ST 0.02 ppm (0.15 mg/m³) OSHA 0.005 ppm (0.04 mg/m³) ST 0.02 ppm (0.15 mg/m³)	Ca [10 ppm]	Colorless to pale-yellow solid or liquid (above 71°F) with a sharp, pungent odor.	MW: 174.2 BP: 484°F Sol: Insoluble Fl.P: 260°F IP: ? Sp.Gr: 1.22 Class IIIB Combustible Liquid	VP(77°F) 0.01 mm MLT: 71°F UEL: 9.5% LEL: 0.9%	Strong oxidizers, water, acids, bases & amines may cause foam and spatter; alcohols [Note: Reacts slowly with water to form carbon dioxide and polyureas.]	Coated glass wool; Methanol; HPLC/UVD; III [#2535]

Personal protection and sanitation (See Table 3)	Recommendations for respirator selection — maximum concentration for use (MUC) (See Table 4)	Health hazards					
		Route	Symptoms (See Table 5)	First aid (See Table 6)			Target organs (See Table 5)
Recommendations vary depending upon the specific compound.	NIOSH/OSHA 1 mg/m³: CCROVDM/SA/SCBA 2.5 mg/m³: SA:CF/PAPROVDM 5 mg/m³: CCRFOVHiE/SCBAF/SAF/GMFOVHiE/PAPRTOVHiE/SAT:CF 200 mg/m³: SAF,PD,PP §: SCBAF:PD,PP/SAF:PD,PP:ASCBA Escape: GMFOVHiE/SCBAE	Inh Abs Ing Con	Head, vertl; irrit eyes; psycho-neurologic dist; sore throat, cough; abdom pain, vomit; urine retention; paresis, focal anes, skin burns; pruritus; in animals: hemolysis, hepatic nec	Eye: Skin: Breath: Swallow:	Irr immed Water flush immed Resp support Medical attention immed		CNS, eyes, liver, urinary tract, skin, blood
Clothing: N R Goggles: N R Wash: N R Change: N R Remove: N R	NIOSH ¥: SCBAF:PD/PP/SAF:PD,PP:ASCBA Escape: HiEF/SCBAE	Inh	Slight lung fib; [carc]	Breath:	Resp support		Lungs
Clothing: Repeat Goggles: Reason prob Wash: Prompt wet Change: N R Remove: Immed wet (flamm)	NIOSH/OSHA 1000 ppm: CCROV*/SA*/PAPROV*/SCBA* 2000 ppm: SA:CF*/SCBAF/SAF/GMFOV §: SCBAF:PD,PP/SAF:PD,PP:ASCBA Escape: GMFOV/SCBAE	Inh Abs Ing Con	Ftg, weak; conf, euph, dizz, head; dilated pupils, lac; ner, musc ftg, insom; pares; derm	Eye: Skin: Breath: Swallow:	Irr immed Soap wash prompt Resp support Medical attention immed		CNS, liver, kidneys, skin
Clothing: Repeat Goggles: Any poss Wash: Prompt contam Change: After work if reason prob contam Remove: Prompt non-impery contam Provide: Eyewash, quick drench	NIOSH ¥: SCBAF:PD,PP/SAF:PD,PP:ASCBA Escape: GMFOV/SCBAE	Inh Ing Con	Irrit nose, throat; choke, paroxysmal cough; chest pain, retster soreness; nau, vomit, abdom pain; bron spasm, pulm edema; dysp, asthma, conj, lac, derm, skin sens; [carc]	Eye: Skin: Breath: Swallow:	Irr immed Soap wash immed Resp support Medical attention immed		Resp sys, skin

