

NATIONAL PRESTO INDUSTRIES, INC. SITE  
EAU CLAIRE, WISCONSIN

---

LAGOON NO. 1  
REMOVAL ACTION WORK PLAN

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PROJECT #497-16  
OCTOBER 1993

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October 8, 1993  
File #497-16

Mr. Michael Gifford, Remedial Project Manager  
United States Environmental Protection Agency  
Waste Management Branch Region V  
77 W. Jackson, HSR W6J  
Chicago, Illinois 60604

Re: National Presto Industries, Inc. Site  
Lagoon No. 1 Removal Action Work Plan

Dear Mike:

I have enclosed three copies of the final Lagoon No. 1 Removal Action Work Plan. This report describes the pilot scale study and the full scale removal action that will be conducted at the NPI site. A Health and Safety Plan for the work is included as Appendix D.

Very truly yours,

EDER ASSOCIATES CONSULTING ENGINEERS, P.C.

*Nora M. Brew*

Nora M. Brew  
Project Engineer

NB/tg

TG3256

cc: R. Riedl  
R. Nauman  
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## I. INTRODUCTION

During July 1993, a pilot scale study described in Eder Associates Consulting Engineers, P.C. (Eder) August 1993 work plan was implemented at the National Presto Industries, Inc. (NPI) site to determine the feasibility of removing waste forge compound from Lagoon #1 and using it as a supplemental fuel in a cement kiln. Figure 1 is a site plan which shows the location of Lagoon #1. Eder provided technical and health and safety oversight of the pilot study. Waste Research and Reclamation (WR&R) removed the waste forge compound from the lagoon, blended it with waste solvent, and arranged for transportation of the blended material to two CERCLA approved cement kilns for use as a supplemental fuel. The pilot scale study was performed in accordance with Eder's June 1993 work plan.

The pilot scale study showed that it is feasible to remove and blend the waste forge compound for use as a fuel in a cement kiln. This report describes the pilot study (Section II), discusses the feasibility of the process (Section III), and includes a work plan for full scale implementation of the process (Section IV).



## II. DESCRIPTION OF PILOT SCALE WORK

During the period July 13 through July 16, 1993, WR&R pumped approximately 20,000 gallons of waste forge compound from Lagoon #1. The waste forge compound was transported to WR&R's facility in Eau Claire, where it was blended with waste solvent. The blended material was transported by tanker truck and railcar to two out-of-state CERCLA approved cement kilns for use as fuel. Representative pictures taken during the pilot scale work are included as Appendix A. Following is a detailed description of the pilot scale study.

### Air Monitoring

Eder performed air monitoring in the area of Lagoon #1 using a Foxboro flame ionization organic vapor analyzer during the first two days that the waste forge compound was pumped. The monitoring was done to establish pretest background conditions and to indicate any air quality impacts associated with pumping the waste forge compound. Monitoring was done at four locations each day, both before and during pumping. The air monitoring results and descriptions of the sample locations are presented in Table 1. The air monitoring locations are shown on Figure 2. The only measurable readings were recorded directly over the pumping cylinder in the lagoon. These readings ranged from one to five parts per million; however, most of the readings were in the range of two to three parts per million. Since no continuous readings greater than 5 ppm were measured at the lagoon during pumping, the air monitoring program was discontinued.

Eder also monitored the air near the loading port at the top of the tanker truck when the waste forge compound was first pumped into the tanker. This air monitoring location (#5) is also shown on Figure 2. Organic vapor readings were sustained above five parts per million, and WR&R personnel at the top of the tanker wore respiratory protection during the truck loading operation. WR&R attributed the elevated organic vapor readings to residual solvent in the tanker

NATIONAL PRESTO INDUSTRIES, INC. SITE  
 EAU CLAIRE, WISCONSIN

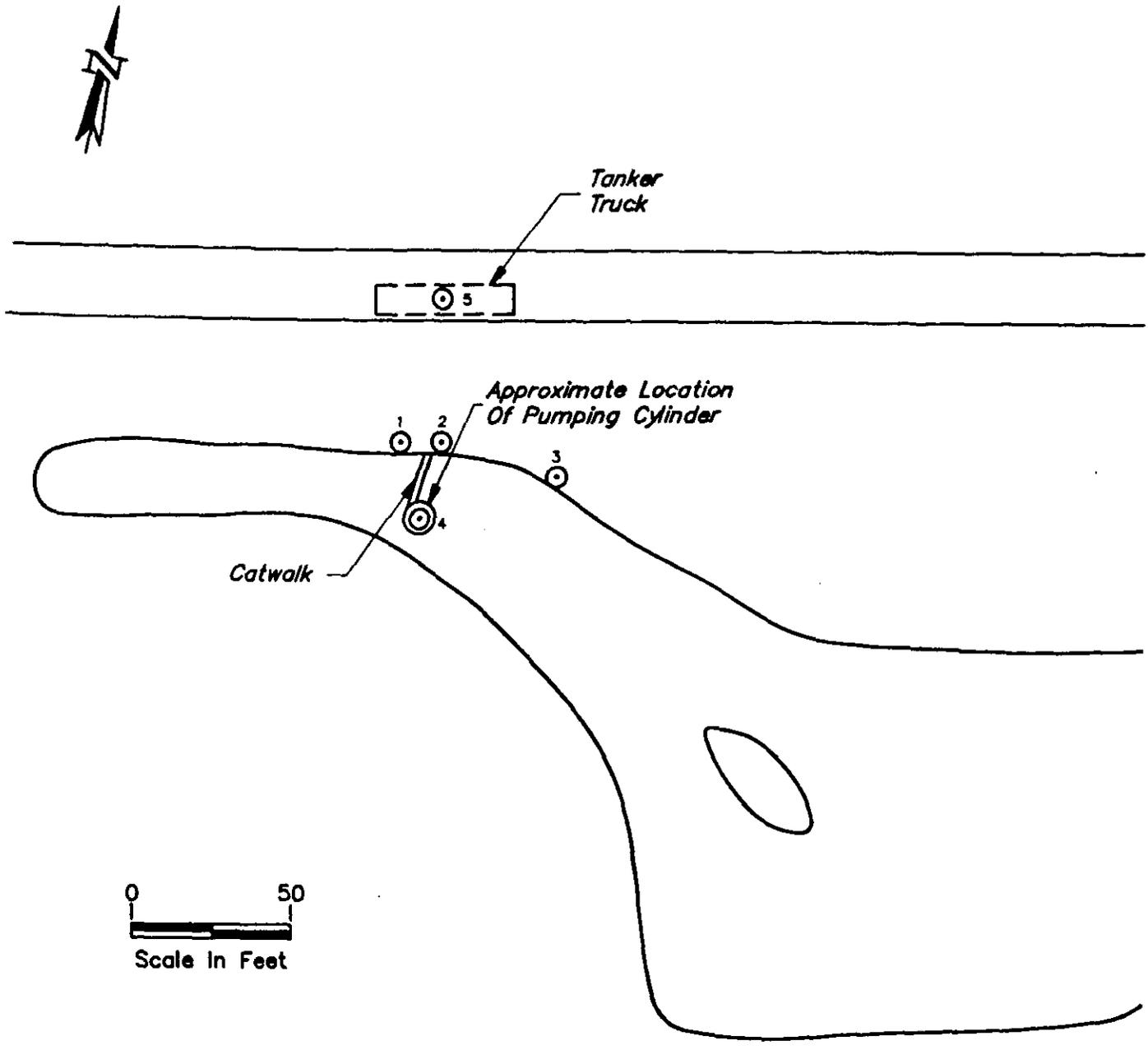
TABLE 1

AIR MONITORING RESULTS DURING LAGOON #1 PILOT SCALE TEST

Date & Time	SAMPLE LOCATIONS			
7/13/93	#1	#2	#3	#4
Before Pumping	0	0	0	1-3 ppm
During Pumping	0	0	0	1-5 ppm
7/14/93				
Before Pumping	0	0	0	0.30 ppm
During Pumping	0	0	0	1-3 ppm

Sample Location Descriptions:

- #1 - Upwind from work area.
- #2 - Edge of catwalk before entering work area
- #3 - Downwind from work area
- #4 - In work area, at opening of cylinder



**LEGEND**

⊙ Air Monitoring Location

**AIR MONITORING LOCATIONS**  
**LAGOON PILOT STUDY**  
**NATIONAL PRESTO INDUSTRIES, INC.**  
**EAU CLAIRE, WISCONSIN**

1007#3  
SW497-8A

truck, not to the waste forge compound being pumped into the truck. Health concerns related to air emissions from working in close proximity to the waste forge compound in the lagoon do not appear to be an issue. However, air emissions from the top of the tanker pose a potential health hazard to WR&R personnel involved in the truck loading/unloading operations.

### **Pumping Test**

Since the pilot scale study only required the removal of approximately 20,000 gallons of waste forge compound, removing the standing water above the waste forge compound was determined not to be necessary. However, to avoid pumping the water, WR&R fabricated a 12-foot diameter steel cylinder with slide gates at the bottom. The cylinder was lowered into the lagoon and a catwalk was constructed from the lagoon edge to the cylinder. A pump was lowered into the cylinder and the slide gates were opened which allowed waste forge compound to flow into the cylinder. The waste forge compound had a viscosity similar to #6 fuel oil.

When no mechanical delays were encountered during the pumping operation, it took approximately one hour and 45 minutes to pump approximately 4,000 gallons of waste forge compound into tanker trucks. The waste forge compound was transported approximately 13 miles to the WR&R facility. Some of the water that was entrained in the waste forge compound separated during the drive from the NPI site to WR&R. When the tanker reached WR&R it was parked on a loading platform. The water that had separated from the waste forge compound was pumped into a holding tank for treatment and disposal.

### **Blending and Transportation**

After the water was removed, approximately 1,500 gallons of waste solvent was added directly to the tanker, which was equipped with internal agitation systems, and blended with the waste forge compound. Blending was done inside the tanker to eliminate transferring the material to other tanks. According to WR&R, the Lagoon #1 waste forge compound meets the minimum BTU value (6000 BTU/#) required at the kiln, however it was blended with waste solvent to

reduce viscosity and enhance the pumpability of the material. While the waste forge compound was being blended with the waste solvent, WR&R collected a representative sample of the blended material from each tanker and analyzed it for percent ash, BTU value, percent chloride, PCBs, percent water, and percent solids. All loads met kiln specifications, which are included in Appendix B.

Two loads of blended material were transported to out-of-state kilns. Both cement kilns comply with USEPA's off-site policy and have been approved to accept Superfund wastes consistent with the facilities' operating permits. Some of the blended material was transported to a railyard in Altoona, approximately nine miles from WR&R, pumped into a 20,000-gallon railcar, and transported by Chicago and Northwestern Transportation to a cement kiln owned by Systech Environmental Corporation (Systech) in Fredonia, Kansas. Unloading the tanker into the railcar took about one hour and there was no spillage of the blended material during transfer to the railcar. The remaining blended material was transported in a 5,000-gallon tanker by J.B. Hunt - Special Commodities, Inc. to a cement kiln owned by Systech in Paulding, Ohio. Copies of the uniform hazardous waste manifests, Systech invoices, and analytical results are included as Appendix B.

### III. EVALUATION OF FEASIBILITY

A number of material handling, mechanical, and material quality issues became apparent during the pilot scale study which could effect the feasibility of pumping, blending, and burning the waste forge compound in a cement kiln on a full scale basis. The following is a discussion of each of these issues:

- Pumping/Pumpability

The waste forge compound has a viscosity similar to #6 fuel oil and is highly abrasive. The viscosity of the waste forge compound increases with decreasing temperature. Even with these characteristics, there were no significant problems pumping the waste forge compound.

The only mechanical problem encountered during the pumping concerned overheated hydraulic pump oil. An in-line oil cooler was installed to correct this problem. Full scale operations would require additional or larger oil coolers to assure that the pumps continue to run efficiently. In addition, steam could be injected into the lagoon in an attempt to reduce the viscosity of the waste forge compound to facilitate pumping, especially during cold weather.

- Water Pumping/Separation

A cone of depression was created inside the pumping cylinder because the waste forge compound could be pumped faster than it would enter the cylinder through the bottom slide gates and some of the standing water was pumped along with the waste forge compound. In an effort to correct this problem, the pump was lowered deeper into the cylinder and a device was constructed to push the waste

forge compound towards the cylinder. These measures helped, but water still entered the cylinder and solids were pumped up from the bottom of the lagoon when the pump was lowered. This method of pumping the waste forge compound would slow down the progress of full scale operations.

During transportation of the waste forge compound from the NPI site to WR&R, water that was entrained in the waste forge compound separated to the top. This water had to be removed at WR&R before waste solvent could be blended with the waste forge compound. Significant additional costs would be incurred during full scale operation if this water has to be pumped from each tanker and disposed of.

The use of a barge mounted pump and auger system in a full scale operation should significantly reduce the volume of water pumped with the waste forge compound. In addition, the waste forge compound could be pumped from the lagoon into on-site storage tanks and any water that separated from the waste forge compound in the tanks could be pumped back to the lagoon.

- Solids

Some solids consisting of clumps of soil and asphalt were pumped up from the bottom of the lagoon when the pump was positioned deeper in the cylinder. After the waste forge compound was blended with waste solvent, the solids settled to the bottom of the tanker. The pump used at the railyard to transfer the blended product from the tanker to the railcar seized because of the solid material. The solid material can be expected to place increasing mechanical burden on machinery and will foul separator screens and increase downtime at an increasing frequency during full scale operation.

The use of a barge mounted auger system in a full scale operation should reduce the volume of solids in the pumped waste forge compound. However, it is probably impossible to prevent some solids from being pumped with the waste forge compound, especially as the pumping nears the lagoon bottom. As the auger pickup nears the bottom of the lagoon it will not be possible to track the uneven bottom topography, increasing the risk of hitting the bottom with the auger and picking up solids off the lagoon bottom. To prevent solids-associated problems at the railyard or cement kiln, the waste forge compound should be pumped through a screening system as it is transferred from intermediate storage tanks to tanker trucks. The occurrence of masses of clumped soil-asphalt picked up during the initial field trial effectively establishes the practical removal limits.

- Blending

There were no problems encountered blending the waste forge compound with the waste solvent during the pilot scale study. All blending during the pilot scale study was done at WR&R.

For a full scale operation, the waste solvent (or off-spec fuel or waste oil) should be put in empty tankers at WR&R and blending done as the waste forge compound is pumped into the tankers at the NPI site. The blended material could then be transported directly to the railyard from the NPI site.

- Product Quality

Even though the waste forge compound contained approximately 20 percent water, it had an average fuel value of 10,000 BTUs per pound and a negligible chloride content. These characteristics made the waste forge compound suitable for blending with waste solvent and burning as a supplemental fuel in a cement kiln. Under full scale operation, the physical and chemical parameters of the waste

forge compound are not expected to change as the work proceeds from one area of the lagoon to another and to greater depths.

- Kiln Burning

The blended waste solvent and waste forge compound transported to the two Systech cement kilns did not cause any operational problems at the kilns. The material was very pumpable and had suitable fuel value.

Systech has assured WR&R that they can handle the volume of waste forge compound that would be generated during a full scale operation. As a backup, WR&R has also obtained approval to burn the waste forge compound at a kiln operated by Cadence.

### Summary

Based on the results of the July 1993 pilot scale study, the feasibility to pump, blend, and burn the waste forge compound in a cement kiln has been demonstrated. Some equipment and material handling changes would be required for full scale operation, as described in Section IV.

#### IV. FULL SCALE REMOVAL OPERATIONS

NPI proposes to begin full scale removal of the Lagoon #1 waste forge compound for blending and use as a supplemental fuel in a cement kiln during fall 1993. WR&R's plan to remove and dispose of the waste forge compound, including a description of the major tasks associated with the project, is included as Appendix C. The work would be conducted in accord with the Health and Safety Plan presented in Appendix D.

##### Floating Oil Removal

Before any waste forge compound is removed, WR&R would remove the floating layer of oil from the northeastern corner of Lagoon #1. Based on the area and thickness of the floating oil, approximately 12,000 to 14,000 gallons would be removed using a floating boom to direct the oil to a skimmer connected to a vacuum tanker. Any water that separates out in the vacuum truck would be pumped off and put back into the lagoon. The oil would be transported to WR&R, blended and disposed of through the cement kiln fuels program. It will take two or three days to remove the floating oil from the lagoon.

##### Waste Forge Compound Removal, Blending, and Transport

Although the standing water created some problems during the pumping trial, there are benefits to removing it or leaving it in place. Removing the standing water would increase thermal heating and could reduce the viscosity of the material, it would eliminate or minimize the need to pump water with the waste forge compound, and it would provide better visual control over the pumping operation. On the other hand, leaving the water in place would allow the use of a shallow draft barge as a pumping platform. The barge could be winched from position to position on twelve to fourteen inches of standing water. It may not be feasible to move equipment across the dewatered lagoon surface. The use of the barge, then depends on the

presence of the standing water. Pumping from the barge would make it feasible to remove the viscous waste forge compound using an enclosed screw auger pickup operated below the lagoon surface. This, in turn effectively eliminates the need to pump water during most of the operation. The use of a barge mounted pump and auger system during full scale operation should significantly reduce the volume of water pumped with the waste forge compound as compared to the method used during the pilot scale study. It would take a significant amount of time (weeks) to remove the standing water, and it would also be necessary to obtain approval from the City of Eau Claire to discharge the water to the sanitary sewer system or to pursue other treatment and disposal options should the City decline to accept the water. As the technical benefits to operating off the barge would far outweigh the benefit derived from dewatering the lagoon, the full scale operation will be run with the standing water in place. The standing water will remain in the lagoon and will reduce volatilization of organic compounds from the waste forge compound and the underlying waste forge compound/soil mixture during and after full scale pumping operations.

An auger would be used to feed the waste forge compound into the pump. The barge would be moved around the lagoon by a cable/winch system. The auger system is eight feet wide and can be adjusted for depth. The occurrence of masses of clumped solids picked up during the initial field trial effectively establishes the practical removal limits. The barge mounted auger system would reduce the volume of solids in the pumped waste forge compound. However, it is probably impossible to prevent some solids from being pumped with the waste forge compound, especially as the pumping nears the lagoon bottom. Moreover, as the auger pickup nears the bottom of the lagoon, it will not be possible to track the uneven bottom topography. This will increase the risk of hitting the bottom with the auger and picking up solids off the lagoon bottom. The limits to the practical removal depth that can be achieved will be determined in the field. The remaining waste forge compound and soil-asphalt solids would be addressed when the waste forge compound and soil mixture under the lagoon is remediated as part of the final cleanup plan for the NPI site.

The barge pump would be connected by a floating hose to three intermediate storage tanks which would be constructed next to the lagoon. The storage tanks would be equipped with overflow protection systems and tarps would be placed beneath the hose between the lagoon and the tanks for spill containment. The use of storage tanks would allow the waste forge compound pumping to be independent of the transportation and processing operations. These on-site tanks would also provide the detention time to allow water to separate from the pumped waste forge compound. This water would be removed and pumped back into the lagoon.

Waste forge compound would be pumped from the intermediate on-site storage tanks directly into transport tankers. To prevent solids-associated problems at the railyard or cement kiln, the waste forge compound would be pumped through a screening system as it is transferred from the storage tanks to the tanker trucks. A duplex in-line screening system which has two screens in series would be used. When the primary screen clogs, it can be removed and steam-cleaned while the system operates using the secondary screen. No solvents will be used to clean the screens at the NPI site. The screens will be taken to WR&R's facility if solvent cleaning is necessary. The frequency at which the screens clog due to solids, the volume of solids being screened, and the volume of waste forge compound passing through the screen will factor into the field determination of the practical limit of waste forge compound removal. Solids removed by the screening system and those remaining at the bottom of the intermediate storage tanks will be put back into the lagoon. A building would be constructed to house the screening system and transfer pumps. Tarps would be placed beneath the piping between the storage tanks and the building, and between the building and the transport tankers for spill containment.

Waste solvent, off-spec fuel, or waste oil would be put in empty tankers at WR&R before they are brought to the NPI site. Hydraulic agitation systems in the transport tankers would blend the waste with the waste forge compound as it is pumped into the tankers at the NPI site. The blended material would be transported directly to the Altoona railyard. At the railyard, WR&R will collect a core sample from each transport tanker before the blended material is pumped into 20,000-gallon railcars. Four transport tanker loads will be pumped into each railcar. Containment, including tarps and a basin that attaches under the railcar, will be used during

transfer operations at the railyard to provide spill and overflow protection. When each railcar is completely loaded, WR&R will collect a core sample of the contents. The samples from the tankers and railcars will be analyzed in WR&R's laboratory in accord with the Sampling and Analysis Plan (SAP) described below. After WR&R verifies that the blended material in the railcar meets kiln specifications for burning, the railcar will be released for delivery to a CERCLA-approved out-of-state cement kiln. At the kiln, a core sample would also be collected from each railcar and analyzed in accord with the SAP to verify that the blended material meets cement kiln specifications.

Systech has assured WR&R that its Fredonia, Kansas and Paulding, Ohio cement kilns can handle the volume of waste forge compound that would be generated during the full scale operation. As a backup, WR&R has also obtained approval to burn the waste forge compound at the Ash Grove cement kiln operated by Cadence in Foreman, Arkansas. These kilns comply with USEPA's off-site policy and have been approved to accept Superfund wastes consistent with the facilities' operating permits. Other CERCLA approved kilns may be used during full scale implementation if necessary.

Spillage of waste forge compound during the pumping and transfer of material between transport vehicles is not expected because of the closed piping systems that would be used. Any spillage of material at the NPI site would be cleaned up to the extent practicable and returned to the lagoon. Any residual spillage would be removed during future remediation activities associated with the lagoon bottom soils as part of the final remedial plan for the NPI site. A transfer at the railyard would be done over containment.

### **Sampling and Analysis Plan**

WR&R will collect core samples of blended material from each loaded tanker before its contents are pumped into a railcar, and from each loaded railcar before it is released for transport to the cement kilns. WR&R's laboratory will analyze these samples for BTU value, percent chlorides, percent water, percent solids, and other parameters such as PCBs and reactivity which WR&R

and/or the cement kilns determine are necessary to ensure that the waste forge compound is consistently blended throughout full scale implementation and to verify that the final blended product is suitable for burning in a cement kiln.

When each railcar arrives at the receiving facility (i.e. - Systech or Cadence), the kiln will collect a core sample for analysis to verify that the delivery of blended material meets the kiln's minimum fuel specifications. The cement kiln's laboratory results will be compared to WR&R's results for each railcar and significant discrepancies will be investigated.

WR&R and the cement kilns will be responsible for laboratory quality control, data quality review, performance auditing, and systems auditing.

### **Project Documentation**

A bound daily log will be kept to record activities during the full scale removal operation.

The wastes leaving WR&R in the transport tankers destined for the NPI site will be accompanied by a bill of lading. After waste forge compound is pumped into each tanker at the NPI site, a separate bill of lading will be prepared for material transport from the NPI site to the Altoona railyard. A hazardous waste manifest will be completed for each railcar transported to the cement kilns. The manifests will show WR&R as the waste generator and the first transporter, and the railroad as the second transporter. The volume of blended material shipped to the kiln in each railcar will be shown on the manifest. The material will be manifested using the proper waste code and DOT shipping description.

Monthly progress reports will be submitted to USEPA over the duration of the project. The monthly progress reports will contain the following information:

- work performed and problems encountered during the preceding month

- modifications to operations in response to problems encountered
- quantity of waste forge compound removed from the lagoon, transported to the railyard, and transported to the cement kilns
- copies of bills of lading, manifests, invoices, analytical results, and other documentation generated by WR&R and the kilns during the reporting period
- anticipated schedule and progress during the next reporting period

After the full scale removal operations are complete, a final report will be prepared in accord with the requirements set forth at 40 CFR 300.165 and submitted to USEPA for review. The report will summarize the removal action conducted at Lagoon #1 and will include the following information:

- the quantity of material removed from the lagoon, and the off-site facility where the material was disposed of
- the analytical results for all samples taken by WR&R and the cement kilns
- documentation generated during the removal action, including bills of lading, manifests, invoices, contracts, etc.
- estimated total cost to implement the removal action.

### **Post-Removal Actions**

After the full scale waste forge compound removal operation is complete, the tanks, barge mounted pump, and other equipment brought on-site for the project will be decontaminated and removed by WR&R, and the area around Lagoon #1 will be cleaned up. All equipment that

comes in contact with the waste forge compound will be decontaminated using a steam cleaner before leaving the NPI site. The rinse water will be contained and placed in Lagoon #1.

Fencing may be installed if necessary to restrict access to the lagoon, which will contain standing water and the bottom mixture of waste forge compound and soil. If the side slopes of the lagoon are unstable and pose a safety hazard, they may be regraded. Other post-removal actions deemed necessary by USEPA, WDNR, and NPI may be taken to secure the area until a final remedy is selected and implemented.

### Post-Removal Sampling and Analysis

After the practical limit of pumping waste forge compound from Lagoon #1 has been reached, the material at the bottom of the lagoon and soil beneath the lagoon will be sampled and analyzed to obtain the information required to evaluate final remedial alternatives in the NPI site feasibility study. A work plan and HASP for the additional Lagoon #1 investigation will be developed when the full scale removal operation is complete. Preliminary concepts and considerations for this work are discussed below.

First, a vertical profile of the lagoon bottom would be established using a grid system similar to the one used during the 1992 lagoon depth survey conducted by WR&R. A hollow pipe or bailer could be driven through the bottom of the lagoon until the native sand below is reached. The pipe would be brought up, the depth of the waste forge compound/soil mixture would be recorded, and the material in the pipe could be visually characterized to determine whether it is areally and vertically homogeneous. This would could be done from a flat bottomed boat or by walking through the lagoon, depending on the depth of the standing water.

A sampling plan specifying a grid pattern and number of samples will then be established to obtain the data required for chemical characterization of the waste forge compound/soil mixture and the soil beneath Lagoon #1. More sampling locations will be selected if the lagoon bottom material is non-homogeneous than if it is homogeneous.

The tires or tracks on the sampling equipment should not travel directly on the lagoon bottom to avoid disturbing the interface and exposing the underlying native sand, creating the potential for downward migration of contaminants from the lagoon. A moveable driveway, such as heavy blasting mats, to each sampling location could be used. Alternatively, platforms could be set up at the sampling locations and a portable drill rig mounted on a barge could be used if the standing water was deep enough to support it. If necessary, the standing water could be directed away from the sampling locations using sand bags or another type of berm.

At each sampling location, a 12 to 24 inch diameter steel pipe or casing would be placed in the lagoon through the waste forge compound/soil mixture. Standing water in the pipe would be pumped out into the lagoon. A core sample of the waste forge compound/soil mixture would be collected using a hand auger. Then, split spoon samples of the native sand beneath the lagoon bottom would be collected at five to ten foot intervals to the water table. Portable GC headspace screening results may be used to select samples for laboratory analysis of volatile organic compounds and cadmium, which are found at elevated concentrations in groundwater downgradient of Lagoon #1. A sample of the waste forge compound/soil mixture may be collected for bench scale solidification testing.

### Project Team

The full scale waste forge compound removal operations will be conducted by WR&R. Eder will coordinate the work and will direct the Health and Safety Plan (HASP), contained in Appendix D, to be followed by all personnel involved in the work including employees and agents of NPI, their contractors, and regulatory agencies. Eder will perform the air monitoring required by the HASP. WR&R and the cement kilns will perform sampling and analysis in accord with the SAP described above.

### Schedule and Cost Estimate

Figure 3 presents the anticipated schedule for the full scale removal action. WR&R estimates that it will take approximately 120 to 160 working days to remove the waste forge compound from the lagoon. This estimate is based on a volume of one million gallons and a daily pumping rate of 6,000 to 8,000 gallons. The time estimate includes approximately three weeks to install the storage tanks, piping and pumps, construct the screening system and building, mobilize the pump barge, and remove the floating oil layer. Pumping could begin in mid-October and would continue until weather conditions begin to impede operations. The work duration could be extended by injecting steam into the lagoon, installing steam panels around the intermediate storage tanks, and providing steam heat to the building to reduce the viscosity of the waste forge compound and maintain pumpability. Steam generated by NPI boilers could be used. However, even if steam could be used to extend the work duration, it is likely that operations would have to cease in December or January due to the weather and could not resume until late March or early April 1994. The need to use steam and then to shutdown full scale operations for the winter would be determined in the field based on weather conditions and personnel safety concerns. Taking the work shutdown during January, February and half of March into account, WR&R estimates that all the waste forge compound could be removed from the lagoon by the end of June 1994. The schedule will be updated as necessary during implementation based on field conditions.

The cost to pump the waste forge compound from the lagoon to the storage tanks would be \$0.30 per gallon and the cost to screen, blend, transport, and burn the waste forge compound at a cement kiln would be \$1.725 per gallon. Given the estimated one million gallons of waste forge compound in the lagoon, the cost of the work would be approximately \$2.025 million. The costs associated with removing and disposing of the oil layer, barge mobilization and rental, tank rental, pumps, screening system and building, decontamination, etc. for full scale implementation would be approximately \$150,000. The following is the overall estimated cost summary for the full scale operation.

**LAGOON NO.1 FULL SCALE REMOVAL**  
**IMPLEMENTATION SCHEDULE**

NATIONAL PRESTO INDUSTRIES, INC.  
 EAU CLAIRE, WISCONSIN

**PROJECT SCHEDULE (MONTHS)**

	1993			1994							
	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG
	<b>Mobilization and Removal Of Floating Oil</b>	█									
<b>Waste Forge Compound Pumping, Blending and Transportation</b>		█	█	█			█	█	█	█	
<b>Demobilization and Post Removal Actions</b>										█	
<b>Summary Report Preparation</b>											█
<b>Develop Post-Removal Sampling and Analysis Work Plan</b>											█

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	<u>Unit Cost</u>	<u>Volume</u>	<u>Capital Cost</u>
Remove and Fuel Blend Floating Oil	\$1.70/gal	12,000 gal	\$ 20,000
Remove Waste Forge Compound	\$0.30/gal	1 M gal	300,000
Blend, Transport & Burn in Kiln	\$1.725/gal	1 M gal	1,725,000
Equipment Purchase, Maintenance, Rental, Mobilization/Demobilization; and Decontamination			<u>130,000</u>
	SUBTOTAL		\$2,175,000
Contingencies @ 20%			435,000
Engineering, Legal, Administrative Fees @ 25%			<u>544,000</u>
	TOTAL		\$3,154,000

Note that these costs do not include remediation of the waste forge compound/soil mixture or the soil beneath Lagoon #1. Remediation of these materials would be evaluated in the feasibility study as part of the final remedial plan for the NPI site, which will include removal and disposal of the standing water, and backfilling of the lagoon. The costs associated with the standing water and backfilling, estimated at approximately \$100,000 each in the September 1992 draft feasibility study, are not included in the table presented above.

APPENDIX A

LAGOON #1 PILOT STUDY PHOTOGRAPHS

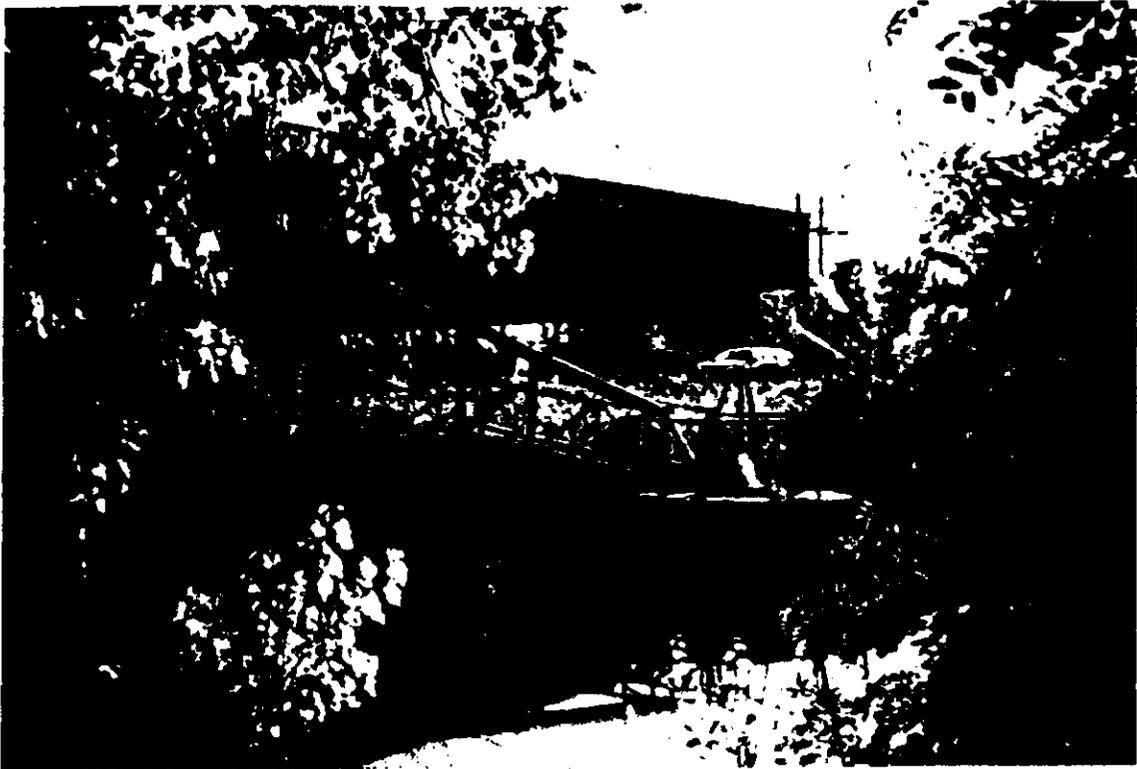
TG3256



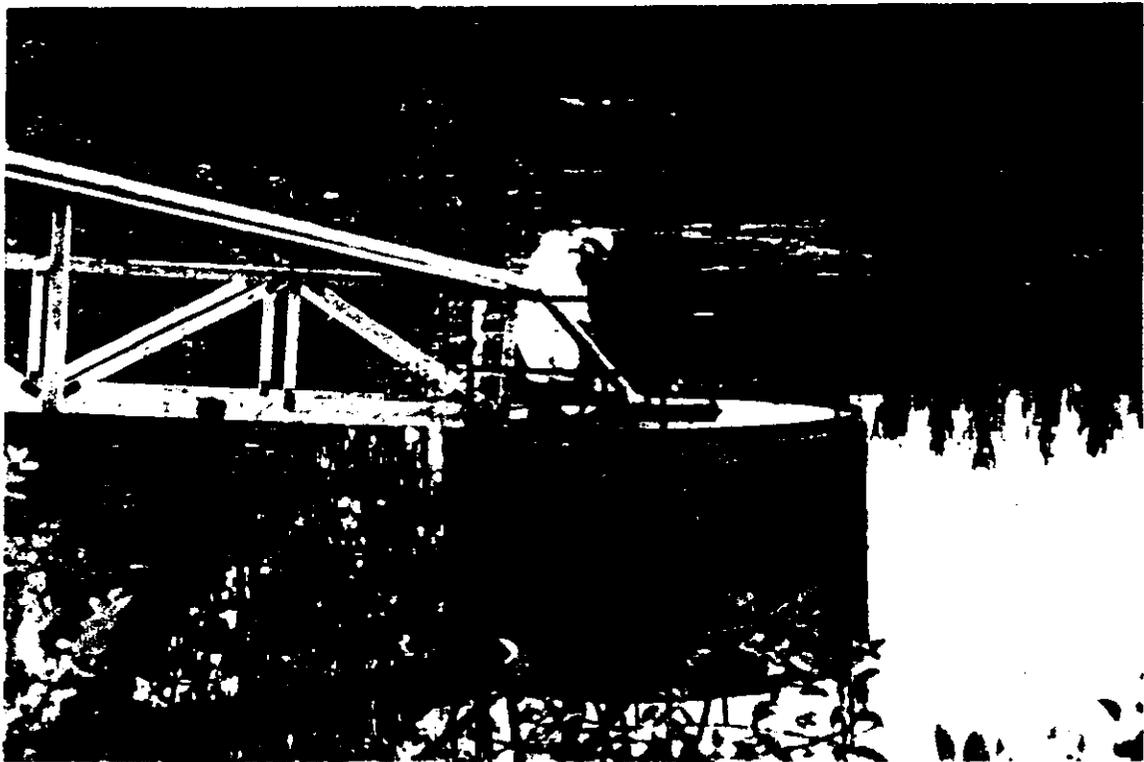
Gate on cylinder used to control water and forge compound flowage.



Product line leading from pump inside cylinder to semi-trailer.  
DWD\5P497-8.001



System used for pumping forge compound from lagoon.



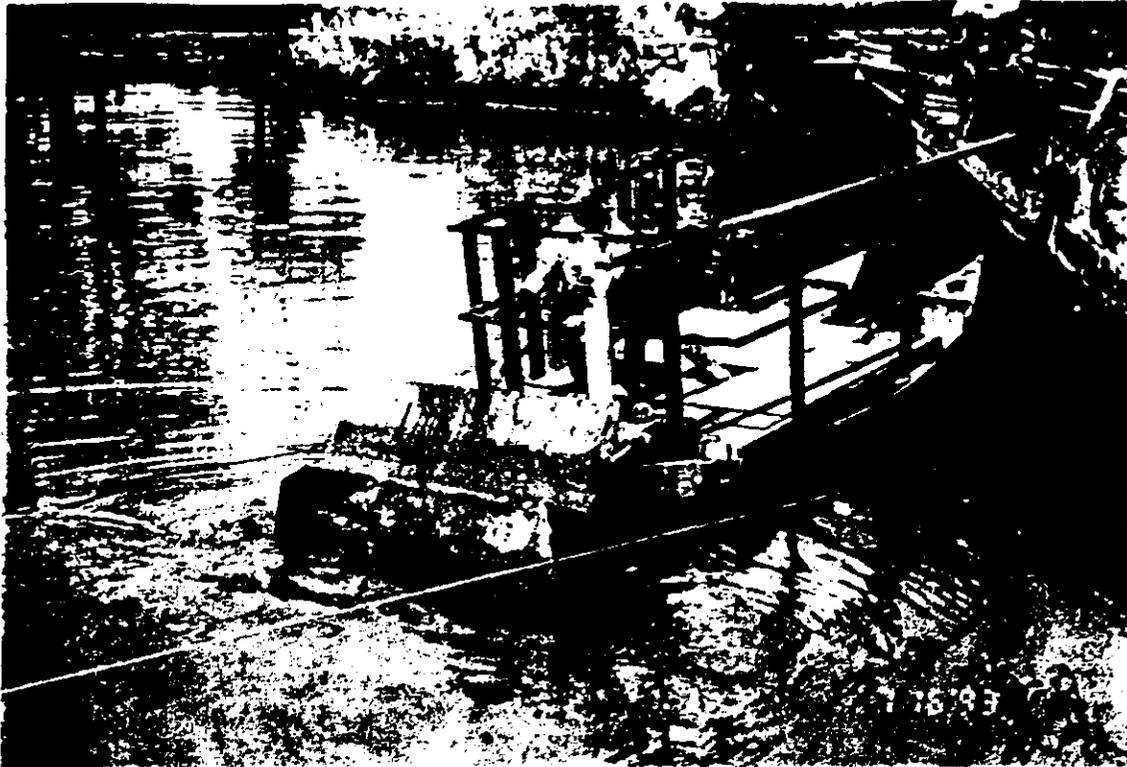
Cylinder used to control water flow and forge compound.



Sample tap used for collecting second and third set of samples during feasibility study.



Pumping forge compound from lagoon to awaiting semi-trailer.



Device used for pushing forge compound toward cylinder.



Unloading thinned forge compound from semi-trailer to railcar.

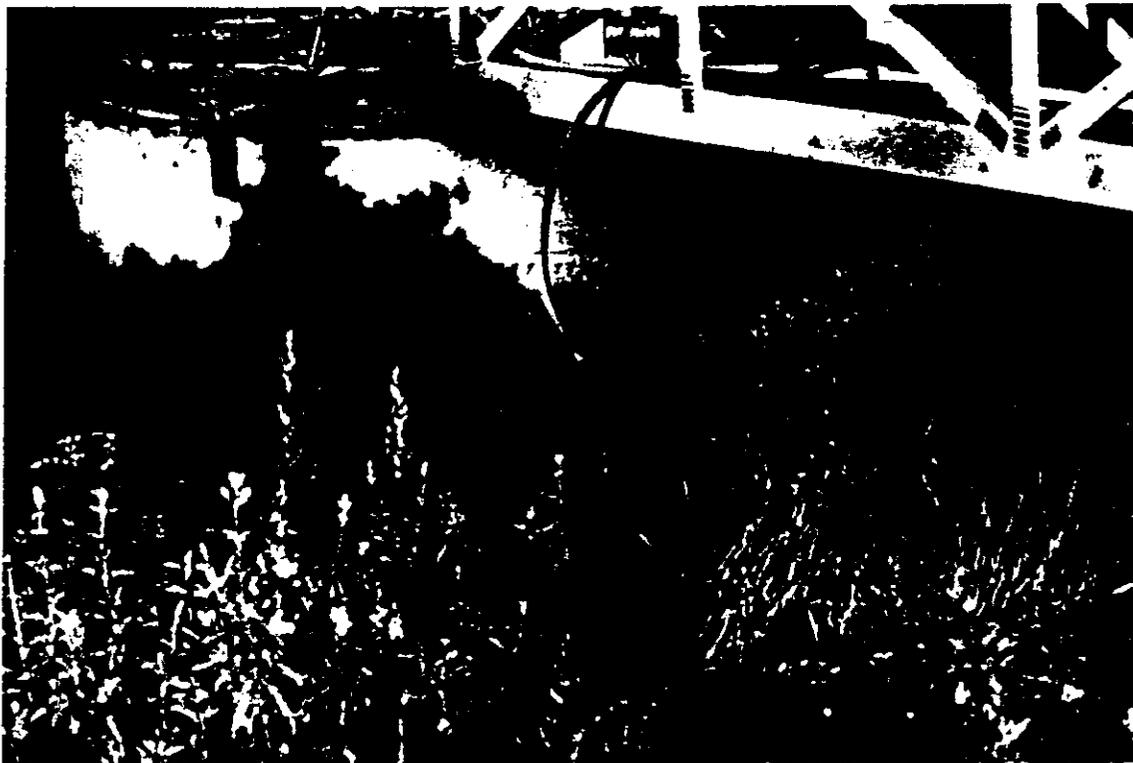


Spill containment used while unloading semi-trailer to railcar.

DWD\SP497-8.001



Hydraulic lines used to power pump for pumping forge compound.



Water that is being pumped off top of forge compound inside of cylinder.  
DWD\5P497-8.001

**APPENDIX B**

**KILN FUEL SPECIFICATIONS AND**  
**PILOT STUDY WASTE FORGE COMPOUND ANALYTICAL**  
**RESULTS AND MANIFESTS**

**Schedule F - Bulk Pricing**

Waste Profile No.: AA12995, AA25107

Customer Rep: Dave Morton

Customer: Waste Research &amp; Reclamation

Site Location: Eau Claire, WI

Contact: Jack Bisek

EPA ID No.: -

Phone: 715-834-9624

Date: August 4, 1993

FAX: -

Effective Date: September 4, 1993

Co-Processing Pricing For: Greencastle, IN; Fredonia, KS; Paulding, OH; Alpena, MI; Demopolis, AL

**Base Price**> 10,000 Btu/lb  
< 2% halogen**Surcharges****Btu:**9,000 to 9,999 Btu/lb  
8,000 to 8,999 Btu/lb  
7,000 to 7,999 Btu/lb  
6,000 to 6,999 Btu/lb**Halogen**2.1 to 4.0% halogen  
4.1 to 6.0% halogen  
6.1 to 8.0% halogen  
8.1 to 10.0% halogen**Water Surcharge**16 to 20%  
21 to 25%  
26 to 30%**Solids Surcharge**

&gt; 25%

**Transportation**

Generator pays

Systech will not be responsible for any demurrage incurred while material is being unloaded.