Toluene-2,4-diisocyanate

Chemical name, structure/formula, CAS and RTECS Nos., and DOT ID and guide Nos.	Synonyms, trade names, and conversion factors	Exposure limits (TWA unless noted otherwise)	IDLH	Physical description	Chemical and physical properties		Incompatibilities and reactivities	Measurement method (See Table 1)
					MW, BP, SOL Fl.P, IP, Sp.Gr, flammability	VP, FRZ UEL, LEL		
o-Toluidine $CH_3C_6H_4NH_2$ 95-53-4 XU2975000 1708 55	o-Aminotoluene, 2-Aminotoluene, 1-Methyl-2-aminobenzene, o-Methylaniline, 2-Methylaniline, ortho-Toluidine 1 ppm = 4.46 mg/m³	NIOSH Ca See Appendix A 2 ppm (9 mg/m³) [skin] OSHA 5 ppm (22 mg/m³) [skin]	Ca [100 ppm] ACGIH A2	Colorless to pale-yellow liquid with an aromatic, aniline-like odor	MW: 107.2 BP: 392°F Sol: 2% Fl.P: 185°F IP: 7.44 eV Sp.Gr: 1.01 Class IIIA Combustible Liquid	VP: 0.3 mm FRZ: 6°F UEL: ? LEL: ?	Strong oxidizers, nitric acid	Si gel, Ethanol, GC/FID, III [#2002, Aromatic Amines]
Tributyl phosphate $(CH_3[CH_2]_3O)_3PO$ 126-73-8 TC7700000 1 ppm = 11.07 mg/m³	Butyl phosphate, TBP, Tributyl ester of phosphoric acid, tri-n-Butyl phosphate	NIOSH/OSHA 0.2 ppm (2.5 mg/m³)	125 ppm	Colorless to pale-yellow, odorless liquid	MW: 266.3 BP: 552°F (Decomposes) Sol: 0.6% Fl.P(oc): 295°F IP: ? Sp.Gr: 0.98 Class IIIB Combustible Liquid	VP(351°F): 127 mm FRZ: -112°F UEL: ? LEL: ?	None reported	Filter, Diethyl ether, GC/FPD, II(3) [#S208]
1,1,2-Trichloroethane $CHCl_2CH_2Cl$ 79-00-5 KJ3150000 2831 74	beta-Trichloroethane, Vinyl trichloride 1 ppm = 5.55 mg/m³	NIOSH Ca See Appendix A 10 ppm (45 mg/m³) [skin] OSHA 10 ppm (45 mg/m³) [skin]	Ca [500 ppm]	Colorless liquid with a sweet, chloroform-like odor	MW: 133.4 BP: 237°F Sol: 0.4% Fl.P: NA IP: 11.00 eV Sp.Gr: 1.44 Noncombustible Liquid	VP: 19 mm FRZ: -34°F UEL: NA LEL: NA	Strong oxidizers & caustics; chemically-active metals such as aluminum, magnesium powders, sodium & potassium	Char, CS_2, GC/FID, III [#1003, Halogenated Hydrocarbons]
Trichloroethylene $ClCH=CCl_2$ 79-01-6 KX4550000 1710 74	Ethylene trichloride, Trilene, Trichloroethene 1 ppm = 5.46 mg/m³	NIOSH Ca See Appendix A 25 ppm OSHA 50 ppm (270 mg/m³) ST 200 ppm (1080 mg/m³)	Ca [1000 ppm]	Colorless liquid (unless dyed blue) with a chloroform-like odor	MW: 131.4 BP: 189°F Sol(77°F): 0.1% Fl.P: 90°F IP: 9.45 eV Sp.Gr: 1.46 Class IC Flammable Liquid, but burns with difficulty	VP: 58 mm FRZ: -99°F UEL(77°F): 10.5% LEL(77°F): 8%	Strong caustics & alkalis, chemically-active metals such as barium, lithium, sodium, magnesium, titanium & beryllium	Char, CS_2, GC/FID, III [#1022]