**Notes**

- Material must be < 120°F at delivery.
- All shipments exceeding 5% halogen, > 25% water, or less than 10,000 Btu/lb requires special scheduling and delivery to ensure blending capabilities and avoid rejection.
- Customer will be notified of any additional charges beyond those specified above if applicable.
- Material must be pumpable (100 to 500 cps).

Companies that require purchase order numbers on invoicing for payment must include the P.O. number on the shipping papers.

Pricing set forth above is firm for 60 days and may be adjusted upon 30 days written notice prior to the effective date of the adjustment.



Cadence Park Plaza • Michigan City, Indiana 46360 • 219-679-0371 • FAX-219-879-0390

**FOREMAN, ARKANSAS PLANT**  
**CHEM-FUEL® S BLEND (CONTAINERIZED SOLIDS) SPECIFICATION**  
**ASH GROVE CEMENT COMPANY & CADENCE ENVIRONMENTAL ENERGY INC.**

Chem-Fuel® shipments are analyzed and tested on-site. One random container per pallet is core sampled using a mechanical device. The samples are composited, blended, tested and analyzed. Test methods are specified in the receiving facility's Waste Analysis Plan. Material found outside of the specification will require additional management and may include surcharge or return.

PARAMETER	SPECIFICATION
Heat of combustion <sup>1</sup>	6,000 Btu/lb. minimum
Radioactivity <sup>2</sup>	Background or less
Sulfur <sup>3</sup>	1% maximum
Antimony <sup>4</sup>	425 ppm maximum
Barium <sup>5</sup>	50,000 ppm maximum
Cadmium <sup>6</sup>	50 ppm maximum
Chromium <sup>7</sup>	7,200 ppm maximum
Mercury <sup>8</sup>	150 ppm maximum
Thallium <sup>9</sup>	200 ppm maximum
PCB <sup>10</sup>	50 ppm maximum
Containers <sup>11</sup>	<ul style="list-style-type: none"> <li>Plant waste fuel manager allowed DOT authorized containers including:</li> <li>Right: 6 or 7-gallon, 26-gauge, rust-inhibited steel pail w/handle, gasketed lug cover and DOT 37A80</li> <li>6 or 7-gallon, 90 mil. high-density, polyethylene pail w/handle, gasketed snap-on cover and DOT 35-80</li> <li>Flexible: 12x2.5x25 inch 180 lb./sq. inch woven polypropylene fabric outer shell, 20 mil. low-density, polypropylene inner shell, double-lined container w/martin-crow 4-inch bottom, zipper-tie closure and DOT approved</li> <li>Headspace: 1-1/2 inch min. (rigid only)</li> <li>Incidental metal: less than 17 gauge/5-ounce pieces totaling under 5 lb. including container (steel containers are 4.5 lb.) <u>no strainers</u>, steel</li> <li>Liquid phase: 1-quart maximum</li> <li>Particle size: 2-inch maximum (high-density material only)</li> <li>Weight: 80 lbs. maximum</li> <li>Closed and sealed box van</li> <li>See Addendum III</li> </ul>
Container parameters <sup>12</sup>	
Transportation <sup>13</sup>	
Waste codes <sup>14</sup>	

PARAMETER	SPECIFICATION
pH, extracted <sup>1</sup>	Between 2 to 12.5
Stability <sup>2</sup>	Stable
Ash <sup>3</sup>	Less than 40% by wt
Arsenic <sup>4</sup>	4,500 ppm maximum
Beryllium <sup>5</sup>	20 ppm maximum
Chlorine <sup>6</sup>	6.5% maximum
Lead <sup>7</sup>	7,200 ppm maximum
Silver <sup>8</sup>	2,000 ppm maximum
Heavy Metals <sup>9</sup>	Less than 0.72% (by weight)
Pesticides (Addendum I) <sup>10</sup>	50 ppm maximum
Container utilization <sup>11</sup>	<ul style="list-style-type: none"> <li>Plant waste fuel manager allowed utilization including:</li> <li>Right: 6-layer minimum, 90-gauge minimum, mechanically stretch-wrapped containers in a 4x3 pattern on a 4-way entry, 40 x 48 GMA pallet with 3/4-inch face and bottom boards</li> <li>Flexible: 6-layer minimum, 90-gauge minimum, mechanically stretch-wrapped containers in a 4x2x3-6 pattern with all end tails tucked-in on a 4-way, 40x48 GMA pallet with 3/4-inch face and bottom boards</li> </ul>
Unacceptable materials <sup>12</sup>	Infectious materials or materials deemed potentially harmful or destructive to the operation.
Safety information <sup>13</sup>	See Addendum II
Appearance <sup>14</sup>	Orderly with no exterior soiled, disfigured or damaged container.

References & Notes: <sup>1</sup> Application/permit; <sup>2</sup> Chlorine & Metal feed rate management; <sup>3</sup> Ash Grove & Cadence management decision; <sup>4</sup> Characteristic peak patterns are treated as positive determination; <sup>5</sup> Aggregate Aroclor 1242, 1248, 1254 & 1260; <sup>6</sup> Shipment to be reconstituted if problems are found; <sup>7</sup> "Heavy metals" means arsenic, silver, cadmium, lead, chromium, selenium, and mercury.

UNIFORM HAZARDOUS  
WASTE MANIFEST

1. Generator's US EPA ID No.  
WID 9 9 0 8 2 9 4 7 5

Manifest  
Document No.  
9 3 2 0 0

2. Page 1  
of 1

Information in the shaded area is not required by Federal law

3. Generator's Name and Mailing Address  
Waste Research & Reclamation Co., Inc.  
5200 State Road 93  
Eau Claire, WI 54701

A. State Manifest Document Number  
WI J425937

B. State Generator's ID

4. Generator's Phone 715-834-9624

5. Transporter 1 Company Name  
J.B. Hunt-Special Commodities, Inc.

6. US EPA ID Number  
ARD 9 8 1 9 0 8 5 5 1

C. State Transporter's ID 61290-88

D. Transporter's Phone 800 330 786

7. Transporter 2 Company Name

8. US EPA ID Number

E. State Transporter's ID

F. Transporter's Phone

9. Designated Facility Name and Site Address  
Systech Environmental Corp.  
11397 Road 176 Box 266  
Paulding, OH 45879

10. US EPA ID Number  
OHD 0 0 5 0 4 8 9 4 7

G. State Facility's ID

H. Facility's Phone 419 599 4435

11. US DOT Description (Including Proper Shipping Name, Hazard Class, and ID Number)	12. Containers		13. Total Quantity	14. Unit wt/vol	15. Waste No.
	No.	Type			
a. XZQ-Hazardous Waste Liquid, N.O.S (oil/D008) 9. NA3082, PGIII (D008)	1	TIT	113	112	F 9100
b.					
c.					
d.					

J. Additional Descriptions for Materials Listed Above  
Profile AA25107 5000 gallons

K. Handling Codes for Wastes Listed Above

15. Special Handling Instructions and Additional Information  
DELIVERY Tuesday, 7/20/93 9:00AM Ohio Time  
IN CASE OF EMERGENCY CALL WBR 715-577-1237  
Tanker 722 Load # 029962  
EMERGENCY RESPONSE GUIDE 31

16. GENERATOR'S CERTIFICATION: I hereby declare that the contents of this consignment are fully and accurately described above by proper shipping name and are classified, packed, marked, and labeled, and are in all respects in proper condition for transport by highway according to applicable international and national governmental regulations and according to the requirements of the Wisconsin Department of Natural Resources. If I am a large quantity generator, I also certify that I have a program in place to reduce the volume and toxicity of waste generated to the degree I have determined to be economically practicable and I have selected the practicable method of treatment, storage, or disposal currently available to me which minimizes the present and future threat to human health and the environment.  
OR, if I am a small quantity generator, I have made a good faith effort to minimize my waste generation and select the best waste management method that is available to me and that I can afford.

Printed/Typed Name & Position Title: Brian Schneider, Traffic Manager  
Signature: Brian Schneider  
Date: 07/29/93

17. TRANSPORTER 1 Acknowledgement of Receipt of Materials  
Printed/Typed Name & Position Title: Kenneth F. Schuster  
Signature: Kenneth F. Schuster  
Date: 07/29/93

18. TRANSPORTER 2 Acknowledgement of Receipt of Materials  
Printed/Typed Name & Position Title:  
Signature:  
Date:

19. Discrepancy Indication Space  
Approx 200 gallons of material remain in tank...  
KCI

20. FACILITY OWNER OR OPERATOR: Certification of receipt of hazardous materials covered by this manifest except as noted in Item 19.  
Printed/Typed Name & Position Title: LISA A CLINE  
Signature: Lisa A Cline  
Date: 07/20/93

SYSTECH ENVIRONMENTAL CORPORATION  
245 North Valley Road.  
Xenia, OH 45385  
(513)372-8077

INVOICE No.: 110157508

WASTE RESEARCH AND RECLAMATION  
Attn: Accts Payable  
Route 7  
Hwy 93 South  
Eau Claire, WI 54701

Invoice Date : 07/22/93

Your Order No:

Payment Terms: NET 30

Salesperson : Dave Morton

Shipped Via : J.B. HUNT SPECIAL CO

Description

Co-processing of SOLVENTS at Lafarge Corporation  
in Paulding, OH on July 20, 1993.

<u>Ticket No</u>	<u>Profile No</u>	<u>Gallons</u>	<u>Pounds</u>
7763	AA25107	3687	30100

BASE PRICE (Minimum Amount 32000 Pounds)

SURCHARGE:

Water = 18.0 %  
Solids (38% - 25% X 30100 Lbs) = 3913 Lbs

*Lead*  
*029962*  
*PRESTO*

Received 7/26/93  
Approved Brian Schneider 057730  
Approved on 7-27-93

Manifest Referenced No: 93200 WIJ425937

Material received from: WASTE RESEARCH AND RECLAMATION  
Eau Claire, WI

Work order#: OD0136  
Tanker ID: 222  
Approved By:  
Destination: SYSTEC-PAULDING  
Material : FLAMM

Date Tested : Jul 19, 1993  
Date Released:  
Date Shipped :

WER Tested		Outside Lab Results		
Solids: 26	X Dry:	X	*Solid:	X
BTU : 10322	BTU/lb		*BTU :	BTU/lb
X ash: 11.04	X		*% ash:	X
X Cl : 0.70	X		*X Cl :	X
PCB : <10	ppm		*PCB :	ppm
Lead:	ppm		*Lead:	ppm

WATER RESULTS

Density: 1.062	gn/ml		
Phenols:	X	*Phenols:	X
Solvent:	X	*Solvent:	X
SPIEST:			
Water :	X		

Comment: WATER 14%, BTU/GAL 91441 -

---

RUAN.DTF Retrieved from 1 of 1 Total Forms: 2033 Page 1 of 2  
You may not edit the record. You have read-only rights in this file.  
Esc-Exit F1-Help Alt-F6-Table F7-Search F8-Calc F10-Continue

Print or type. Form designed for use on elite (12-pitch) typewriter.

Form Approved. OMB No. 2050-0089. Expires 9-30-

<b>UNIFORM HAZARDOUS WASTE MANIFEST</b>		1. Generator's US EPA ID No. WID 990829475	Manifest Document No. 91312014	2. Page 1 of 1	Information in the shaded area is not required by Federal law.	
8. Generator's Name and Mailing Address Waste Research & Reclamation Co., Inc. 3200 State Road 93 Eau Claire, WI 54701 4. Generator's Phone ( ) 715-834-9624				A. State Manifest Document Number WI 1425814		
6. Transporter 1 Company Name Chicago & Northwestern Transportation		6. US EPA ID Number ILD 030899116		C. State Transporter's ID		
7. Transporter 2 Company Name		8. US EPA ID Number		D. Transporter's Phone 715-834-722		
9. Designated Facility Name and Site Address Systech Environmental Corp. South Cement Road P.O. Box 111 Fredonia, KS 66736		10. US EPA ID Number KSD 980633259		E. State Transporter's ID		
				F. Transporter's Phone		
				G. State Facility's ID		
				H. Facility's Phone 316-378-4451		
11. US DOT Description (Including Proper Shipping Name, Hazard Class, and ID Number)		12. Containers No.	Type	13. Total Quantity	14. Unit Wt/Vol	15. Waste No.
a. RQ-Hazardous Waste, Liquid, N.O.S. (D008) 9, NA3082, POIIT (D008)		1	T C	167600	P	W-0-0
b.						
c.						
d.						
J. Additional Descriptions for Materials Listed Above As Profiled W-25107 20,000 gallons				K. Handling Codes for Wastes Listed Above		
15. Special Handling Instructions and Additional Information STC Code 48-101-18 RAIL CAR - NATY 25461 PREPAID PLACARDED - 3082 Seals WNR 676928, 676929, 676930						
IN CASE OF EMERGENCY CALL WNR 715-577-1237 EMERGENCY RESPONSE GUIDE 31						
16. GENERATOR'S CERTIFICATION: I hereby declare that the contents of this consignment are fully and accurately described above by proper shipping name and are classified, packed, marked, and labeled, and are in all respects in proper condition for transport by highway according to applicable international and national governmental regulations and according to the requirements of the Wisconsin Department of Natural Resources. If I am a large quantity generator, I also certify that I have a program in place to reduce the volume and toxicity of waste generated to the degree I have determined to be economically practicable and I have selected the practicable method of treatment, storage, or disposal currently available to me which minimizes the present and future threat to human health and the environment:  OR, if I am a small quantity generator, I have made a good faith effort to minimize my waste generation and select the best waste management method that is available to me and that I can afford.						
Printed/Typed Name & Position Title Ray Thomas, Utility Supt.				Signature <i>Ray Thomas</i>		Date 07/20/91
17. TRANSPORTER 1 Acknowledgement of Receipt of Materials				Signature <i>W.G. Glassbrenner</i>		Date 07/20/91
Printed/Typed Name & Position Title W.G. GLASSBRENNER				Signature		Date
18. TRANSPORTER 2 Acknowledgement of Receipt of Materials				Signature		Date
Printed/Typed Name & Position Title				Signature		Date
19. Discrepancy Indication Space No. of containers, weight, etc. that do not agree with manifest information should be noted in this space.						
20. FACILITY OWNER OR OPERATOR: Certification of receipt of hazardous materials covered by this manifest except as noted in Item 19.						
Printed/Typed Name & Position Title Joe W. Sommer				Signature <i>Joe W. Sommer</i>		Date 08/10/91

SYSTECH ENVIRONMENTAL CORPORATION  
245 North Valley Road.  
Xenia, OH 45385  
(513)372-8077

INVOICE No.: 140262408

Invoice Date : 08/18/93

Your Order No:

Payment Terms: NET 30

Salesperson : Dave Morton

Shipped Via : BURLINGTON/NORTHERN

WASTE RESEARCH AND RECLAMATION  
Attn: Accts Payable  
Route 7  
Hwy 93 South  
Eau Claire, WI 54701

Description

Co-processing of SOLVENTS at Lafarge Corporation  
in Fredonia, KS on August 17, 1993.

<u>Ticket No</u>	<u>Profile No</u>	<u>Gallons</u>	<u>Pounds</u>
2968	AA25107	17885	146000

BASE PRICE

SURCHARGE:

Water = 22.0 %  
Solids (40% - 25% X 146000 Lbs) = 21900 Lbs

Agitation Fee

**POSTED**  
**PRESTO**

Received 8/23/93  
Approved w/ B. M. Heath 52746  
Approved on 8-23-93

. ReflCar No.: NATX 25461  
. Manifest Referenced No: J425874  
. Material received from: WASTE RESEARCH AND RECLAMATION  
Eau Claire, WI

I-98713-G-14026240B-081793-14- 9490.00-0402001405000-WI  
I-98713-G-14026242B-081793-14- 500.00-0410001405000-WI

Presto Material going to RAIL CAR NATX25461

Work order#	Tanker ID	Destination	BTU	% ash	% Cl	Solids	Water	Date Sampled
OD0125	222(PRESTO)	NATX25461	10317	13.26	0.53	26.00	10	7/13
OD0126	222(PRESTO)	NATX25461	9481	13.3	0.49	25.00	12	7/14
OD0131	222	NATX25461	10408	8.65	0.456	30.00	21.2	7/15
OD0133	222(PRESTO)	NATX25461	9776	14.7	0.74	25.00	10.7	7/16
*****	*****	*****	*****	*****	*****	*****	*****	
Average:			9,995.50	12.48	0.55	26.50	13.48	

SYSTECH RAILCAR (PRESTO MATERIAL)

July 16, 1993

Work order#	Tanker ID	Destination	BTU	% ash	% Cl	Solids	Water	
OD0134	NATX25461	SYSTEC	11362	7.94	0.91	25	14.3	7/16

**APPENDIX C**

**WR&R PILOT STUDY SUMMARY AND FULL SCALE REMOVAL PROPOSAL**

TG3256



Waste Research &amp; Reclamation Co. Inc.

5200 State Road 93, Eau Claire, Wisconsin 54701

NATIONAL PRESTO INDUSTRIES

## WASTE FORGE COMPOUND REMOVAL AND DISPOSAL

During the second week of July, 1993, Waste Research & Reclamation Co., Inc. (WRR) removed and fuel blended 20,000 gallons of forge compound from Lagoon #1. Four Thousand gallons of forge compound was removed from the lagoon and fuel blended on July 6th, 7th, and 8th; with 8,000 gallons on July 9th.

## OBJECTIVE

The objective of the pilot study was to determine the feasibility of removing forge compound from the lagoon and its use as a supplemental fuel for a cement kiln fuels program.

## NARRATIVE

WRR's initial proposal for removal and disposal of forge compound, dated June, 1992, proposed to remove the top water layer from the lagoon prior to pumping the forge compound. The purpose of removing the water layer was to: 1) allow the forge compound to warm using direct sunlight, thus reducing the viscosity, and, 2) prevent water from filling the cone of depression that forms when the forge compound is pumped. Since the pilot study only required 20,000 gallons of forge compound be pumped, the removal of the complete lagoon water layer was not seen as feasible. As an alternative, a 12-ft. diameter cylinder with slide gates at the bottom was lowered into the lagoon as a coffer dam. Within the cylinder, the water was removed from the top of the forge compound. This allowed the lower gates to regulate the in-flow of forge compound. In practice, this worked very well for the removal of the first 4,000 gallons of forge compound. Thereafter,

the forge compound around the perimeter of the coffer dam formed a cone of depression that, at times, allowed water under the bottom edge of the dam. The water/forge compound mixture caused problems. The excess water that had been pumped into the transport tanker had to be removed and properly disposed of. The pilot study confirmed that during a full-scale project, the removal of the upper water layer would be required if the pilot study pumping system was used. However, an alternative option that would allow the water layer to be left in place is being considered. This option involves using a mobile auger pump supported by a small barge. The use of a mobile barge pump would eliminate the time required to remove the water layer and periodic precipitation from the lagoon. The mobile barge auger pump system is a proven technology that will improve mobility and increase the efficiency of removal of waste forge compound from the lagoon.

#### RECOMMENDATIONS FOR FULL-SCALE PROJECT

After further reviewing the pilot study, WRR has the following recommendations for improving the forge compound removal operation in the full-scale project.

- Option 1. Removing the water layer from the lagoon prior to pumping the forge compound would provide three distinct benefits:
- o It would allow the forge compound to utilize the sun for thermal heating, therefore reducing the viscosity of the forge compound.
  - o It would prevent water from filling the cone of depression that forms when pumping the forge compound.

- o It would allow unimpeded visual inspection of the surface of the forge compound, therefore allowing easier tracking of its movement.

Option 2. Leaving the water layer in the lagoon in place and using the mobile barge unit to pump the waste forge compound from below the surface would provide the following benefits:

- o Time factor in removing water layer would be eliminated, depending upon the flow capacity of NPI's oil separator.
- o Problems associated with the cone of depression would be eliminated.
- o Advantages of auger system feeding forge compound into pump.
- o Mobile barge system would allow greater mobility and flexibility of pumping operations.
- o Pumping operations would not be hampered by continual precipitation that the lagoon may receive.
- o Barge pump technology already exists and has been proven to remove greater quantities of material on a daily basis than a stationary pump.

CONCLUSION

After weighing the advantages and disadvantages of removing the water layer, particularly with the anticipated fall-season start of the project, WRR recommends leaving the water layer in place until the waste forge compound is removed.

WRR proposes to use a mobile auger pump supported by a small barge. The pump would have an auger system to feed the forge compound into the pump, which would eliminate the problems associated with the cone of depression. The barge would be propelled by a cable/winch which would move the equipment from end to end in the lagoon. The pump would be connected to the intermediate storage tanks by a floating hose.

Ancillary equipment needs would include three movable storage tanks equipped with an overflow protection system. The tanks would be attached to a screening system and a common transfer pump for filling transport tankers. By using intermediate storage tanks, the lagoon pumping operation would be more independent of the transportation and processing operations. Providing temporary storage of the material would also allow any water to separate. This water can then be removed and put into the oil separator for treatment prior to discharge.

#### REMOVAL OF FLOATING OIL LAYER

Waste Research & Reclamation Co., Inc. proposes to remove the floating layer of oil from the eastern portion of Lagoon #1 with a vacuum tanker. The floating oil layer would be guided to a skimmer by use of a floating boom. The oil layer would be pumped into a clean tanker and any water layer would be decanted off and put back into the lagoon. The oil layer would be blended and disposed of through

the cement kiln fuels program.

The approximate size of this lagoon is 50 ft. x 200 ft.. The estimated thickness of the floating oil layer is 2-4" (4" = .33 ft.). Using these values, the approximate volume of forge compound is calculated to be:

$$50 \text{ ft.} \times 200 \text{ ft.} \times .33 \text{ ft.} = 3300 \text{ ft.}$$

$$3300 \text{ ft.} \times 7.48 \text{ gal/ft.} = 24,684 \text{ gal.} \quad (12,342 \text{ gal. if layer is 2" thick})$$

It would take about one day for two men using a tractor with a vacuum tanker to remove 6,000 gallons of the floating oil layer and decant the free water from the tanker and return it to the lagoon (NOTE: The tanker would be cleaned of solvents prior to starting the pumping operation). Approximately ten 6-ft. sections of booms for each tanker load. If the booms cannot be re-used for more than one tanker, for each tanker-load of the floating oil layer that is removed, approximately two 55-gal. barrels of waste would be generated and would have to be disposed of.

ATTACHMENT A

NATIONAL PRESTO INDUSTRIES

WASTE FORGE COMPOUND REMOVAL AND DISPOSAL  
LAGOON #1

MOBILIZATION/SET-UP

The following is a list of major tasks to be completed, not necessarily in order or priority, along with an estimate of the time required to complete each task. Several of these projects will be in progress at the same time.

1. Install concrete "dead men" anchors for the barge pump winch system.
2. Fabricate three intermediate holding tanks with a total capacity of 38,000 gallons. The tanks will be equipped with at least the following: ladder, clean-out manholes, overflow pipe back to the lagoon, cat walk for top inspections, outlet manifold system, inlet manifold system.

NOTE: Project may begin with one tank, with the other tanks being added as they are completed.

3. Construct 12' x 16' building, supplied with electricity. The building will be used to house the filter screening system and transfer pump and to provide a place for personnel to change into and out of protective clothing. NPI will have to provide 440V 3-phase and 120V single-phase electricity to this building. In cold weather, steam heat will be beneficial for operations.

NOTE: Project may begin before the building is completed.

4. NPI has pumps and motors that appear to be sufficient for the application. Inspect, and rebuild if necessary, transfer pump motor and base. A base plate may have to be fabricated.
5. NPI has a duplex filter screen that appears to be sufficient for the application. NPI also has filter screen that appears to be the desired size. New filter screens may have to be fabricated if the existing screens are not the correct size. Inspect system and, if necessary, fabricate new filter screens.
6. Install pipe from transfer pump to filter screen to transport tanker loading area. Much of the equipment from the pilot study will be used for this.
7. Install pipe from intermediate tanks to filter screen.
8. Install a dock for the shuttle boat which will be used for travel to and from the barge pump.
9. Move the barge pump from the manufacturer to the lagoon, set cables, test operations. Barge pump mobilization and demobilization includes its transportation from the manufacturer to NPI, its placement in the lagoon, and its transportation back to the manufacturer.

#### OPERATIONS

The following is a sequence of operations and major tasks.

1. Pump waste forge compound from the lagoon into one of the intermediate tanks. Continue this operation until all tanks are full.
2. Sequence the removal of the waste forge compound from the intermediate tanks. This is to allow time for the water to separate from the forge compound and to be pumped from the top of the waste forge compound prior to the waste forge compounds being pumped into the transport tanker.
3. Put mix material into the transport tanker before going to NPI. Run hydraulic agitation system while loading forge compound.
4. Pump waste forge compound from the intermediate tanks, through the filter screening system, and into the transport tanker.

NOTE: Motor control for the transfer pump will be equipped with an on-site stop/start, an intrinsically safe stop/start for operation from the top of the transport tanker, and high-pressure stop switches for the filter screen system.

5. At the rail site, the transport tanker will be unloaded into a railcar. Four transport tanker loads will be put into each railcar. Prior to unloading, a core sample will be taken from each transport tanker for testing in WRR's laboratory. After the railcar is completely loaded, a core sample of the contents of the railcar will also be taken for testing in WRR's laboratory. Tests will include at least the following: BTU, Chloride, water, solids.

6. After laboratory verification that the material in the railcar is within proper parameters, the railcar will be released to the railroad for delivery to the cement kiln.
7. Laboratory results from the cement kiln will be compared with WRR's laboratory results and any major discrepancies will be investigated.

POSSIBLE OBSTRUCTIONS

1. Cold Weather

Steam heat may be used to extend the processing season.

2. Kiln Problems

WRR has assurance from Systech that they can handle the volume. As a backup, WRR also has had the waste stream approved at Cadence.

3. Mechanical or Equipment Malfunction

The company that WRR is leasing the barge pump from is located in Wisconsin.

None of the other equipment is very complex; all can be rebuilt or repaired in a short amount of time.

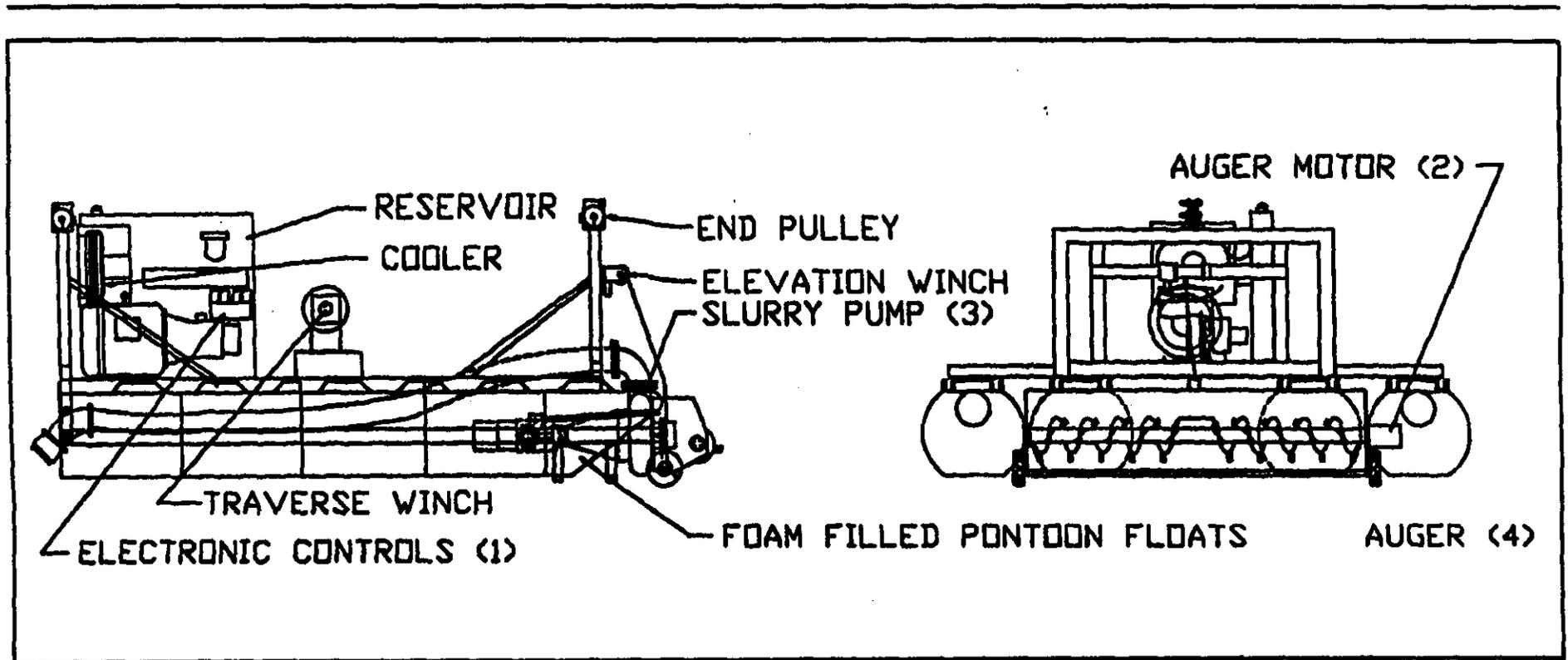
**Attachment B**  
**NATIONAL PRESTO INDUSTRIES**  
 Waste Forge Compound Removal

Tasks	Week 1	Week 2	Week 3	Week 4
Anchors		●————●		
Holding Tanks	●————		————●	
Building		●————●		
Transfer Pump And Filter	●————●			
Pipe Tank		●————	————●	
Dock			●————●	
Barge Installation			●————●	
Removal of Floating Oil Layer	●————●			
Begin Pumping Forge Compound				●————●



RECEIVED

# LAGOON PUMPER



**APPENDIX D**

**HEALTH AND SAFETY PLAN**

NATIONAL PRESTO INDUSTRIES, INC. SITE  
EAU CLAIRE, WISCONSIN

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HEALTH AND SAFETY PLAN  
LAGOON NO. 1 REMOVAL ACTION

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PROJECT #497-16  
OCTOBER 1993

---

*Office Location:*

Eder Associates Consulting Engineers, P.C.  
480 Forest Avenue  
Locust Valley, New York 11560

*Office Contact:*

Gary A. Rozmus  
Nora Brew  
(516) 671-8440

Offices in New York, Wisconsin, Michigan, Georgia, Florida and New Jersey

HEALTH AND SAFETY PLAN  
NATIONAL PRESTO INDUSTRIES, INC. SITE  
EAU CLAIRE, WISCONSIN

EDER PROJECT DIRECTOR: Gary A. Rozmus, P.E. DATE \_\_\_\_\_  
NAME

Senior Vice President  
TITLE

EDER PROJECT MANAGER: William Warren DATE \_\_\_\_\_  
NAME

Vice President  
TITLE

EDER SITE SAFETY

MANAGER: Darrell Dallmann DATE \_\_\_\_\_  
NAME

Environmental Scientist  
TITLE

\_\_\_\_\_

AMENDMENTS CONTAINED IN ATTACHMENT A

AMENDMENT 1. DATE \_\_\_\_\_

AMENDMENT 2. DATE \_\_\_\_\_

AMENDMENT 3. DATE \_\_\_\_\_

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**TABLES**

<u>No.</u>	<u>Description</u>
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 Consulting Engineers, P.C. (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 Eder 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 Eder Project Manager, Site Manager, and 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. Andrianas	03/28/86	11/21/92	2/27/93	07/14/92	11/21/92
N. Brew	06/25/93	--	--	09/08/92	06/25/93
J. Barish	02/05/88	11/21/92	2/27/93	09/10/92	11/21/92
B. Battaglia	10/30/92	11/21/92	--	08/27/92	11/21/92
E. Beacon	06/10/88	11/21/92	--	06/09/92	11/21/92
K. Butler	08/27/92	11/21/92	--	07/21/92	11/21/92
D. Dallmann	04/02/92	04/03/93	04/03/92	04/93	04/03/93
M. Delong	03/90	11/25/92	05/91	02/09/93	11/25/92
M. Foley	06/19/87	--	6/20/87	--	--
A. Glalmo	10/30/92	11/21/92	--	10/22/92	11/21/92
J. Heaney	06/19/87	11/21/92	06/24/91	12/03/91	11/21/92
K. McHale	06/16/89	11/21/92	02/27/93	09/01/92	11/21/92
S. O'Brien	01/15/93	--	--	01/07/93	01/15/93
K. Pasterak	05/14/86	11/26/92	--	12/03/91	07/01/88
B. Pendergast	05/04/90	11/21/92	02/27/93	07/02/92	11/21/92
T. Perotto	10/16/91	10/12/92	--	01/07/93	10/12/92
V. Raykin	05/04/90	11/21/92	02/27/93	08/25/92	11/21/92
K. Savo	03/26/93	--	--	03/18/93	03/26/93
J. Valenti	09/14/90	11/21/92	02/27/93	12/10/91	11/21/92
E. Wildfang	11/92	--	--	11/03/92	11/92

#### **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 Dallmann. Any changes in Eder's key project personnel will be recorded with 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 had 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 SCOPE OF WORK

During July 1993, a pilot scale study was implemented at the National Presto Industries, Inc. (NPI) site to determine the feasibility of removing waste forge compound from Lagoon #1 and using it as a supplemental fuel in a cement kiln. Waste Research and Reclamation (WR&R) removed the waste forge compound from the lagoon, blended it with waste solvent, and arranged for transportation of the blended material to two CERCLA approved cement kilns for use as a supplemental fuel. The pilot scale study was performed in accordance with Eder's June 1993 work plan.

The pilot scale study showed that it is feasible to remove and blend the waste forge compound for use as a fuel in a cement kiln. NPI proposes to begin full scale removal of the Lagoon #1 waste forge compound for blending and use as a supplemental fuel in a cement kiln during fall 1993. This work would be conducted in accord with the Lagoon #1 Removal Action Work Plan, this HASP, and USEPA's off-site policy.

Before any waste forge compound is removed, WR&R would remove the floating layer of oil from the northeastern corner of Lagoon #1 using a floating boom to direct the oil to a skimmer connected to a vacuum tanker. Any water that separates out in the vacuum truck would be pumped off and put back into the lagoon. The oil would be transported to WR&R, blended and disposed of through the cement kiln fuels program.

The standing water would be left in place to allow the use of a shallow draft barge as a pumping platform. The barge would be moved around the lagoon on twelve to fourteen inches of standing water by a cable/winch system. Pumping from the barge would make it feasible to remove the viscous waste forge compound using an enclosed screw auger pickup operated below the lagoon surface. The auger system is eight feet wide and can be adjusted for depth. The standing water will remain in the lagoon and will reduce volatilization of organic compounds from the waste

forge compound and the underlying waste forge compound/soil mixture during and after full scale pumping operations.

The barge pump would be connected by a floating hose to three intermediate storage tanks which would be constructed next to the lagoon. The storage tanks would be equipped with overflow protection systems and tarps would be placed beneath the hose between the lagoon and the tanks for spill containment. These on-site tanks would provide the detention time to allow water to separate from the pumped waste forge compound. This water would be removed and pumped back into the lagoon.

Waste forge compound would be pumped from the intermediate on-site storage tanks directly into transport tankers. The waste forge compound would be pumped through a screening system as it is transferred from the storage tanks to the tanker trucks. No solvents will be used to clean the screens at the NPI site. The screens will be taken to WR&R's facility if solvent cleaning is necessary. Solids removed by the screening system and those remaining at the bottom of the intermediate storage tanks will be put back into the lagoon. A building would be constructed to house the screening system and transfer pumps. Tarps would be placed beneath the piping between the storage tanks and the building, and between the building and the transport tankers for spill containment.

Waste solvent, off-spec fuel, or waste oil would be put in empty tankers at WR&R before they are brought to the NPI site. Hydraulic agitation systems in the transport tankers would blend the waste with the waste forge compound as it is pumped into the tankers at the NPI site. The blended material would be transported directly to the Altoona railyard. At the railyard, WR&R will collect a core sample from each transport tanker before the blended material is pumped into 20,000-gallon railcars. Four transport tanker loads will be pumped into each railcar. Containment, including tarps and a basin that attaches under the railcar, will be used during transfer operations at the railyard to provide spill and overflow protection. When each railcar is completely loaded, WR&R will collect a core sample of the contents. The samples from the tankers and railcars will be analyzed in WR&R's laboratory in accord with the Sampling and

Analysis Plan described in the Removal Action Work Plan. After WR&R verifies that the blended material in the railcar meets kiln specifications for burning, the railcar will be released for delivery to a CERCLA-approved out-of-state cement kiln. At the kiln, a core sample would also be collected from each railcar and analyzed to verify that the blended material meets cement kiln specifications.

After the full scale waste forge compound removal operation is complete, the tanks, barge mounted pump, and other equipment brought on-site for the project will be decontaminated and removed by WR&R, and the area around Lagoon #1 will be cleaned up. All equipment that comes in contact with the waste forge compound will be decontaminated using a steam cleaner before leaving the NPI site. The rinse water will be contained and placed in Lagoon #1. Post-removal actions may be taken if necessary to secure the area until a final remedy is selected and implemented.

### 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

##### Waste Forge Compound Pumping, Blending, and Transportation

WR&R will be responsible for physical hazards associated with the mobilization, set-up and operation of the barge and associated pumping equipment, the intermediate storage tanks, the screening system, and other equipment involved in pumping, storing, and transferring waste forge compound at the NPI site. WR&R will also be responsible for physical hazards during waste transport, sampling tankers and railcars, and unloading operations at the Altoona railyard.

During the July 1993 pilot scale study, organic vapor readings at the top of the tanker trucks were sustained above five parts per million during the truck loading operation near the lagoon. WR&R personnel at the top of the tanker wore respiratory protection during the truck loading operation. WR&R attributed the elevated organic vapor readings to residual solvent in the tanker trucks brought to the NPI site during the pilot study, not to the waste forge compound being pumped into the trucks. During the Lagoon #1 full scale removal action, the waste forge compound will be pumped into tanker trucks that contain the waste solvent, off-spec fuel, or waste oil to be blended with the waste forge compound. Air emissions during the full scale truck and railcar

loading, sampling, and unloading operations pose a potential health hazard and personnel involved in these operations will use appropriate respiratory protection as necessary.

### 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.

### 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. 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

A summary table containing hazardous chemicals known at the NPI site, and pertinent health information is contained in Attachment D. As additional chemicals are identified on-site and off-site, Attachment D will be supplemented with the appropriate information.

The Lagoon #1 waste forge compound samples collected during the RI and feasibility study were analyzed for volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), and metals. The laboratory detection limits for VOCs and SVOCs were elevated due to the oil content of the waste forge compound. The VOCs 1,1,1-trichloroethane (TCA), 1,1-dichloroethane (1,1-DCA), and tetrachloroethene (PCE) were detected in the samples. SVOCs including

naphthalene, phenanthrene, anthracene, fluoranthene, pyrene, and chrysene were also detected. Metals including cadmium, chromium, copper, lead, nickel, zinc, vanadium, barium, and arsenic were detected in the waste forge compound samples.

The standing water on the lagoon surface was also sampled and analyzed. 1,1-DCA, 1,2-dichloroethene, lead, nickel, and zinc were detected in these samples.

The analytical data for the Lagoon #1 samples are summarized in the June 1993 NPI site RI report.

## 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 Lagoon No. 1 will be initially performed in Level C. Air monitoring will be conducted continuously and recorded to determine whether Level B is required or if Level D conditions are suitable. If air monitoring in the breathing zone indicates sustained PID VOC readings at 5 ppm or greater over 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 continue downgraded to Level C. If this is done, then air samples for gas chromatograph analysis will be collected 4 times a day to verify 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 organic vapor analyzer (OVA, or equivalent). 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 workboots;
- 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 organic vapor analyzer (OVA, or equivalent). 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 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 workboots;
- Chemical resistant overboots 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 portable organic vapor analyzer or equivalent, 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 initial site entry shall be conducted using:

- Combustible Gas Indicator(CGI)/Oxygen Meter;
- Organic Vapor Analyzer (OVA);
- MicroTip.

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

CGI readings of < 10% LEL: continue.

CGI readings of 10 to 20% LEL: proceed with caution.

CGI readings > 20% LEL: stop work.

OVA (or equivalent) readings in breathing zone sustained at background: continue.

OVA (or equivalent) readings in breathing zone sustained at levels greater than 5 ppm above background: Level B PPE.

## **5.2 Activity-Specific Air Monitoring**

The following activity-specific air monitoring guidelines shall apply. All air monitoring results will be recorded in the site field log book.

Real-time air monitoring will be performed at the perimeter of the exclusion zone and at the site boundary at regular intervals determined by the Site Safety Officer. Air will also be monitored outside the exclusion zone, along the edge of the lagoon, to verify that emissions from the lagoon do not pose a health hazard to NPI, WR&R, Eder, or other personnel in the vicinity of the work area. All monitoring data will be recorded in the field notebook.

Real-time measurements of organic vapor concentrations will be made using a photoionization detector or a flame ionization detector. Real-time air monitoring locations will be at four locations on the perimeter of the exclusion zones and at the site boundaries (one location upwind and two locations downwind).

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 to evaluate the dissipation of contaminant concentrations in the air. Weather conditions such as temperature, relative humidity,

wind speed and wind direction can be obtained from the Chippewa Valley Regional Airport weather station (telephone number 715-835-3163).

The work activity will be suspended if the real-time measurements of organic vapor concentrations (at the NPI property line) are sustained at levels greater than 5 ppm above background levels during three consecutive hourly sampling events. If the work is suspended due to high organic vapor concentrations at the NPI site boundary, mitigation measures will be discussed with USEPA and WDNR, and appropriate measures will be implemented before proceeding with the full scale waste forge compound removal work.

## 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 performed.

The exclusion zone will be the area of the lagoon 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, and the locations of the map to the hospital and 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 D, 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 puddles and discolored surfaces. Do not kneel 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 forge compound or contaminated soils 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. 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 removing 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; and,

- Remove SCBA and face piece and place on rack provided;
- 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 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 map to the hospital will be 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/Command post.
Fire Extinguisher:	On-site Eder vehicle, excavator, 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 exclusion zone where Level B PPE is worn.

**9.2 Emergency Telephone Numbers and Hospital Information**

	<u>EMERGENCY NUMBER</u>	<u>NON-EMERGENCY</u>
Eau Claire Fire Department	911	839-5012
Eau Claire Police Department	911	839-4972
Sacred Heart Hospital (Trauma Center)	839-4222	
Luther Hospital	839-3242	
(Poison Control Center)	835-1515	
National Response Center	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 Ave. and continue approx. 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 THE MAP 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 or Site Manager 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, site personnel will:

- Inform their supervisor immediately;
- Locate the source or 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.

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 Traitor	Decontamination - field office
MicroTip	Exclusion zone - air monitoring
OVA	Exclusion zone - air monitoring
MSA-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: \_\_\_\_\_

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\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

REQUIRED CHANGES IN PPE: \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

\_\_\_\_\_  
EDER PROJECT MANAGER (DATE)

\_\_\_\_\_  
EDER SITE SAFETY OFFICER (DATE)

\_\_\_\_\_  
EDER SITE MANAGER (DATE)

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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EDER PROJECT MANAGER (DATE)

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EDER SITE SAFETY OFFICER (DATE)

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EDER SITE MANAGER (DATE)

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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EDER PROJECT MANAGER (DATE)

\_\_\_\_\_  
EDER SITE SAFETY OFFICER (DATE)

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EDER SITE MANAGER (DATE)

ATTACHMENT B

SITE SAFETY ACKNOWLEDGEMENT FORM



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 98.6°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 void 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.

## HEAT CRAMPS (continued)

### 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 head 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 salt 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<sup>(1)</sup>REQUIRED FREQUENCY OF HEAT STRESS MONITORING  
FOR WORKERS IN IMPERMEABLE CLOTHING

Adjusted <sup>(2)</sup> 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:

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

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<sup>(1)</sup>  
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 to 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<sup>(1)</sup>

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.

ihl-rat TCl<sub>o</sub>: 57 mg/m<sup>3</sup>/4H (22W pre): TER  
 ori-rat LD50: 1120 mg/kg  
 ori-mus LD50: 625 mg/kg  
 ihl-mus LCl<sub>o</sub>: 10 g/m<sup>3</sup>  
 skn-rbt LD50: 3890 mg/kg  
 unr-mam LD50: 807 mg/kg

GISAAAA 39(7),25,74  
 HYSAAV 32,349,67  
 HYSAAV 32,349,67  
 GISAAA 20(8),19,55  
 UCDS\*\* 3/23/70  
 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<sup>-</sup>. See also 1,2-DICHLOROETHANE; and CHLORINATED HYDROCARBONS, ALIPHATIC.