Personal protection and sanitation (See Table 3)		Recommendations for respirator selection — maximum concentration for use (MUC) (See Table 4)	Health hazards				
			Route	Symptoms (See Table 5)	First aid (See Table 6)		Target organs (See Table 5)
Clothing: Goggles: Wash: Change: Remove: Provide:	Any poss Any poss Immed contam N R Immed non imperv contam Eyewash, quick drench	NIOSH ¥: SCBAF:PD,PP/SAF:PD,PP:ASCBA Escape: GMFOV/SCBAE	Inh Abs Ing Con	Anoxia, head, cyan; weak, dizz, drow; micro hematuria, eye burns; derm; [carc]	Eye: Skin: Breath: Swallow	Irr immed Soap wash immed Resp support Medical attention immed	Blood, kidneys, liver, CVS, skin, eyes
Clothing: Goggles: Wash: Change: Remove:	Repeat Reason prob Prompt wet N R Prompt non imperv wet	NIOSH:OSHA 2 ppm: SA/SCBA 5 ppm: SA CF 10 ppm: SCBAF/SAF 125 ppm: SAF:PD,PP §: SCBAF:PD,PP/SAF:PD,PP:ASCBA Escape: GMFOV/HiE:SCBAE	Inh Con Ing	Eyes, resp, skin irrit; head, nau	Eye: Skin: Breath: Swallow	Irr immed Soap wash prompt Resp support Medical attention immed	Resp sys, skin, eyes
Clothing: Goggles: Wash: Change: Remove:	Repeat Reason prob Prompt contam N R Prompt non imperv contam	NIOSH ¥: SCBAF:PD,PP/SAF:PD,PP:ASCBA Escape: GMFOV/SCBAE	Inh Abs Ing Con	Irrit nose, eyes; CNS depres; liver, kidney damage; [carc]	Eye: Skin: Breath: Swallow	Irr immed Soap wash prompt Resp support Medical attention immed	CNS, eyes, nose, liver, kidneys
Clothing: Goggles: Wash: Change: Remove:	Repeat Reason prob Prompt wet N R Prompt non imperv wet	NIOSH ¥: SCBAF:PD,PP/SAF:PD,PP:ASCBA Escape: GMFOV/SCBAE	Inh Ing Con	Head, verti, vis dist, tremors, som, nau, vomit, irrit eyes; derm; card arrhy, pares; [carc]	Eye: Skin: Breath: Swallow	Irr immed Soap wash prompt Resp support Medical attention immed	Resp sys, heart, liver, kidneys, CNS, skin

Trichloroethylene

Chemical name, structure/formula, CAS and RTECS Nos., and DOT ID and guide Nos.	Synonyms, trade names, and conversion factors	Exposure limits (TWA unless noted otherwise)	IDLH	Physical description	Chemical and physical properties MW, BP, SOL Fl.P, IP, Sp.Gr, flammability VP, FRZ UEL, LEL	Incompatibilities and reactivities	Measurement method (See Table 1)
Xylenes (o-, m-, p- isomers) $C_6H_4(CH_3)_2$ 1330 20 7 ZE2100000 1307 27	o: 1,2-Dimethylbenzene; o-Xylol, m: 1,3-Dimethylbenzene, m-Xylol, p: 1,4-Dimethylbenzene, p-Xylol 1 ppm = 4.41 mg/m³	NIOSH/OSHA 100 ppm (435 mg/m³) ST 150 ppm (655 mg/m³)	1000 ppm	Colorless liquids with an aromatic odor [Note: Pure p-xylene is a solid below 56°F.]	MW: 106.2 BP: 292/269/281°F Sol: Insoluble Fl.P: 63/84/81°F IP: 8.56/8.56/8.44 eV Sp.Gr: 0.88/0.86/0.86 Class IB Flammable Liquid (o) Class IC Flammable Liquids (m, p) VP: 7/9/9 mm FRZ: 13/54/56°F UEL: 7.0/7.0/7.0% LEL: 1.1/1.0/1.1%	Strong oxidizers	Char., CS₂, GC/FID; III [#1501, Aromatic Hydrocarbons]
Xylidine $(CH_3)_2C_6H_3NH_2$ 1300 73 8 ZE8575000 1711 55	Aminodimethylbenzene, Aminoxylene, Dimethylaminobenzene, Dimethylaniline, Xylidine isomers, Xylidine (mixed o-, m-, p-) 1 ppm = 5.04 mg/m³	NIOSH/OSHA 2 ppm (10 mg/m³) [skin]	150 ppm	Pale yellow to brown liquid with a weak, aromatic, amine-like odor	MW: 121.2 BP: 415/439°F Sol: Slight Fl.P: 206°F IP: ? Sp.Gr: 0.98 Class IIIB Combustible Liquid VP: <1 mm FRZ: ? UEL: ? LEL: 1.0%	Strong oxidizers, hypochlorite bleaches	Si gel, Ethanol, GC/FID; III [#2002]
Yttrium compounds (as Y) Y 7440 65 5 (Metal) ZG2980000 (Metal)	Metal: Yttrium metal Synonyms of other compounds vary depending upon the specific compound.	NIOSH/OSHA 1 mg/m³	N.E.	Metal: Dark gray to black solid	MW: 88.9 BP: 5301°F Sol: ? Fl.P: NA IP: NA Sp.Gr: 4.47 Noncombustible Solid in bulk form VP: 0 mm (approx) MLT: 2732°F UEL: NA LEL: NA	Oxidizers	Filter, Acid, ICP; III [#7300 Elements]
Zinc chloride fume $ZnCl_2$ 7646 85 7 ZH1400000	None	NIOSH/OSHA 1 mg/m³ ST 2 mg/m³	4800 mg/m³	White particulate dispersed in air.	MW: 136.3 BP: 1350°F Sol(77°F): 432% Fl.P: NA IP: NA Sp.Gr(77°F): 2.91 Noncombustible Solid VP: 0 mm (approx) MLT: 554°F UEL: NA LEL: NA	Potassium	None available