DFB809

1,1-DICHLOROETHANE



HR: 3

CAS: 75-34-3

NIOSH: KI 0175000

DOT: 2362

mf: C<sub>2</sub>H<sub>4</sub>Cl<sub>2</sub> mw: 98.96

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

SYNS:

AETHYLIDENCHLORID (GERMAN)  
 CHLORINATED HYDROCHLORIC ETHER  
 CHLORURE d'ETHYLIDENE (FRENCH)  
 CLORURO DI ETILIDENE (ITALIAN)  
 1,1-DICHLOROETHAAN (DUTCH)

1,1-DICHLORAETHAN (GERMAN)  
 1,1-DICHLOROETHANE  
 1,1-DICLOROETANO (ITALIAN)  
 ETHYLIDENE CHLORIDE  
 ETHYLIDENE DICHLORIDE  
 NCI-C04535  
 RCRA WASTE NUMBER U076

TOXICITY DATA:

ihl-rat TCl<sub>o</sub>: 6000 ppm/7H (6-15D preg): TER  
 ori-mus TDLo: 185 g/kg/78 W-I: ETA  
 ori-mus TD : 1300 g/kg/78 W-I: ETA  
 ori-rat LD50: 725 mg/kg

CODEN:

TXAPA9 28,452,74  
 NCITR\* NCI-CG-TR-66,78  
 NCITR\* NCI-CG-TR-66,78  
 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<sup>-</sup>. See also 1,2-DICHLOROETHANE; and CHLORINATED HYDROCARBONS, ALIPHATIC.

DFB900

1,2-DICHLOROETHANE

HR: 3

CAS: 107-06-2

NIOSH: KI 0525000

DOT: 1184

mf: C<sub>2</sub>H<sub>4</sub>Cl<sub>2</sub> 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)  
 1,2-BICHLOROETHANE  
 BICHLORURE D'ETHYLENE (FRENCH)  
 BORER SOL  
 BROCIDO  
 CHLORURE D'ETHYLENE (FRENCH)  
 CLORURO DI ETHENE (ITALIAN)  
 1,2-DCE  
 DESTRUOXOL BORER-SOL  
 1,2-DICHLOROETHAAN (DUTCH)  
 1,2-DICHLOR-AETHAN (GERMAN)  
 DICHLOREMULSION  
 DI-CHLOR-MULSION  
 DICHLORO-1,2-ETHANE (FRENCH)  
 α,β-DICHLOROETHANE

sym-DICHLOROETHANE  
 1,2-DICHLOROETHANE  
 DICHLOROETHYLENE  
 1,2-DICLOROETANO (ITALIAN)  
 DUTCH LIQUID  
 DUTCH OIL  
 EDC  
 ENT 1,656  
 ETHANE DICHLORIDE  
 ETHYLEENDICHLORIDE (DUTCH)  
 ETHYLENE CHLORIDE  
 ETHYLENE DICHLORIDE (ACGIH DOT)  
 1,2-ETHYLENE DICHLORIDE  
 GLYCOL DICHLORIDE  
 NCI-C00511  
 RCRA WASTE NUMBER U077

TOXICITY DATA:

skn-rbt 600 mg open MLD  
 eye-rbt 63 mg SEV  
 mm-m-sat 40 μmol/plate  
 msc-hmn: lym 100 mg/L  
 slit-mus-ivr 300 mg/kg  
 otr-ham: emb 200 μL/plate  
 ihl-rat TCl<sub>o</sub>: 300 ppm/7H (6-15D preg): REP  
 ori-rat TDLo: 5286 mg/kg/69W-I: CAR  
 ihl-rat TCl<sub>o</sub>: 5 ppm/7H/78W-I: ETA  
 ori-mus TDLo: 3536 mg/kg/78W-I: CAR  
 ihl-mus TCl<sub>o</sub>: 5 ppm/7H/78W-I: ETA  
 skn-mus TDLo: 1120 g/kg/74W-I: NEO  
 ori-rat TD : 38 g/kg/78W-I: CAR  
 ori-mus TD : 76 g/kg/78W-I: CAR, TER  
 ori-rat TD : 18 g/kg/78W-I: CAR  
 ori-mus TD : 38 g/kg/78W-I: CAR, TER  
 ihl-hmn TCl<sub>o</sub>: 4000 ppm/H: CNS, PNS, GIT  
 ori-hmn TDLo: 428 mg/kg: GIT, CNS, PUL  
 ori-man TDLo: 892 mg/kg: GIT, LIV  
 ori-hmn LDLo: 286 mg/kg: GIT, LIV  
 ori-man LDLo: 714 mg/kg: CNS, CVS, PUL  
 ori-rat LD50: 670 mg/kg  
 ihl-rat LC50: 1000 ppm/7H  
 scu-rat LDLo: 99 mg/kg  
 ori-mus LD50: 489 mg/kg

CODEN:

UCDS\*\* 3/23/70  
 UCDS\*\* 3/23/70  
 CBINA8 20,1,78  
 MUREAV 142,133,85  
 MUREAV 117,201,83  
 EVSRBT 25,75,82  
 BANRDU 5,149,80  
 BANRDU 5,35,80  
 BANRDU 5,3,80  
 BANRDU 5,35,80  
 BANRDU 5,3,80  
 JJIND8 63,1433,79  
 NCITR\* NCI-CG-TR-55,78  
 NCITR\* NCI-CG-TR-55,78  
 NCITR\* NCI-CG-TR-55,78  
 NCITR\* NCI-CG-TR-55,78  
 PCOC\*\* -,500,66  
 SOMEAU 22,132,58  
 WILEAR 28,983,75  
 CLCEAL 86,203,47  
 KLWOAZ 48,822,70  
 FMCHA2 -,C99,83  
 AMIHBC 4,482,51  
 AMPLAO 51,346,51  
 TOXID9 1,26,81

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<sub>3</sub>; oleum. Can react vigorously with oxidizing materials. To fight fire, use alcohol foam, CO<sub>2</sub>, dry chemical. When heated to decomposition it emits toxic fumes of Cl<sup>-</sup>.

**DFI200**

HR: 1

**cis-DICHLOROETHYLENE**

CAS: 156-59-2

NIOSH: KV 9420000

mf: C<sub>2</sub>H<sub>2</sub>Cl<sub>2</sub> mw: 96.94

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:**

mno-smc 100 mmol/L  
mma-smc 40 mmol/L  
mrc-smc 100 mmol/L  
dns-rat:ivr 4300 µmol/L  
ihl-mus LCLo: 65000 mg/  
m<sup>3</sup>/2H  
ihl-cat LCLo: 20000 mg/  
m<sup>3</sup>/6H

**CODEN:**

TCMUD8 4,365,84  
TCMUD8 4,365,84  
TCMUD8 4,365,84  
CRNGDP 5,1629,84  
AHBAAM 116,131,36  
AHBAAM 116,131,36

Reported in EPA TSCA Inventory.

THR: Mildly toxic 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 alkalis or their concentrated solutions produces chloroacetylene gas which ignites spontaneously in air. Reacts violently with N<sub>2</sub>O<sub>4</sub>; 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<sub>2</sub>, dry chemical. When heated to decomposition it emits toxic fumes of Cl<sup>-</sup>. See also 1,1-DICHLOROETHYLENE and CHLORINATED HYDROCARBONS, ALIPHATIC. For further information, see Vol. 4, No. 3 of *DPIM Report*.

**DFI600****trans-1,2-DICHLOROETHYLENE**

HR: 1

CAS: 156-60-5

NIOSH: KV 9400000

mf: C<sub>2</sub>H<sub>2</sub>Cl<sub>2</sub> mw: 96.94

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

SYN:

trans-ACETYLENE DICHLORIDE

trans-DICHLOROETHYLENE

**TOXICITY DATA:**

ihl-hmn TCLo: 4800 mg/m<sup>3</sup>/10M  
ipr-rat LD50: 7536 mg/kg  
ihl-mus LCLo: 75000 mg/m<sup>3</sup>/2H  
ipr-mus LD50: 4019 mg/kg  
ihl-cat LCLo: 43000 mg/m<sup>3</sup>/6H

**CODEN:**

AHBAAM 116,131,36  
TXCYAC 7,141,77  
AHBAAM 116,131,36  
TXCYAC 7,141,77  
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 alkalis or their concentrated solutions produces chloroacetylene gas which ignites spontaneously in air. Reacts violently with N<sub>2</sub>O<sub>4</sub>; 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<sub>2</sub>, dry chemical. When heated to decomposition it emits toxic fumes of Cl<sup>-</sup>. 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<sub>3</sub>H<sub>2</sub>Cl<sub>2</sub>O<sub>3</sub> mw: 156.95

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

**TOXICITY DATA:**

scu-mus TDLo: 648 mg/kg/54W-  
I:ETA

**CODEN:**

JNCIAM 48,1431,72

THR: An experimental tumorigen. When heated to decomposition it emits toxic fumes of Cl<sup>-</sup>.

**DFJ000**

HR: 3

**DICHLORO(ETHYLENEDIAMMINE)PLATINUM(II)**

CAS: 14096-51-6

NIOSH: TP 2497100

mf: C<sub>2</sub>H<sub>8</sub>Cl<sub>2</sub>N<sub>2</sub>Pt mw: 326.11

SYNS:

ETHYLENEDIAMINEDICHLORIDE  
PLATINUM (II)

PLATINUM ETHYLENEDIAMMINE  
DICHLORIDE

**TOXICITY DATA:**

mno-sat 2 µg/plate  
mma-sat 2 µg/plate  
dnd-esc 100 mmol/L  
dni-hmn:oth 25 µmol/L  
oms-mam:lym 10 µmol/L  
ipr-mus LDLo: 14 mg/kg

**CODEN:**

MUREAV 77,45,80  
MUREAV 77,45,80  
CBINA8 16,39,77  
JCNAAW 6,207,70  
BCPCA6 23,1659,74  
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<sup>-</sup> and NO<sub>2</sub>.

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:

skn-rbt 500 mg/24H  
eye-rbt 100 mg SEV  
ori-mus TDLo: 129 g/kg/2Y-1:  
CAR  
ori-mus TD: 258 g/kg/2Y-1: CAR

CODEN:

AMPMAR 35.593,74  
AMPMAR 35.593,74  
NTPTR\* NTP-TR-237,82  
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<sup>-</sup>. For further information, see Vol. 4, No. 3 of DPIM Report.

TBQ250

1,1,2,2-TETRACHLOROETHYLENE

CAS: 127-18-4

DOT: 1897

mf: C<sub>2</sub>Cl<sub>4</sub> 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 I  
CARBON BICHLORIDE  
CARBON DICHLORIDE  
CZTEROCHLOROETYLEN (POLISH)  
DIDAKENE  
DOW-PER  
ENT 1.860  
ETHYLENE TETRACHLORIDE  
FEDAL-UN  
NCI-C04580  
NEMA  
PERAWIN  
PERCHLOROETHYLEEN, PER (DUTCH)  
PERCHLOR  
PERCHLORAETHYLEN, PER (GERMAN)  
PERCHLORETHYLENE  
PERCHLORETHYLENE, PER (FRENCH)

PERCHLOROETHYLENE (ACGIH, DOT)  
PERCLENE  
PERCHLOROETILENE (ITALIAN)  
PERCOSOLVE  
PERK  
PERKLONE  
PERSEC  
RCRA WASTE NUMBER U210  
TETLEN  
TETRACAP  
TETRACHLOORETHEEN (DUTCH)  
TETRACHLORAETHEN (GERMAN)  
TETRACHLOROETHENE  
TETRACHLOROETHYLENE (DOT)  
TETRACHLOROETENE (ITALIAN)  
TETRALENO  
TETRALEX  
TETRAVEC  
TETROGUER  
TETROPIL

HR: 3

NIOSH: KX 3850000

TOXICITY DATA:

skn-rbt 810 mg/24H SEV  
eye-rbt 162 mg MLD  
mmo-sat 50 µL/plate  
mma-sat 200 µL/plate  
dns-hmn: lng 100 mg/L  
otr-rat: emb 97 µmol/L  
ihl-rat TCLo: 1000 ppm/24H (14D pre/1-22D preg): TER  
ihl-rat TCLo: 900 ppm/7H (7-13D preg): REP  
ihl-mus TCLo: 300 ppm/7H (6-15D preg): TER  
ori-mus TDLo: 195 g/kg/50W-1: CAR  
ori-mus TD : 240 g/kg/62W-1: CAR  
ihl-hmn TCLo: 96 ppm/7H: PNS,EYE,CNS  
ihl-man TCLo: 280 ppm/2H: EYE,CNS  
ihl-man TCLo: 600 ppm/10M: EYE,CNS  
ihl-man LDLo: 2857 mg/kg: CNS,PUL  
ori-rat LD50: 8850 mg/kg  
ihl-rat LCLo: 4000 ppm/4H  
ori-mus LD50: 8100 mg/kg  
ihl-mus LC50: 5200 ppm/4H  
ipr-mus LD50: 4700 mg/kg  
ori-dog LDLo: 4000 mg/kg  
ipr-dog LD50: 2100 mg/kg  
ivn-dog LDLo: 85 mg/kg  
ori-cat LDLo: 4000 mg/kg  
ori-rbt LDLo: 5000 mg/kg  
scu-rbt LDLo: 2200 mg/kg

CODEN:

JETOAS 9,171,76  
JETOAS 9,171,76  
NIOSH\* 5AUG77  
NIOSH\* 5AUG77  
NTIS\*\* PB82-185075  
ITCSAF 14,290,78  
APTOD9 19,A21,80  
  
TJADAB 19,41A,79  
TXAPA9 32,84,75  
  
NCITR\* NCI-CG-TR-13,77  
NCITR\* NCI-CG-TR-13,77  
NTIS\*\* PB257-185  
AMIHBC 5,566,52  
AMIHBC 5,566,52  
MLDCAS 5,152,72  
  
NPIRI\* 1,96,74  
JOCMA7 4,262,62  
NTIS\*\* PB257-185  
APTOA6 9,303,53  
NTIS\*\* PB257-185  
AJHYA2 9,430,29  
TXAPA9 10,119,67  
QJPPAL 7,205,34  
AJHYA2 9,430,29  
AJHYA2 9,430,29  
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<sup>3</sup>); 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

**TETRACHLOROETHYLENE**

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<sub>2</sub>O<sub>4</sub>; metals; NaOH. When heated to decomposition it emits highly toxic fumes of Cl<sup>-</sup>. 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<sub>3</sub>Cl<sub>4</sub>O<sub>3</sub> mw: 225.84

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

**TBQ275** *HR: 3*  
**TETRACHLOROETHYLENE OXIDE**  
 CAS: 16650-10-5 NIOSH: KI 8760000  
 mf: C<sub>2</sub>Cl<sub>4</sub>O mw: 181.82

**SYNS:**  
 EPOXYPERCHLOROVINYL TETRACHLOROEPOXYETHANE  
 PCBO

**TOXICITY DATA:** **CODEN:**  
 otr-ham: emb 4300 μmol/L JJIND8 69,531.82  
 skin-mus TDLo: 300 mg/kg/66W- CNREA8 43,159.83  
 I: CAR  
 acu-mus TDLo: 20 mg/kg/70W-1: CNREA8 43,159.83  
 ETA

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

**TBQ300** *HR: 3*  
**2,3,4,5-TETRACHLOROHEXATRIENE**  
 NIOSH: MP 5425500  
 mf: C<sub>6</sub>H<sub>4</sub>Cl<sub>4</sub> mw: 217.90

**TOXICITY DATA:** **CODEN:**  
 ori-rat LD50: 370 mg/kg 85GMAT -,108.82  
 hl-rat LCLo: 670 mg/m<sup>3</sup>/2H 85GMAT -,108.82  
 ori-mus LD50: 290 mg/kg 85GMAT -,108.82  
 hl-mus LCLo: 190 mg/m<sup>3</sup>/2H 85GMAT -,108.82

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

**TBQ500** *HR: 3*  
**TETRACHLOROHYDROQUINONE**  
 CAS: 87-87-6 NIOSH: MX 7700000  
 mf: C<sub>6</sub>H<sub>2</sub>Cl<sub>4</sub>O<sub>2</sub> 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  
 ori-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<sup>-</sup>.

**TBQ750** *HR: 3*  
**TETRACHLOROISOPHTHALONITRILE**  
 CAS: 1897-45-6 NIOSH: NT 2600000  
 mf: C<sub>8</sub>Cl<sub>4</sub>N<sub>2</sub> mw: 265.90

**SYNS:**  
 BRAVO EXOTHERM TERMIL  
 BRAVO 6F FORTURF  
 BRAVO-W-75 NCI-C00102  
 CHLOROALONIL NOPCOCIDIE  
 CHLOROTHALONIL SWEEP  
 CHLOROTHALONIL (GERMAN) TCIN  
 DAC 2797 m-TCPN  
 DAPONIL TERMIL  
 DAPONIL 2787 FLOWABLE FUN- 2,4,5,6-TETRACHLORO-3-CYANO-  
 GICIDE BENZONITRILE  
 DACOSOIL m-TETRACHLOROPHTHALONI-  
 1,3-DICYANOTETRACHLOROBEN- TRILE  
 ZENE TPN (pesticide)  
 EXOTHERM

**TOXICITY DATA:** **CODEN:**  
 ori-rat TDLo: 142 g/kg/80W-C: NCITR\* NCI-CG-TR-  
 CAR 41,78  
 ori-rat LD50: 10 mg/kg 85ARAE 4,75.76  
 ori-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 (MEMDT 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<sup>-</sup>, NO<sub>x</sub>, and CN<sup>-</sup>. Used as a fungicide. See also NITRILES.

**TBR000** *HR: 3*  
**TETRACHLORONAPHTHALENE**  
 CAS: 1335-88-2 NIOSH: QK 3700000  
 mf: C<sub>10</sub>H<sub>4</sub>Cl<sub>4</sub> mw: 265.94

## TIM000

HR: 1

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

CAS: 354-21-2

NIOSH: KI 1435000

mf:  $\text{CHCl}_2\text{F}_2$  mw: 157.37

## SYNS:

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

## TOXICITY DATA:

ori-rat LDLo: 7500 mg/kg

ihl-rat LCLo: 4000 ppm/4H

## CODEN:

HXPHAU 20(Pt 1),  
459.66

UCMH\*\* 15NOV62

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

## TIM500

HR: 1

## TRICHLORO ESTERTIN

NIOSH: WH 8240000

SYN: ESTERTRICHLOROSTANNANE

## TOXICITY DATA:

unr-rat LD50: 5500 mg/kg

## CODEN:

TIUSAD 107,1.76

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

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

## TIM750

HR: 3

## 1,1,1-TRICHLOROETHANE

CAS: 71-55-6

NIOSH: KJ 2975000

DOT: 2831

mf:  $\text{C}_2\text{H}_3\text{Cl}_3$  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

NCl-C04626

RCRA WASTE NUMBER U226

SOLVENT III

STROBANE

a-T

1,1,1-TCE

1,1,1-TRICHLOROETHAAN

(DUTCH)

1,1,1-TRICHLORAETHAN (GER-

MAN)

TRICHLORO-1,1,1-ETHANE

(FRENCH)

a-TRICHLOROETHANE

1,1,1-TRICHLOROETANO (ITALIAN)

TRI-ETHANE

## TOXICITY DATA:

eye-man 450 ppm/8H

skn-rbt 5 g/12D-1 MLD

skn-rbt 500 mg/24H MOD

eye-rbt 100 mg MLD

eye-rbt 2 mg/24H SEV

dnr-esc 500 mg/L

otr-mus: emb 20 mg/L

ori-rat TDLo: 43 mg/kg (1-22D

preg/21D post): TER

ihl-rat TCLo: 2100 ppm/24H

(14D pre/1-20D preg): TER

ihl-man LCLo: 27 g/m<sup>3</sup>/10M

ihl-man TCLo: 350 ppm: CNS

ori-hmn TDLo: 670 mg/kg: GIT

ihl-hmn TCLo: 920 ppm/70M:

EYE, CNS

ihl-man TCLo: 200 ppm/4H: CNS

ori-rat LD50: 10300 mg/kg

ihl-rat LC50: 18000 ppm/4H

ipr-rat LD50: 5100 mg/kg

ori-mus LD50: 11240 mg/kg

ihl-mus LC50: 3911 ppm/2H

ipr-mus LD50: 4700 mg/kg

ori-dog LD50: 750 mg/kg

ipr-dog LD50: 3100 mg/kg

ivn-dog LDLo: 95 mg/kg

ihl-cat LCLo: 600 mg/m<sup>3</sup>/4H

ori-rbt LD50: 5660 mg/kg

skn-rbt LDLo: 1 g/kg

scu-rbt LDLo: 500 mg/kg

ori-gpg LD50: 9470 mg/kg

## CODEN:

BJIMAG 28,286,71

AIHAAP 19,353,58

28ZPAK -,28,72

AIHAAP 19,353,58

28ZPAK -,28,72

PMRSDJ 1,195,81

CALEDQ 28,85,85

TJADAB 29(2),25A,84

TOXID9 1,28,81

JOCMA7 8,358,66

WEHSAL 10,82,73

NTIS\*\* PB257-185

AIHAAP 19,353,58

ATSUDG 5,96,82

NTIS\*\* PB257-185

28ZPAK -,28,72

NTIS\*\* PB257-185

NTIS\*\* PB257-185

SAIGBL 13,226,71

TXAPA9 13,287,68

FMCHA2 -,C242,83

TXAPA9 10,119,67

HBTXAC 5,72,59

85GMAT -,38,82

AIHAAP 19,353,58

85GMAT -,38,82

HBTXAC 5,72,59

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<sup>3</sup>); 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.