Personal protection and sanitation (See Table 3)		Recommendations for respirator selection — maximum concentration for use (MUC) (See Table 4)	Health hazards				
			Route	Symptoms (See Table 5)	First aid (See Table 6)		Target organs (See Table 5)
Clothing Goggles Wash Change Remove	Repeat Reason prob Prompt contam N R Immed wet (flamm)	NIOSH/OSHA 1000 ppm CCROV* PAPROV* SA* SCBA* § SCBAF PD PP SAF PD PP ASCBA Escape GMFOV SCBAE	Inh Abs Ing Con	Dizz, excitement, drow, inco, staggering gait, irrit eyes, nose, throat, corneal vacuolization, anor, nau, vomit, abdom pain, derm	Eye Skin Breath Swallow	Irr immed Soap wash prompt Resp support Medical attention immed	CNS, eyes, GI tract, blood, liver, kidneys, skin
Clothing Goggles Wash Change Remove Provide	Any poss Any poss Immed contam N R Immed non imperv contam Eyewash, quick drench	NIOSH/OSHA 20 ppm CCROV/SA SCBA 50 ppm SA CF PAPROV 100 ppm CCRFOV PAPRTOV GMFOV SCBAF/SAF 150 ppm SA PD,PP § SCBAF PD,PP/SAF PD PP ASCBA Escape GMFOV/SCBAE	Inh Abs Ing Con	Anoxia, cyan, lung, liver, kidney damage	Eye Skin Breath Swallow	Irr immed Soap wash immed Resp support Medical attention immed	Blood, lungs, liver, kidneys, CVS
Clothing Goggles Wash Change Remove Provide	N R Any poss N R N R N R Eyewash	NIOSH/OSHA 5 mg/m³ DM 10 mg/m³ DMXSQ SA/SCBA 25 mg/m³ PAPRDM/SA CF 50 mg/m³ HiEF/PAPRTHiE SAT CF/SCBAF/SAF 500 mg/m³ SA PD,PP § SCBAF PD,PP/SAF PD PP ASCBA Escape HiEF SCBAE	Inh Ing Con	Irrit eyes, in animals pulm irrit, eye inj, possible liver damage	Eye Skin Breath Swallow	Irr immed Soap wash prompt Resp support Medical attention immed	Eyes, lungs
Clothing Goggles Wash Change Remove	N R N R N R N R N R	NIOSH/OSHA 10 mg/m³ DMFu* SA*/SCBA* 25 mg/m³ PAPRDMFu*/SA CF* 50 mg/m³ HiEF/PAPRTHiE*/SCBAF SAF 2000 mg/m³ SAF PD PP § SCBAF PD PP/SAF PD PP ASCBA Escape HiEF SCBAE	Inh Con	Conj irrit nose, throat, cough, copious sputum, dysp, chest pain, pulm edema, broncopneu, pulm fib, cor pulmonale, fever, cyan, tachypnea, burn skin, irrit skin, eyes	Breath	Resp support	Resp sys, skin, eyes

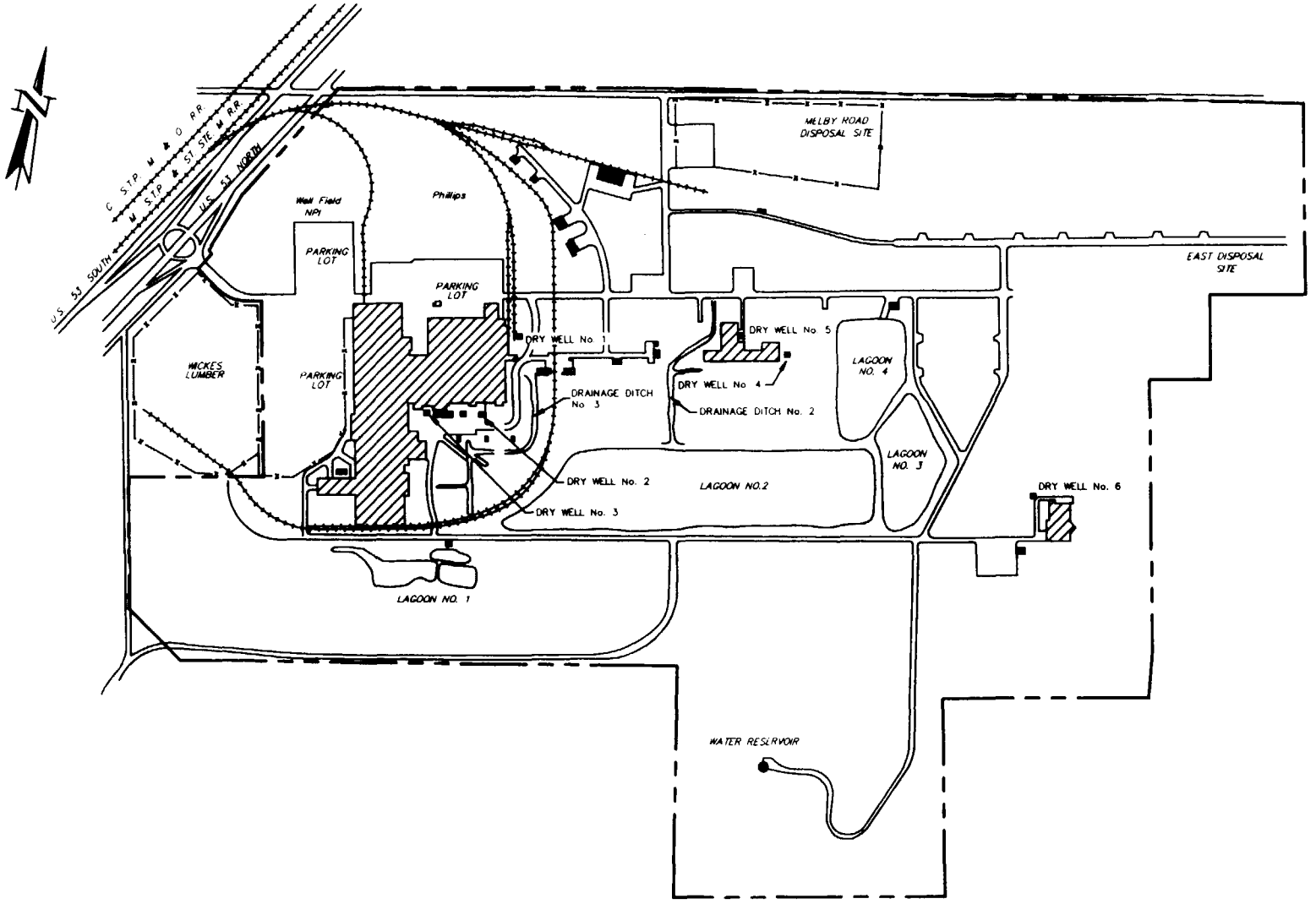
Zinc chloride fume

ATTACHMENT E

SITE MAP

eder associates

FIGURE 1



SITE PLAN

NATIONAL PRESTO INDUSTRIES, INC. SITE

EAU CLAIRE, WISCONSIN

JK497/PA
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