## 1,1,1-TRICHLOROETHANE

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<sub>2</sub>O<sub>4</sub>; oxygen. When heated to decomposition it emits toxic fumes of Cl<sup>-</sup>. 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

## 1,1,2-TRICHLOROETHANE

CAS: 79-00-5

NIOSH: KJ 3150000

mf: C<sub>2</sub>H<sub>3</sub>Cl<sub>3</sub> 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  
NCL-C04579  
RCRA WASTE NUMBER U227  
β-T  
1,1,2-TRICHLOROETHANE

β-TRICHLOROETHANE  
1,1,2-TRICHLOROETHANE  
TRICHLOROETHANE (1,1,2) (POL-  
ISH)  
VINYL TRICHLORIDE

## TOXICITY DATA:

skn-rbt 500 mg open MLD  
skn-rbt 810 mg/24H SEV  
eye-rbt 162 mg MLD  
skn-gpg 1440 mg/15M  
otr-mus:emb 25 mg/L  
cyt-gpg-skn 2880 μg/kg  
dnd-mam:lym 1 mmol/L  
orl-mus TDLo:532 mg/kg (14D  
male):REP  
orl-mus TDLo:76 g/kg/78W-1:  
CAR  
orl-mus TD :152 g/kg/78W-1:  
CAR  
orl-rat LD50:580 mg/kg  
ihl-rat LCLo:500 ppm/8H  
orl-mus LD50:378 mg/kg  
ipr-mus LD50:494 mg/kg  
scu-mus LD50:227 mg/kg  
orl-dog LDLo:500 mg/kg  
ipr-dog LD50:450 mg/kg  
ivn-dog LDLo:95 mg/kg  
ihl-cat LCLo:13100 mg/m<sup>3</sup>/4.5H  
skn-rbt LD50:3730 mg/kg  
scu-rbt LDLo:500 mg/kg

## CODEN:

UCDS\*\* 6/28/72  
JETOAS 9,171,76  
JETOAS 9,171,76  
APTOA6 41,298,77  
CALEDQ 28,85,85  
APTOA6 41,298,77  
TODEDS 11,243,82  
DCTODJ 8,333,85  
NCITR\* NCI-CG-TR-  
74,78  
NCITR\* NCI-CG-TR-  
74,78  
AIHAAP 30,470,69  
AIHAAP 30,470,69  
DCTODJ 8,333,85  
TXAPA9 9,139,66  
JPETAB 123,224,58  
AJHYA2 16,325,32  
TXAPA9 10,119,67  
QJPPAL 7,205,34  
AHBAAM 116,131,36  
AIHAAP 30,470,69  
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<sup>3</sup>)

## HR: 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<sup>-</sup>. 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

## TRICHLOROETHANOL

CAS: 115-20-8

NIOSH: KM 3850000

mf: C<sub>2</sub>H<sub>3</sub>Cl<sub>3</sub>O 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:

TRICHLOROETHANOL  
2,2,2-TRICHLOROETHANOL  
TRICHLOROETHYL ALCOHOL

2,2,2-TRICHLOROETHYL ALCO-  
HOL

## TOXICITY DATA:

mno-asn 5 μL/plate/2H  
sln-asn 10240 μmol/L  
sce-hmn:lym 178 g/L  
orl-rat LDLo:500 mg/kg  
ipr-rat LDLo:300 mg/kg  
orl-mus LDLo:500 mg/kg  
ivn-mus LD50:201 mg/kg  
ivn-rbt LDLo:50 mg/kg  
rec-rbt LDLo:500 mg/kg

## CODEN:

CBINAB 30,9,80  
MUREAV 155,105,85  
TOERD9 3,63,81  
CRAA7 17,258,38  
JPETAB 63,453,38  
CRAAA7 17,258,38  
28ZPAK -,78,72  
JPETAB 63,453,38  
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<sup>-</sup>. Used as an hypnotic and anesthetic. See also CHLORINATED HYDROCARBONS, ALIPHATIC.

## TIN750

## TRICHLOROETHENYLSILANE

CAS: 75-94-5

NIOSH: VV 6125000

DOT: 1305

mf: C<sub>2</sub>H<sub>3</sub>Cl<sub>3</sub>Si mw: 161.49

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

## SYNS:

SILANE, VINYL TRICHLORO 1-150  
TRICHLOROVINYLSILANE  
TRICHLOROVINYL SILICANE  
UNION CARBIDE A-150

VINYLSILICON TRICHLORIDE  
VINYL TRICHLOROSILANE (DOT)  
VINYL TRICHLOROSILANE, IN-  
HIBITED (DOT)

## HR: 3

## TOXICITY DATA:

skn-rbt 10 mg/24H open  
skn-rbt 625 mg open SEV  
eye-rbt 50 µg open SEV  
ori-rat LD50: 1280 mg/kg  
ihl-rat LCLo: 500 ppm/4H  
skn-rbt LD50: 680 mg/kg

## CODEN:

AMIHBC 10,61,54  
UCDS\*\* 1/19/72  
AMIHBC 10,61,54  
AMIHBC 10,61,54  
UCDS\*\* 1/19/72  
AMIHBC 10,61,54

Reported in EPA TSCA Inventory.

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

THR: Moderately toxic by ingestion, inhalation and skin contact. A severe eye and skin irritant. A corrosive irritant to skin, eyes and mucous membranes: A very dangerous fire hazard when exposed to heat or flame. Reacts violently with water, moist air or steam to produce toxic and corrosive fumes. When heated to decomposition it emits toxic fumes of Cl<sup>-</sup>. See also CHLOROSILANES.

## T10000

HR: 2

## 2,2,2-TRICHLORO-1-ETHOXYETHANOL

CAS: 515-83-3

NIOSH: KM 4725000

mf: C<sub>4</sub>H<sub>7</sub>Cl<sub>3</sub>O<sub>2</sub> mw: 193.46

PROP: Crystals. D: 1.143, mp: 47.5°, bp: 116°. Less sol in water than chloral hydrate; sol in organic solvents.

## SYNS:

CHLORAL ALCOHOLATE  
CHLORAL ETHYLALCOHOLATE  
CHLORAL ETHYL HEMIACETAL

TRICHLOROACETALDEHYDE  
MONOETHYLACETAL

## TOXICITY DATA:

ori-rat LD50: 880 mg/kg  
ori-dog LDLo: 1200 mg/kg  
ori-cat LDLo: 500 mg/kg  
ori-rbt LDLo: 1100 mg/kg

## CODEN:

JPETAB 78,340,43  
JPETAB 78,340,43  
JPETAB 78,340,43  
JPETAB 78,340,43

Reported in EPA TSCA Inventory.

THR: Moderately toxic by ingestion. When heated to decomposition it emits toxic fumes of Cl<sup>-</sup>. See also ALDEHYDES.

## T10500

HR: 3

## TRICHLOROETHYL CARBAMATE

CAS: 107-69-7

NIOSH: FD 1750000

mf: C<sub>3</sub>H<sub>4</sub>Cl<sub>3</sub>NO<sub>2</sub> mw: 192.43

## SYNS:

CARBAMIC ACID, 2,2,2-TRICHLOROETHYL ESTER

2,2,2-TRICHLOROETHANOL CARBAMATE  
VOLUNTAL

## TOXICITY DATA:

ipr-mus TDLo: 3250 mg/kg/13W-1:NEO  
ori-mus LDLo: 750 mg/kg  
ipr-mus LD50: 500 mg/kg

## CODEN:

JNCIAM 8,99,47  
LDTU\*\* -,31  
JNCIAM 8,99,47

THR: Moderately toxic by ingestion and intraperitoneal routes. An experimental neoplastigen. When heated to decomposition it emits very toxic fumes of Cl<sup>-</sup> and NO<sub>2</sub>. See also ESTERS and CARBAMATES.

## T10750

## TRICHLOROETHYLENE

CAS: 79-01-6

DOT: 1710

mf: C<sub>2</sub>HCl<sub>3</sub> mw: 131.38

PROP: Mobile liquid; characteristic odor of chloroform. D: 1.4649 @ 20°/4°, bp: 86.7°, flash p: 89.6°F, lel: 12.5%, uel: 90% @ > 30°, mp: -73°, fp: -86.8°, autoign temp: 788°F, vap press: 100 mm @ 32°, vap d: 4.53.

## SYNS:

ACETYLENE TRICHLORIDE  
ALGYLEN  
ANAMENTH  
BENZINOL  
BLACOSOLV  
CECOLENE  
1-CHLORO-2,2-DICHLOROETHYLENE  
CHLORYLEA  
CHORYLEN  
CIRCOSOLV  
CRAWHASPOL  
DENSINPLUAT  
1,1-DICHLORO-2-CHLOROETHYLENE  
DOW-TRI  
DUKERON  
ETHINYLE TRICHLORIDE  
ETHYLENE TRICHLORIDE  
FLECK-FLIP  
FLUATE  
GERMALGENE  
LANADIN  
LETHURIN  
NARCOGEN  
NARKOSOID  
NCI-CO4546  
NIALK

PERM-A-CHLOR

PETZINOL

RCRA WASTE NUMBER U228

THRETHYLENE

TRIAD

TRIASOL

TRICHLOROETHENE (DUTCH)

TRICHOORETHYLEEN, TRI (DUTCH)

TRICHLORAETHEN (GERMAN)

TRICHLORAETHYLEN, TRI (GERMAN)

TRICHLORAN

TRICHLORETHENE (FRENCH)

TRICHLORETHYLENE, TRI (FRENCH)

TRICHLOROETHENE

1,2,2-TRICHLOROETHYLENE

TRI-CLENE

TRICLORETENE (ITALIAN)

TRICLOROETILENE (ITALIAN)

TRIELINA (ITALIAN)

TRILENE

TRIMAR

TRI-PLUS

VESTROL

VITRAN

WESTROSOL

## TOXICITY DATA:

skn-rbt 500 mg/24H SEV  
eye-rbt 20 mg/24H MOD  
mmo-asn 2500 ppm  
sln-asn 17500 ppm  
dns-rat: lvr 2800 µmol/L  
otr-mus: emb 20 mg/L  
otr-ham: emb 5 mg/L  
ori-rat TDLo: 2688 mg/kg (1-22D preg/21D post): REP  
ihl-rat TCLo: 1800 ppm/24H (1-2D preg): TER  
ihl-rat TCLo: 100 ppm/4H (8-21D preg): TER  
ihl-rat TCLo: 150 ppm/7H/2Y-1: CAR  
ori-mus TDLo: 455 g/kg/78W-1: CAR

## CODEN:

28ZPAK -,28,72  
28ZPAK -,28,72  
MUREAV 155,105,85  
MUREAV 155,105,85  
CRNGDP 5,1629,84  
CALEDQ 28,85,85  
CRNGDP 4,291,83  
TOXID9 4,179,84  
APTOD9 19,A22,80  
BJANAD 54,337,82  
INHEAO 21,243,83  
NCITR\* NCI-CG-TR-2,76

**TRICHLOROETHYLENE**

ihl-mus TLo: 150 ppm/7H/2Y- I: CAR	INHEAD 21,243.83
ihl-ham TLo: 100 ppm/6H/ 77W-I: ETA	ARTODN 43,237.80
ori-mus TD :912 g/kg/78W-I: CAR	NCITR* NCI-CG-TR- 2,76
ihl-mus TC: 500 ppm/6H/77W-I: ETA	ARTODN 43,237.80
ihl-mus TC: 150 ppm/7H/2Y-I: CAR	INHEAO 21,243.83
ori-man TLo: 2143 mg/kg: GIT	34ZIAG -.602.69
ihl-hmn TLo: 6900 mg/m <sup>3</sup> / 10M: CNS	AHBAAM 116,131.36
ihl-hmn TLo: 160 ppm/83M: CNS	AIHAAP 23,167.62
ihl-hmn TLo: 812 mg/kg: CNS, GIT, LIV	BMJOAE 2,689.45
ihl-man TLo: 110 ppm/8H: EYE, CNS	BJIMAG 28,293.71
ori-hmn LDLo: 7 g/kg	ARTODN 35,295.76
ihl-man LLo: 2900 ppm	NZMJAX 50,119.51
ori-rat LC50: 3670 mg/kg	28ZPAK -.28.72
ihl-rat LLo: 8000 ppm/4H	AIHAAP 30,470.69
ori-mus LD50: 2402 mg/kg	NTIS** AD-A080-636
ihl-mus LC50: 8450 ppm/4H	APTOA6 9,303.53
ipr-mus LD50: 3000 mg/kg	EJTXAZ 7,247.74
ivn-mus LD50: 34 mg/kg	CBCCT* 6,141.54
ipr-dog LD50: 1900 mg/kg	TXAPA9 10,119.67
scu-dog LDLo: 150 mg/kg	HBTXAC 5,76.59
ivn-dog LDLo: 150 mg/kg	QJPPAL 7,205.34
ori-cat LDLo: 5864 mg/kg	NBTXAC 5,76.59
ihl-cat LLo: 32500 mg/m <sup>3</sup> /2H	AMBAAM 116,131.36
ori-rbt LDLo: 7330 mg/kg	HBTXAC 5,76.59
scu-rbt LDLo: 1800 mg/kg	QJPPAL 7,205.34
ihl-gpg LLo: 37200 ppm/40M	HBTXAC 5,76.59

IARC Cancer Review: Animal Limited Evidence IMEMDT 20,545,79; Human Inadequate Evidence IMEMDT 20,545,79; Animal Sufficient Evidence IMEMDT 11,263,76. NCI Carcinogenesis Bioassay (gavage); No Evidence: rat NCITR\* NCI-CG-TR-2,76; (gavage); Clear Evidence: mouse NCITR\* NCI-CG-TR-2,76. Community Right To Know List. Reported in EPA TSCA Inventory. EPA Genetic Toxicology Program.

OSHA PEL: TWA 100 ppm; CI 1200; Pk 300/5M/2H  
ACGIH TLV: TWA 50 ppm; STEL 200 ppm; BEI: trichloroethanol in urine end of shift 320 mg/g creatinine, trichloroethylene in end-exhaled air prior to shift and end of work week 0.5 ppm

DFG MAK: 50 ppm (260 mg/m<sup>3</sup>); BAT: blood end of work week and end of shift 500  $\mu$ g/dl

NIOSH REL: (Trichloroethylene) TWA 250 ppm; (Waste Anesthetic Gases) CL 2 ppm/1H

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

THR: Experimental poison by intravenous and subcutaneous routes. Moderately toxic experimentally by ingestion and intraperitoneal routes. Mildly toxic to humans by ingestion and inhalation. Mildly toxic experimentally by inhalation. An experimental carcinogen, tumorigen and teratogen.

Human systemic effects by ingestion and inhalation: eye effects, somnolence, hallucinations or distorted perceptions, gastrointestinal changes and jaundice. Experimental reproductive effects. Human mutagenic data. An eye and severe skin irritant. Inhalation of high concentrations causes narcosis and anesthesia. A form of addiction has been observed in exposed workers. Prolonged inhalation of moderate concentrations causes headache and drowsiness. Fatalities following severe, acute exposure have been attributed to ventricular fibrillation resulting in cardiac failure. There is damage to liver and other organs from chronic exposure. A common air contaminant.

A very dangerous fire hazard when exposed to heat or flame. Explosive in the form of vapor when exposed to heat or flame. High concentrations of trichloroethylene vapor in high-temperature air can be made to burn mildly if plied with a strong flame. Though such a condition is difficult to produce, flames or arcs should not be used in closed equipment which contains any solvent residue or vapor. Reacts with alkali; epoxides [e.g., 1-chloro-2,3-epoxypropane; 1,4-butanediol mono-2,3-epoxypropylether; 1,4-butanediol di-2,3-epoxypropylether; 2,2-bis(4(2',3'-epoxypropoxy)phenyl)propane] to form the spontaneously flammable gas dichloroacetylene. Can react violently with Al; Ba; N<sub>2</sub>O<sub>4</sub>; Li; Mg; liquid O<sub>2</sub>; O<sub>3</sub>; KOH; KNO<sub>3</sub>; Na; NaOH; Ti. Reacts with water under heat and pressure to form HCl gas. When heated to decomposition it emits toxic fumes of Cl<sup>-</sup>. Used as a vapor degreaser and in dry cleaning. See also CHLORINATED HYDROCARBONS, ALIPHATIC. For further information, see Vol. 3, No. 1 of *DPIM Report*.

## TIP000

HR: 2

 $\alpha$ -TRICHLOROETHYLIDENE GLYCEROL

NIOSH: JI 3380000

mf: C<sub>5</sub>H<sub>7</sub>Cl<sub>3</sub>O<sub>3</sub> mw: 221.47SYN:  $\alpha$ -2-(TRICHLOROMETHYL)-1,3-DIOXOLANE-4-METHANOL

## TOXICITY DATA:

ipr-mus LD50: 920 mg/kg  
ivn-mus LD50: 520 mg/kg

## CODEN:

JPETAB 81,72.44  
JPETAB 81,72.44

THR: Moderately toxic by intraperitoneal and intravenous routes. When heated to decomposition it emits toxic fumes of Cl<sup>-</sup>.

## TIP250

HR: 2

 $\beta$ -TRICHLOROETHYLIDENE GLYCEROL

NIOSH: JI 3440000

mf: C<sub>5</sub>H<sub>7</sub>Cl<sub>3</sub>O<sub>3</sub> mw: 221.47SYN:  $\beta$ -2-(TRICHLOROMETHYL)-1,3-DIOXOLANE-4-METHANOL

## TOXICITY DATA:

ipr-mus LD50: 959 mg/kg  
ivn-mus LD50: 518 mg/kg

## CODEN:

JPETAB 81,72.44  
JPETAB 81,72.44

**APF750** *HR: 3*  
**ANTHRA(9,1,2-cde)BENZO(h)CINNOLINE**  
 CAS: 189-58-2 NIOSH: CA 8925000  
 mf: C<sub>22</sub>H<sub>12</sub>N<sub>2</sub> mw: 304.36

SYN: 1,2-DIAZA-3,4:9,10-DIBENZOPYRENE

TOXICITY DATA: CODEN:  
 scu-mus TDLo: 80 mg/kg:ETA UMRAQ 53,638,65

THR: An experimental tumorigen. When heated to decomposition it emits toxic fumes of NO<sub>x</sub>.

**APG000** *HR: 3*  
**2-ANTHRACENAMINE**  
 CAS: 613-13-8 NIOSH: CA 9275000  
 mf: C<sub>14</sub>H<sub>11</sub>N mw: 193.26

PROP: Yellow leaflets from alc. Mp: 238°; bp: subl @ 93° @ 9 mm. Insol in water, sltly sol in alc and ether.

## SYNS:

β-AMINOANTHRACENE 2-ANTHRYLAMINE  
 2-AMINOANTHRACENE 2-ANTHRAMINE  
 2-ANTHRACYLAMINE

TOXICITY DATA: CODEN:  
 mmo-sat 6 nmol/plate BBBCA9 89,259,79  
 mma-sat 2 μg/plate PNASA6 72,5135,75  
 dnr-esc 100 mg/L JNCIAM 62,873,79  
 hma-mus/sat 125 mg/kg JNCIAM 62,911,79  
 orl-rat TDLo: 45 mg/kg/30D-I: CNREA8 28,924,68  
 CAR  
 skn-rat TDLo: 260 μg/kg/33W-I: BJCAAI 9,631,55  
 ETA  
 skn-mus TDLo: 800 μg/kg/20W-I: BJCAAI 9,631,55  
 I:ETA  
 imp-mus TDLo: 50 mg/kg:CAR BJCAAI 12,222,58  
 skn-ham TDLo: 1200 mg/kg/ CNREA8 20,100,60  
 55W-I:ETA  
 orl-rat TD: 100 mg/kg:CAR CNREA8 26,619,66  
 imp-mus TD: 96 mg/kg:ETA BMBUAQ 14,147,58

THR: An experimental tumorigen and carcinogen. Mutagenic data. See also AMINES. When heated to decomposition it emits toxic fumes of NO<sub>x</sub>.

**APG250** *HR: 3*  
**1-ANTHRACENAMINE**  
 CAS: 610-49-1 NIOSH: CA 9100000  
 mf: C<sub>14</sub>H<sub>11</sub>N mw: 193.26

PROP: Yellow needles from alc. Mp: 130°. Insol HCl, sol in alc.

## SYNS:

α-AMINOANTHRACENE 1-ANTHRACYLAMINE  
 1-AMINOANTHRACENE 1-ANTHRAMINE

TOXICITY DATA: CODEN:  
 mma-sat 20 μg/plate PNASA6 72,5135,75  
 dnr-esc 100 mg/L JNCIAM 62,873,79  
 mrc-smc 5 pph JNCIAM 62,901,79  
 orl-rat TDLo: 7200 mg/kg/27D-I: CNREA8 28,924,68  
 ETA

THR: An experimental tumorigen. Mutagenic data. When heated to decomposition it emits toxic fumes of NO<sub>x</sub>.

**APG500** *HR: 3*  
**ANTHRACENE**   
 CAS: 120-12-7 NIOSH: CA 9350000  
 mf: C<sub>14</sub>H<sub>10</sub> mw: 178.24



PROP: Colorless crystals, violet fluorescence. Mp: 217°, lcl: 0.6%, flash p: 250°F (CC), d: 1.24 @ 27°/4°, autoign temp: 1004°F, vap press: 1 mm @ 145.0°, (sublimes), vap d: 6.15, bp: 339.9°. Insol in water. Soly in alc @ 1.9/100 @ 20°; in ether 12.2/100 @ 20°.

## SYNS:

ANTHRACEN (GERMAN) PARANAPHTHALENE  
 ANTHRACIN TETRA OLIVE N2G  
 GREEN OIL

## TOXICITY DATA:

mma-sat 100 μg/plate  
 skn-mus 118 μg MLD  
 dns-hmn: fbr 10 mg/L  
 hma-mus/sat 125 mg/kg  
 dnd-mam: lym 100 μmol  
 orl-rat TDLo: 20 g/kg/79W-I:  
 ETA  
 scu-rat TDLo: 3300 mg/kg/33W-I:  
 I:NEO  
 scu-rat TD: 660 mg/kg/33W-I:  
 ETA

## CODEN:

ABCHA6 43,1433,79  
 CALEDQ 4,333,78  
 CNREA8 38,2091,78  
 JNCIAM 62,911,79  
 BIPMAA 9,689,70  
 ZEKBAI 60,697,55  
 NATWAY 42,159,55  
 ZEKBAI 60,697,55

Reported in EPA TSCA Inventory. Community Right To Know List. IARC Cancer Review: Animal No Evidence IMEMDT 32,105,83

THR: An experimental tumorigen and neoplastigen. A skin irritant and allergen. Mutagenic data. Combustible when exposed to heat, flame, or oxidizing materials. Moderately explosive when exposed to flame; Ca(OCl)<sub>2</sub>; chromic acid. To fight fire, use water, foam, CO<sub>2</sub>, water spray or mist, dry chemical. Explodes on contact with fluorine. For further information, see Vol. 4, No. 6 of DPIM Report.

**APH250** *HR: 3*  
**1,8,9-ANTHRACENETRIOL**  
 CAS: 480-22-8 NIOSH: CB 1225000  
 mf: C<sub>14</sub>H<sub>10</sub>O<sub>3</sub> mw: 226.24

PROP: Yellow powder. Mp: 178-180°. Insol in water; sol in fat, hot alc, benzene and dilute alkalis.

## SYNS:

ANTHRALIN 1,8-DIHYDROXY-9-ANTHRANOL  
 1,8,9-ANTHRATRIOL 1,8-DIHYDROXY-9-ANTHRONE  
 DIHYDROXY ANTHRANOL DIOXYANTHRANOL  
 1,8-DIHYDROXYANTHRANOL 1,8,9-TRIHIDROXYANTHRACENE

## TOXICITY DATA:

mma-sat 100 μg/plate  
 mma-sat 100 μg/plate

## CODEN:

BCSTB5 5,1489,77  
 BCSTB5 5,1489,77

**CML750****HR: 3****CHRYSAROBIN**

CAS: 491-59-8

NIOSH: CB 1400000

mf: C<sub>15</sub>H<sub>12</sub>O<sub>3</sub> mw: 240.27

PROP: Brownish to orange-yellow crystals.

**SYNS:**CHRY SOPH ANIC ACID ANTHRA-  
NOL  
3-METHYL-1,8,9-ANTHRACENE-  
TRIOX3-METHYLANTHRALIN  
1,8,9-TRIHYDROXY-3-METHYL-  
ANTHRACENE**TOXICITY DATA:**mmo-sat 100 µg/plate  
mma-sat 100 µg/plate  
mmo-smc 1000 ppm/16H  
ipr-mus LDLo: 4 mg/kg**CODEN:**BCSTB5 5,1489,77  
BCSTB5 5,1489,77  
ADVEA4 51,45,71  
CBCCT\* 2,241,50

THR: Poison by intraperitoneal route. Mutagenic data. An irritant and an allergen. Combustible when exposed to heat or flame. When heated to decomposition it emits acrid smoke and fumes.

**CML800****HR: 3****6-CHRYSENAMINE**

CAS: 2642-98-0

NIOSH: GC 0500000

mf: C<sub>18</sub>H<sub>13</sub>N mw: 243.32

PROP: Leaflets from alc. Mp: 210-211°. Slightly sol in alc, benzene, ethyl acetate.

**SYNS:**6-AMC  
6-AMINOCHRYSENECHRYSENEX  
CHRYSOXEX**TOXICITY DATA:**mmo-sat 2500 ng/plate  
mma-sat 500 ng/plate  
dnr-bcs 20 uL/disc  
dns-rat:ivr 500 nmol/L  
msc-ham:ovr 50 mg/L  
skn-mus TDLo: 1100 g/kg/  
39W-I:CAR**CODEN:**CNREA8 44,3408,84  
MUREAV 155,7,85  
MUREAV 97,1,82  
ENMUDM 3,11,81  
JTEHD6 13,531,84  
EJCAAH 11,327,75

EPA Genetic Toxicology Program.

THR: An experimental carcinogen by skin contact. Mutagenic data. When heated to decomposition it emits toxic fumes of NO<sub>x</sub>. See also AROMATIC AMINES and CHRYSENE.**CML810****HR: 3****CHRYSENE**

CAS: 218-01-9

NIOSH: GC 0700000

mf: C<sub>18</sub>H<sub>12</sub> mw: 228.30

PROP: Occurs in coal tar. Is formed during distillation of coal, in very small amount during distillation or pyrolysis of many fats and oils. Orthorhombic bipyramidal plates from benzene. D: 1.274, mp: 254°. Sublimes easily in vacuo, bp: 448°. Slightly sol in alc, ether, carbon bisulfide, glacial acetic acid. Moderately sol in boiling benzene. Insol

in water. Chrysene is generally only slightly sol in cold organic solvents, but fairly sol in these solvents when hot, including glacial acetic acid.

**SYNS:**1,2-BENZOPHENANTHRENE  
BENZO(a)PHENANTHRENE  
1,2-BENZPHENANTHRENEBENZ(a)PHENANTHRENE  
1,2,3,6-DIBENZONAPHTHALENE  
RCRA WASTE NUMBER U050**TOXICITY DATA:**mma-sat 5 µg/plate  
msc-hmn:lym 6 µmol/L  
msc-hmn:oth 12 µmol/L  
dnd-mus-skn 192 µmol/kg  
dnd-ham:emb 1 mg/L  
skn-mus TDLo: 3600 µg/kg:  
NEO  
scu-mus TDLo: 200 mg/kg:ETA  
skn-mus TD : 99 mg/kg/31W-I:  
ETA  
skn-mus TD : 40 mg/kg/3W-I:  
ETA  
skn-mus TD : 3600 mg/kg/  
30W-I:ETA  
skn-mus TD : 23 mg/kg:NEO**CODEN:**MUREAV 156,61,85  
DTESD7 10,227,82  
MUREAV 130,127,84  
CRNGDP 5,231,84  
CRNGDP 3,1051,82  
CNREA8 38,1831,78  
CNREA8 15,632,55  
CNREA8 11,301,51  
CCSUDL 1,325,76  
CANCAR 12,1079,59  
CNREA8 40,642,80

IARC Cancer Review: Animal Limited Evidence IMEMDT 32,247,83; Animal Sufficient Evidence IMEMDT 3,-159,73. EPA Genetic Toxicology Program. Reported in EPA TSCA Inventory.

ACGIH TLV: Suspected Human Carcinogen

NIOSH REL: Chrysene-to be controlled as a carcinogen

THR: An experimental carcinogen, neoplastigen and tumorigen by skin contact. Human mutagenic data. When heated to decomposition it emits acrid smoke and fumes.

**CML815****HR: 3****CHRYSENE-5,6-EPOXIDE**

CAS: 15131-84-7

NIOSH: GC 1225000

mf: C<sub>18</sub>H<sub>12</sub>O mw: 244.30**SYNS:**CHRYSENE-K-REGION EPOXIDE  
CHRYSENE-5,6-OXIDE5,6-EPOXY-5,6-DIHYDROCHRYS-  
ENE**TOXICITY DATA:**mma-sat 50 µg/plate  
dnr-esc 100 µmol/L  
dns-esc 100 µmol/L  
scu-mus TDLo: 400 mg/kg/10W-  
I:ETA**CODEN:**PNASA6 72,5135,75  
ZKKOBW 92,157,78  
ZKKOBW 92,157,78  
UCNAW 2,500,67

EPA Genetic Toxicology Program.

THR: An experimental tumorigen. Mutagenic data. When heated to decomposition it emits acrid smoke and fumes. See also CHRYSENE.

**CML820****HR: 2****CHUANGHSINMYCIN**

CAS: 63339-68-4

NIOSH: XN 3876900

mf: C<sub>12</sub>H<sub>11</sub>NO<sub>2</sub>S mw: 233.30

## SYNS:

1,3-DIHYDRO-5-(6-FLUOROPHE-  
NYL)-1-METHYL-7-NITRO-2H-  
1,4-BENZODIAZEPIN-2-ONE  
1-METHYL-7-NITRO-5-(2-FLUORO-  
PHENYL)-3H-1,4-BENZODIAZE-  
PIN-2(1H)-ONE

NARCOZEP  
PRIMUM  
RO 5-4200  
ROHYPNOL  
ROIPNOL

## TOXICITY DATA:

mmo-sat 3 mg/plate  
mma-sat 2 mg/plate  
bfa-rat/sat 500 mg/kg  
ori-wmn TDLo: 310 µg/kg (16-  
39W preg): REP  
ims-wmn TDLo: 560 µg/kg (39W  
preg): REP  
ori-rat TDLo: 225 mg/kg (7-15D  
preg): REP  
ori-rat LD50: 415 mg/kg  
ipr-rat LD50: 1060 mg/kg  
ori-mus LD50: 1200 mg/kg  
ipr-mus LD50: 1050 mg/kg

## CODEN:

BSIBAC 60,2247,84  
BSIBAC 60,2247,84  
BSIBAC 60,2247,84  
THERAP 36,305,81  
THERAP 36,305,81  
TXAPA9 53,92,80  
KSRNAM 19,1277,85  
KSRNAM 19,1277,85  
KSRNAM 19,1277,85  
KSRNAM 19,1277,85

THR: Moderately toxic by ingestion and intraperitoneal routes. An experimental teratogen. Human reproductive effects by ingestion and intramuscular routes: apgar score of newborn and other neonatal and postnatal effects. Experimental reproductive effects. Mutagenic data. Used as a hypnotic agent. Note: This is a controlled substance (depressant) listed in the U.S. Code of Federal Regulations, Title 21 Part 1308.14 (1985). When heated to decomposition it emits toxic fumes of F<sup>-</sup> and NO<sub>x</sub>. See also DIAZEPAM.

## FDD150

HR: 3

## FLUOCINOLIDE

CAS: 356-12-7  
mf: C<sub>26</sub>H<sub>32</sub>F<sub>2</sub>O<sub>7</sub> mw: 494.58

NIOSH: TU 3831000

PROP: Crystals from methanol. Mp: 308-311°.

## SYNS:

BISCOSAL  
DERMAPLUS  
6-α, 9-DIFLUORO-11-β,16-α,17,21-  
TETRAHYDROXY-PREGNA-1,4-  
DIENE-3,20-DIONE cyclic 17-  
ACETAL with ACETONE-21-ACE-  
TATE  
FLUOCINOLONE ACETONIDE  
ACETATE

FLUOCINOLONE ACETONIDE-21-  
ACETATE  
FLUOCINONIDE  
LIDEX  
METOSYN  
STRADERM  
SYNALATE  
TOPSYM  
TOPSYN  
TOPSYNE

## TOXICITY DATA:

dni-mus-skn 4 g/kg  
scu-rat TDLo: 3 mg/kg (3D pre):  
REP  
ori-rat LD50: 14 mg/kg  
ipr-rat LD50: 300 µg/kg  
scu-rat LD50: 720 µg/kg  
ipr-mus LD50: 165 mg/kg  
scu-mus LD50: 335 mg/kg

## CODEN:

BJDEAZ 94,1,76  
NYKZAU 84,553,84  
NIIRDN 6,694,82  
NIIRDN 6,694,82  
IYKEDH 6,386,75  
NIIRDN 6,694,82  
IYKEDH 6,386,75

THR: Poison by ingestion, subcutaneous and intraperitoneal routes. Mutagenic data. Experimental reproductive effects.

A steroid. When heated to decomposition it emits toxic fumes of F<sup>-</sup>.

## FDE000

HR: D

## FLUORACIZINE

CAS: 30223-48-4  
mf: C<sub>20</sub>H<sub>21</sub>F<sub>3</sub>N<sub>2</sub>OS mw: 394.49

NIOSH: SO 4700000

SYN: 10-DIETHYLAMINOPROPIONYL-3-TRIFLUOROMETHYL PHENO-  
THIAZINE HYDROCHLORIDE

## TOXICITY DATA:

ori-mus TDLo: 10 mg/kg (4D  
preg): TER  
ori-rbt TDLo: 140 mg/kg (16-29D  
preg): TER

## CODEN:

FATOAO 36,399,73  
FATOAO 36,399,73

THR: An experimental teratogen. Experimental reproductive effects. When heated to decomposition it emits very toxic fumes of SO<sub>x</sub>, NO<sub>x</sub> and F<sup>-</sup>.

## FDF000

HR: 3

## FLUORANTHENE

CAS: 206-44-0  
mf: C<sub>16</sub>H<sub>10</sub> mw: 202.26

NIOSH: LL 4025000

PROP: A polycyclic hydrocarbon. Colorless solid. Mp: 120°, bp: 367°, vap press: 0.01 mm @ 20°.

## SYNS:

1,2-BENZACENAPHTHENE  
BENZO(a)FLUORENE  
IDRYL

1,2-(1,8-NAPHTHALENE(DI)YL)BEN-  
ZENE  
1,2-(1,8-NAPHTHYLENE)BENZENE  
RCRA WASTE NUMBER U120

## TOXICITY DATA:

mma-sat 5 µg/plate  
msc-hmn: lym 2 µmol/L  
msc-ham: ovr 20 mg/L  
skn-mus TDLo: 280 mg/kg/58W-  
1:ETA

## CODEN:

MUREAV 156,61,85  
DTESD7 10,277,82  
ENMUDM 6,539,84  
JNCIAM 56,1237,76  
AIHAAP 23,95,62  
CSLNX\* NX#00205  
AIHAAP 23,95,62

ori-rat LD50: 2000 mg/kg  
iva-mus LD50: 100 mg/kg  
skn-rbt LD50: 3180 mg/kg

Reported in EPA TSCA Inventory. EPA Genetic Toxicology Program.

THR: Poison by intravenous route. Moderately toxic by ingestion and skin contact. An experimental tumorigen. Human mutagenic data. Combustible when exposed to heat or flame. When heated to decomposition it emits acrid smoke and irritating fumes.

## FDH000

HR: D

## FLUORAPATITE

CAS: 1306-05-4  
mf: Ca<sub>10</sub>F<sub>2</sub>O<sub>4</sub>P mw: 533.77

NIOSH: LL 4850000

SYN: PHOSPHATE ROCK

OSHA PEL: TWA 2.5 mg(F)/m<sup>3</sup>

NIOSH REL: (Inorganic Fluorides) TWA 2.5 mg(F)/m<sup>3</sup>

**TOXICITY DATA:**

ipr-mus LD50: 118 mg/kg  
 scu-mus LD50: 107 mg/kg  
 scu-rbt LD50: 54 mg/kg

**CODEN:**

JPETAB 94,299,48  
 JPETAB 70,315,40  
 JPETAB 70,315,40

**THR:** Poison by subcutaneous and intraperitoneal routes. When heated to decomposition it emits toxic fumes of NO<sub>2</sub> and HCl. See also ESTERS.

**NAJ000**

**HR: 3**

**NAPHTHACENE**

CAS: 92-24-0

NIOSH: QI 7605000

mf: C<sub>18</sub>H<sub>12</sub> mw: 228.30

**PROP:** Orange crystals. Sublimes in vacuo. Mp: 341°, d: 1.35.

**SYNS:**

BENZ(a)ANTHRACENE  
 2,3-BENZANTHRACENE

2,3-BENZANTHRENE  
 TETRACENE

**TOXICITY DATA:**

mma-sat 5 µmol/L  
 dnd-rat:ivr 500 µmol/L  
 dnd-mam:lym 20 mg

**CODEN:**

ENMUDM 3,11,81  
 ENMUDM 3,11,81  
 BIPMAA 4,409,66

Reported in EPA TSCA Inventory.

**THR:** Mutagenic data. Explosion hazard; shock will explode it. Can react on contact with oxidizing materials. When heated to decomposition it emits acrid smoke and irritating fumes.

**NAJ500**

**HR: 2**

**NAPHTHA, COAL TAR**

CAS: 8030-30-6

NIOSH: DE 3030000

DOT: 1255/1256/2553

**PROP:** Dark straw-colored to colorless liquid. Bp: 149-216°, flash p: 107°F (CC), d: 0.862-0.892, autoign temp: 531°F. Sol in benzene, toluene, xylene, etc.

**SYNS:**

AMICO H-1  
 AMICO H-5B  
 BENZIN 870

NAPHTHA  
 NAPHTHA, PETROLEUM  
 PETROLEUM BENZIN  
 PETROLEUM NAPHTHA  
 SUPER VMP

COAL TAR NAPHTHA DISTILLATE  
 100 DBOREE BENZOL  
 IS-FLASH NAPHTHA

**TOXICITY DATA:**

in-hum LCLo: 3 pph/5M  
 in-rat LCLo: 1600 ppm/6H

**CODEN:**

TABIA2 3,231,33  
 CHINAG 17,1078,39

Reported in EPA TSCA Inventory.

OSHA PEL: TWA 100 ppm

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

**THR:** Mildly toxic by inhalation. Can cause unconsciousness, which may go to coma, stentorous breathing, and reddish tint to the skin. Recovery follows removal from

exposure. In mild form, intoxication resembles drunkenness. On a chronic basis, no true poisoning; sometimes headache, lack of appetite, dizziness, sleeplessness, indigestion, and nausea. A common air contaminant. Flammable when exposed to heat or flame; can react with oxidizing materials. Keep containers tightly closed. Slight explosion hazard. To fight fire, use foam, CO<sub>2</sub>, dry chemical. See also MINERAL OILS.

**NAJ000**

**HR: 3**

**α-NAPHTHAL**

CAS: 66-77-3

NIOSH: QI 0175000

**TOXICITY DATA:**

scu-dog LDLo: 330 mg/kg

**CODEN:**

ZMWIAJ 19,545,1881

Reported in EPA TSCA Inventory.

**THR:** Poison by subcutaneous route. When heated to decomposition it emits acrid smoke and irritating fumes.

**NAJ500**

**HR: 3**

**NAPHTHALENE**

CAS: 91-20-3

NIOSH: QI 0525000

DOT: 1334/2304

mf: C<sub>10</sub>H<sub>8</sub> mw: 128.18

**PROP:** Aromatic odor; white, crystalline, volatile flakes. Mp: 80.1°, bp: 217.9°, flash p: 174°F (OC), d: 1.162, lel: 0.9%, uel: 5.9%, vap press: 1 mm @ 52.6°, vap d: 4.42, autoign temp: 1053°F (567°C). Sol in alc, benzene; insol in water, very sol in ether, CCl<sub>4</sub>, CS<sub>2</sub>, hydronaphthalenes, in fixed and volatile oils.

**SYNS:**

CAMPHOR TAR  
 MIGHTY 150  
 MOTH BALLS  
 MOTH FLAKES  
 NAPTALEN (POLISH)  
 NAPHTHALENE, CRUDE or REFINED (DOT)  
 NAPHTHALENE, MOLTEN (DOT)

NAPHTHALIN (DOT)  
 NAPHTHALINE  
 NAPHTHENE  
 NCI-C52904  
 RCRA WASTE NUMBER U165  
 TAR CAMPHOR  
 WHITE TAR

**TOXICITY DATA:**

skn-rbt 495 mg open MLD  
 eye-rbt 100 mg MLD  
 dnd-rat-ori 26 umol/kg  
 dnd-mus-ipr 200 mg/kg  
 ipr-rat TDLo: 5925 mg/kg (1-15D preg): REP  
 ori-mus TDLo: 2400 mg/kg (7-14D preg): REP  
 scu-rat TDLo: 3500 mg/kg/12W-1:ETA  
 ori-chd LDLo: 100 mg/kg  
 unr-man LDLo: 74 mg/kg  
 ori-rat LD50: 1250 mg/kg  
 ori-mus LD50: 533 mg/kg  
 ipr-mus LD50: 150 mg/kg  
 scu-mus LD50: 969 mg/kg

**CODEN:**

UCDS\*\* 1/11/68  
 BIOFX\* 16-4/70  
 CBINA8 33,301,81  
 CBINA8 40,287,82  
 TXAPA9 48,A35,79  
 JTEHD6 15,25,85  
 APAVAY 329,141,56  
 28ZRAQ -,228,60  
 8SDCAI 2,73,70  
 GISAAA 47(11),78,82  
 FAATDF 4(3, Pt 1),-406,84  
 NTIS\*\* AD691-490  
 TOIZAG 20,772,73

## NAK000 1-NAPHTHALENEACETAMIDE

**NAPHTHALENE**

ivn-mus LD50: 100 mg/kg  
 orl-dog LDLo: 400 mg/kg  
 orl-cat LDLo: 1000 mg/kg  
 orl-rbt LDLo: 3 g/kg  
 orl-gpg LD50: 1200 mg/kg

CSLNX\* NX#00203  
 HBAMAK 4,1289,35  
 HBAMAK 4,1289,35  
 HBAMAK 4,1289,35  
 GISAAA 47(11),78,82

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

OSHA PEL: TWA 10 ppm  
 ACGIH TLV: TWA 10 ppm; STEL 15 ppm  
 DFG MAK: 10 ppm (50 mg/m<sup>3</sup>)

DOT Classification: ORM-A; Label: None; Flammable Solid; Label: Flammable Solid

THR: Human poison by ingestion and possibly other routes. Experimental poison by ingestion, intravenous, and intraperitoneal routes. Moderately toxic by subcutaneous route. An experimental tumorigen. Experimental reproductive effects. Mutagenic data. An eye and skin irritant. Can cause nausea, headache, diaphoresis, hematuria, fever, anemia, liver damage, vomiting, convulsions, and coma. Poisoning may occur by ingestion of large doses, inhalation, or skin absorption. Flammable when exposed to heat or flame; reacts with oxidizing materials. Explosive reaction with dinitrogen pentoxide. Reacts violently with CrO<sub>3</sub>; aluminum chloride + benzoyl chloride. Fires in the benzene scrubbers of coke oven gas plants have been attributed to oxidation of naphthalene. Explosive in the form of vapor or dust when exposed to heat or flame. To fight fire, use water, CO<sub>2</sub>, dry chemical. When heated to decomposition it emits acrid smoke and irritating fumes.

## NAK000

HR: 2

## 1-NAPHTHALENEACETAMIDE

CAS: 86-86-2 NIOSH: QJ 0590000  
 mf: C<sub>12</sub>H<sub>11</sub>NO mw: 185.24

## SYNS:

N-ACETYL-1-NAPHTHYLAMINE  
 AMID-THIN  
 FRUITONE  
 NAAM  
 NAD  
 NAPHTHALENE ACETAMIDE

α-NAPHTHALENEACETAMIDE  
 α-NAPHTHYLACETAMIDE  
 1-NAPHTHYLACETAMIDE  
 ROOTONE  
 ROSETONE

## TOXICITY DATA:

orl-mam LD50: 1000 mg/kg

## CODEN:

FMCHA2 -,C165,83

Reported in EPA TSCA Inventory.

THR: Moderately toxic by ingestion. When heated to decomposition it emits toxic fumes of NO<sub>x</sub>.

## NAK500

HR: 3

## 1-NAPHTHALENEACETIC ACID

CAS: 86-87-3 NIOSH: QJ 0875000  
 mf: C<sub>12</sub>H<sub>10</sub>O<sub>2</sub> mw: 186.22

PROP: Needles from H<sub>2</sub>O; white, odorless crystals. Mp: 134.5-135.5°. Only sltly water-sol; sol in approx 30 parts alc; very sol in acetone, ether, chloroform.

## SYNS:

AGRONAA  
 ALPHASPIRA  
 ANA  
 APPL-SET  
 CELMONE  
 FRUITONE  
 KLINGTITE  
 LIQUI-STIK  
 NAA 800  
 NAFUSAKU  
 NAPHTHALENE-1-ACETIC ACID  
 α-NAPHTHALENEACETIC ACID  
 α-NAPHTHYLACETIC  
 NAPHTHYLACETIC ACID  
 α-NAPHTHYLACETIC ACID  
 1-NAPHTHYLACETIC ACID  
 α-NAPHTHYLENEACETIC ACID  
 α-NAPHTHYLESSIGSAEURE (GERMAN)

NAPHYL-1-ESSIGSAEURE (GERMAN)  
 NIAGARA-STIK  
 NU-TONE  
 PARMONE  
 PHYMONE  
 PIMACOL-SOL  
 PLANOFIX  
 PLUCKER  
 PRIMACOL  
 ROOTONE  
 STAFAST  
 STIK  
 STOP-DROP  
 TEKKAM  
 TIP-OFF  
 TRANSPLANTONE  
 TRE-HOLD  
 VARDHAK

## TOXICITY DATA:

eye-rbt 100 mg SEV  
 mmo-smc 500 mg/L  
 orl-rat TDLo: 27 g/kg (90D male): REP  
 orl-rat LD50: 1000 mg/kg  
 ipr-rat LD50: 100 mg/kg  
 ipr-mus LD50: 720 mg/kg  
 orl-mam LD50: 1000 mg/kg

## CODEN:

PESTC\* 9,10,80  
 IDZAAW 48,185,73  
 TXCYAC 5,371,76

85DPAN -,71/76  
 PESTC\* 9,10,80  
 FRPSAX 13,286,58  
 FMCHA2 -,C165,83

Reported in EPA TSCA Inventory.

THR: Poison by intraperitoneal route. Moderately toxic by ingestion. Experimental reproductive effects. Mutagenic data. A skin, mucous membrane and severe eye irritant. Can cause depression. A pesticide. When heated to decomposition it emits acrid smoke and irritating fumes.

## NAM000

HR: 3

## 1,5-NAPHTHALENEDIAMINE

CAS: 2243-62-1 NIOSH: QJ 3400000  
 mf: C<sub>10</sub>H<sub>10</sub>N<sub>2</sub> mw: 158.22

## SYNS:

1,5-DIAMINONAPHTHALENE  
 1,5-NAPHTHYLENEDIAMINE

NCI-C03021

## TOXICITY DATA:

mma-sat 33300 ng/plate

mma-sat 33300 ng/plate

otr-rat:emb 5200 ng/plate

orl-rat TDLo: 721 g/kg/1Y-C:

CAR  
 orl-mus TDLo: 120 g/kg/2Y-C:

CAR  
 orl-mus TD :288 g/kg/2Y-C:

CAR

## CODEN:

ENMUDM 7(Suppl 5),1,85

ENMUDM 7(Suppl 5),1,85

JJATDK 1,190,81

IARC\*\* 27,127,82

NCITR\* NCI-CG-TR-143,78

NCITR\* NCI-CG-TR-143,78

THR: Poison by intraperitoneal route. Experimental reproductive effects. Mutagenic data. When heated to decomposition it emits toxic fumes of  $\text{Cl}^-$  and  $\text{NO}_x$ .

**PCU500****HR: 3****PHENACYL-6-AMINOPENICILLINATE**

CAS: 551-16-6 NIOSH: XH 8225000  
mf:  $\text{C}_8\text{H}_{12}\text{N}_2\text{O}_3\text{S}$  mw: 216.28

PROP: Obtained from *Penicillium chrysogenum* and *Pleurotus ostroaeatus* (12VXA5 8,59,68).

**SYNS:**

6-AMINOPENICILLANIC ACID PENICIN

**TOXICITY DATA:**

scu-rat TDLo: 2600 mg/kg/65W-1:ETA

**CODEN:**

BJCAA1 19,392,65

Reported in EPA TSCA Inventory.

THR: An experimental tumorigen. When heated to decomposition it emits very toxic fumes of  $\text{NO}_x$  and  $\text{SO}_x$ .

**PCV350****HR: 2****PHENACYLPIVALATE**

CAS: 2522-81-8 NIOSH: TO 7876400  
mf:  $\text{C}_{13}\text{H}_{16}\text{O}_3$  mw: 220.29

**SYNS:**

BENZOYL CARBINOL TRIMETHYL-ACETATE 2,2-DIMETHYL-PROPANOIC ACID-2-OXO-2-PHENYLETHYL ESTER (9CI)  
BENZOYL CARBINYL TRIMETHYL-ACETATE PIBECARB

**TOXICITY DATA:**

ori-dog TDLo: 91 g/kg (26W male):REP

ipr-rat LD50: 2600 mg/kg  
ori-mus LD50: 1900 mg/kg  
ipr-mus LD50: 1400 mg/kg  
scu-mus LD50: 4900 mg/kg

**CODEN:**

KSRNAM 8,1913,74

GNRIDX 4,1,70  
KSRNAM 8,1895,74  
KSRNAM 8,1895,74  
KSRNAM 8,1895,74

THR: Moderately toxic by ingestion and intraperitoneal routes. Experimental reproductive effects. When heated to decomposition it emits acrid smoke and irritating fumes.

**PCV500****HR: 3****PHENALENO(1,9-gh)QUINOLINE**

CAS: 189-92-4 NIOSH: SF 6125000  
mf:  $\text{C}_{19}\text{H}_{11}\text{N}$  mw: 253.31

**SYNS:**

PYRENOLINE PYRIDOX(2',3':4)PYRENE

**TOXICITY DATA:**

scu-mus TDLo: 72 mg/kg/9W-1:ETA

**CODEN:**

COREAF 258,3387,64

THR: An experimental tumorigen. When heated to decomposition it emits toxic fumes of  $\text{NO}_x$ .

**PCV750****HR: 3****PHENAMACIDE HYDROCHLORIDE**

CAS: 31031-74-0 NIOSH: MC 0840000  
mf:  $\text{C}_{13}\text{H}_{19}\text{NO}_2 \cdot \text{ClH}$  mw: 257.79

**SYNS:**

AKLONIN (GERMAN) 3-METHYLBUTYL  $\alpha$ -AMINO BENZENEACETATE HYDROCHLORIDE ( $\pm$ )  
AKLONINE  
( $\pm$ )- $\alpha$ -AMINO BENZENEACETIC ACID, 3-METHYLBUTYL ESTER HYDROCHLORIDE (9CI)  
ISOAMYL PHENYLAMINOACETATE HYDROCHLORIDE  
ISOPENTYL-2-PHENYLGLYCINATE HYDROCHLORIDE  
PHENYLAMINOACETIC ACID ISOAMYL ESTER HYDROCHLORIDE  
DI-2-PHENYLGLYCINISOAMYL ESTER HYDROCHLORIDE (GERMAN)

**TOXICITY DATA:**

ori-mus LD50: 2600 mg/kg  
ipr-mus LD50: 415 mg/kg  
ivn-mus LD50: 77 mg/kg

**CODEN:**

PHARAT 33,749,78  
PHARAT 30,765,75  
PHARAT 33,749,78

THR: Poison by intravenous route. Moderately toxic by ingestion and intraperitoneal routes. When heated to decomposition it emits very toxic fumes of  $\text{Cl}^-$  and  $\text{NO}_x$ .

**PCV775****HR: D****PHENAMIDE**

CAS: 40068-20-0 NIOSH: AB 4549190  
mf:  $\text{C}_{14}\text{H}_{20}\text{Cl}_2\text{N}_2\text{O}$  mw: 303.26

**SYNS:**

2-(p-(BIS(2-CHLOROETHYL)AMINO)-N-ETHYLACETAMIDE 4-(BIS(2-CHLOROETHYL)AMINO)-N-ETHYL-BENZENEACETAMIDE NSC 122053

**TOXICITY DATA:**

ori-rat TDLo: 100 mg/kg (14D pre):REP  
scu-rat TDLo: 80 mg/kg (14D male):REP

**CODEN:**

STEDAM 19,771,72  
STEDAM 19,771,72

THR: Experimental reproductive effects. When heated to decomposition it emits toxic fumes of  $\text{Cl}^-$  and  $\text{NO}_x$ .

**PCW000****HR: 3****PHENANTHRA-ACENAPHTHENE**

CAS: 7258-91-5 NIOSH: QI 9400000  
mf:  $\text{C}_{24}\text{H}_{16}$  mw: 304.40

SYN: 4,5-DIHYDRO-NAPHTHA(1,2-b)ACEPHENANTHRYLENE

**TOXICITY DATA:**

skn-mus TDLo: 1250 mg/kg/52W-1:ETA

**CODEN:**

PRLBA4 117,318,35

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

**PCW250****HR: 3****PHENANTHRENE**

CAS: 85-01-8 NIOSH: SF 7175000  
mf:  $\text{C}_{14}\text{H}_{10}$  mw: 178.24



## PCW500 PHENANTHRENE-3,4-DIHYDRODIOL

2702

**PHENANTHRENE**

PROP: Solid or monoclinic crystals. Mp: 100°, bp: 339°, d: 1.179 @ 25°, vap press: 1 mm @ 118.3°, vap d: 6.14. Insol in water; sol in CS<sub>2</sub> benzene, hot alc; very sol in ether.

## SYNS:

PHENANTHREN (GERMAN)

PHENANTRIN

## TOXICITY DATA:

dnd-ham:kdy 5 mg/L  
mma-sat 100 µg/plate  
dnd-ham:fbr 5 mg/L/24H  
cyt-ham:lng 40 mg/L/27H  
sce-ham-ivr 900 mg/kg/24H  
sce-ham:fbr 10 µmol/L  
skn-mus TDLo:71 mg/kg:NEO  
skn-mus TD :22 g/kg/10W-1:

## ETA

orl-mus LD50:700 mg/kg  
ivn-mus LD50:56 mg/kg

## CODEN:

BCPCA6 20,1297,71  
APXAS 17,189,80  
BCPCA6 20,1297,71  
MUREAV 66,277,79  
MUREAV 66,65,79  
JNCIAM 58,1635,77  
JNCIAM 50,1717,73  
BJCAA1 10,363,56

HYSAAV 29,19,64  
CSLNX\* NX#00190

IARC Cancer Review: Animal Inadequate Evidence  
IMEMDT 32,419,83. Reported in EPA TSCA Inventory.  
EPA Genetic Toxicology Program.

THR: Poison by intravenous route. Moderately toxic by ingestion. An experimental neoplastigen and tumorigen by skin contact. Mutagenic data. A human skin photosensitizer. Combustible when exposed to heat or flame; can react vigorously with oxidizing materials. To fight fire, use water, foam, CO<sub>2</sub>, dry chemical. When heated to decomposition it emits acrid smoke and irritating fumes.

## PCW500

HR: 3

## PHENANTHRENE-3,4-DIHYDRODIOL

CAS: 20057-09-4

NIOSH: SF 7353100

mf: C<sub>14</sub>H<sub>12</sub>O<sub>2</sub> mw: 212.26

## SYNS:

3,4-DIHYDROMORPHOL

3,4-DIHYDRO-3,4-PHENANTHRE-  
NEDIOL

## TOXICITY DATA:

skn-mus TDLo:85 mg/kg:ETA

## CODEN:

CNREA8 39,4069,79

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

## PCX000

HR: 3

## 9,10-PHENANTHRENE OXIDE

CAS: 585-08-0

NIOSH: SF 7352000

mf: C<sub>14</sub>H<sub>10</sub>O mw: 194.24

PROP: Colorless needles. Mp: 152-153°. Very sltly sol in water; very sol in alc, ether.

## SYNS:

1α,9β-DIHYDROPHENANTHRO  
(9,10-B)OXIRENE (PCT)9,10-EPOXY-9,10-DIHYDROPE-  
NANTHRENE

PHENANTHRENE-9,10-EPOXIDE

## TOXICITY DATA:

mmo-sat 50 µg/plate  
mma-sat 100 µg/plate  
dni-omi 100 µg/L  
skn-mus TDLo:40 mg/kg:ETA

## CODEN:

MUTAEX 1,35,86  
MUREAV 66,337,79  
PNASA6 74,1378,77  
JNCIAM 39,1217,67

EPA Genetic Toxicology Program.

THR: An experimental tumorigen by skin contact. Mutagenic data. When heated to decomposition it emits acrid smoke and irritating fumes.

## PCX250

HR: 3

## PHENANTHRENEQUINONE

CAS: 84-11-7

NIOSH: SF 7875000

mf: C<sub>14</sub>H<sub>8</sub>O<sub>2</sub> mw: 208.22

PROP: Orange needles. D: 1.405 @ 4°, mp: 206.5-207.5°, bp: >300° subl. Very sltly sol in water; sol in hot alc, benzene; sltly sol in ether.

## SYNS:

9,10-PHENANTHRAQUINONE

9,10-PHENANTHRENEQUINONE

9,10-PHENANTHRENEKONE

## TOXICITY DATA:

mma-sat 30 µmol/L  
skn-mus TDLo:800 mg/kg/29W-  
C:ETA

## CODEN:

PNASA6 81,1696,84  
PIATA8 16,309,40

ivr-mus LDLo:165 mg/kg

HBTXAC 5,110,59

Reported in EPA TSCA Inventory. EPA Genetic Toxicology Program.

THR: Poison by acute intraperitoneal route. An experimental tumorigen by skin contact. Mutagenic data. When heated to decomposition it emits acrid smoke and irritating fumes.

## PCX500

HR: 3

## PHENANTHRENETETRAHYDRO-3,4-EPOXIDE

CAS: 66997-69-1

NIOSH: SF 8470000

mf: C<sub>14</sub>H<sub>12</sub>O mw: 196.26

SYN: 1,2,3,4-TETRAHYDROPHENANTHRO(3,4-B)OXIRENE

## TOXICITY DATA:

skn-mus TDLo:16 mg/kg:NEO

## CODEN:

CNREA8 39,4069,79

THR: An experimental neoplastigen by skin contact. When heated to decomposition it emits acrid smoke and irritating fumes.

## PCY250

HR: 3

## 1,10-PHENANTHROLINE

CAS: 66-71-7

NIOSH: SF 8300000

mf: C<sub>12</sub>H<sub>8</sub>N<sub>2</sub> mw: 180.22

PROP: Crystals from benzene. Mp: 93-94°, anhydr. 117°. Sol in water, alc, ether.

## SYNS:

4,5-DIAZAPHENANTHRENE  
ORTHOPHENANTHROLINE

α-PHENANTHROLINE

1,10-β-PHENANTHROLINE

β-PHENANTHROLINE

**POM500** **HR: 2**  
**PYRAZOLE**  
 CAS: 288-13-1 NIOSH: UQ 4900000  
 mf: C<sub>3</sub>H<sub>4</sub>N<sub>2</sub> mw: 68.09

PROP: Needles from ether. Mp: 70°, bp: 186-188°. Sol in water, alc, ether, benzene.

SYN: 1,2-DIAZOLE

<b>TOXICITY DATA:</b>	<b>CODEN:</b>
ori-rat TDLo: 100 mg/kg (9D preg): TER	RCOCB8 26,65,79
ori-rat TDLo: 100 mg/kg (6D preg): REP	RCOCB8 26,65,79
ipr-mus TDLo: 24 mg/kg (8-14D preg): TER	TJADAB 25(2),43A,82
ori-rat LD50: 1010 mg/kg	EXPEAM 25,816,69
ori-mus LD50: 1456 mg/kg	JAPMA8 47,70,58
ipr-mus LD50: 538 mg/kg	JPETAB 178,199,71

Reported in EPA TSCA Inventory.

THR: Moderately toxic by ingestion and intraperitoneal routes. Experimental teratogenic and reproductive effects. When heated to decomposition it emits toxic fumes of NO<sub>x</sub>.

**POM600** **HR: 3**  
**PYRAZOLOADENINE**  
 CAS: 2380-63-4 NIOSH: UR 0717000  
 mf: C<sub>3</sub>H<sub>3</sub>N<sub>5</sub> mw: 135.15

SYNS:  
 4-AMINOPYRAZOLOPYRIMIDINE NSC 1393  
 4-AMINOPYRAZOLO(3,4-d)PYRIMIDINE 1H-PYRAZOLO(3,4-d)PYRIMIDIN-4-AMINE (9CT)  
 4-APP

<b>TOXICITY DATA:</b>	<b>CODEN:</b>
dni-mus: ast 5 μmol/L	ECREAL 48,319,67
ipr-mus LD50: 181 mg/kg	NCISP* JAN86
unr-mus LD10: 15 mg/kg	PMDCA Y 7,69,70

Reported in EPA TSCA Inventory.

THR: Poison by intraperitoneal and possibly other routes. Mutagenic data. When heated to decomposition it emits toxic fumes of NO<sub>x</sub>.

**POM800** **HR: 3**  
**PYR BUTEROL HYDROCHLORIDE**  
 CAS: 38029-10-6 NIOSH: US 9105000  
 mf: C<sub>12</sub>H<sub>20</sub>N<sub>2</sub>O<sub>3</sub>·2ClH mw: 313.26

SYNS:  
 6-(2-(tert-BUTYLAMINO)-1-HYDROXYETHYL)-3-HYDROXY-2-PYRIDINEMETHANOL DIHYDROCHLORIDE α<sup>6</sup>-((1,1-DIMETHYLETHYL)AMINOMETHYL)-3-HYDROXY-2,6-PYRIDINEDIMETHANOL DIHYDROCHLORIDE  
 PIRBUTEROL DIHYDROCHLORIDE PIR BUTEROL DIHYDROCHLORIDE

<b>TOXICITY DATA:</b>	<b>CODEN:</b>
ori-rat TDLo: 3300 mg/kg (7-17D preg): REP	YACHDS 8,731,80
ori-rat TDLo: 390 mg/kg (6-18D preg): REP	YACHDS 8,731,80
ori-rat LD50: 2800 mg/kg	IYKEDH 13,637,82
scu-rat LD50: 645 mg/kg	YACHDS 8,689,80
ivn-rat LD50: 53 mg/kg	IYKEDH 13,637,82
ori-mus LD50: 2500 mg/kg	YACHDS 8,689,80
scu-mus LD50: 280 mg/kg	IYKEDH 13,637,82
ivn-mus LD50: 42 mg/kg	IYKEDH 13,637,82

THR: Poison by subcutaneous and intravenous routes. Moderately toxic by ingestion. Experimental reproductive effects. When heated to decomposition it emits NO<sub>x</sub> and HCl.

**PON000** **HR: 3**  
**1-PYRENAMINE**  
 CAS: 1606-67-3 NIOSH: UR 2275000  
 mf: C<sub>16</sub>H<sub>11</sub>N mw: 217.28

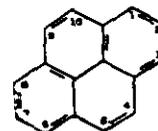
SYNS:  
 1-AMINOPYRENE 3-AMINOPYRENE

<b>TOXICITY DATA:</b>	<b>CODEN:</b>
mno-sat 500 ng/plate	MUREAV 138,113,84
mna-sat 500 ng/plate	MUREAV 138,113,84
dnd-esc 10 μmol/L	PNCCA2 2,39,65
mna-ham: ovr 2 mg/L	JTEHD6 10,373,82
dnd-ham: lng 30 μmol/L	CALEDQ 24,121,84
ori-rat LD50: 1070 mg/kg	AIHAAP 30,470,69
ipr-mus LD50: 250 mg/kg	AIPTAK 135,376,62

Reported in EPA TSCA Inventory. EPA Genetic Toxicology Program.

THR: Poison by intraperitoneal route. Moderately toxic by ingestion. Mutagenic data. When heated to decomposition it emits toxic fumes of NO<sub>x</sub>.

**PON250** **HR: 3**  
**PYRENE**  NIOSH: UR 2450000  
 CAS: 129-00-0 mw: 202.26  
 mf: C<sub>16</sub>H<sub>10</sub>



PROP: Colorless solid, solutions have a slight blue color. Mp: 156°, d: 1.271 @ 23°, bp: 404°. Insol in water, fairly sol in organic solvents. (A condensed ring hydrocarbon).

SYNS:  
 BENZO(a)OPHENANTHRENE β-PYRINE  
 PYREN (GERMAN)

<b>TOXICITY DATA:</b>	<b>CODEN:</b>
sku-rtx 500 mg/24H MLD	28ZPAK -,26,72
mna-sat 300 ng/plate	ENMUDM 6(Suppl 2),1,84
mna-esc 1 μg/plate	PMRSDJ 1,387,81

2928 **PYRENE**

dns-hmn: fbr 100 mg/L  
msc-hmn: oth 12 μmol/L  
dns-rat: lvr 250 nmol/L  
dns-ham: lvr 100 μmol/L  
skn-mus TDL<sub>0</sub>: 10 g/kg/3W-1:

TXCYAC 21,151,81  
MUREAV 130,127,84  
CNREA8 42,3010,82  
ENMUDM 5,1.83  
BJCAA1 10,363,56

ETA  
ori-rat LD50: 2700 mg/kg  
ihl-rat LC50: 170 mg/m<sup>3</sup>  
ori-mus LD50: 800 mg/kg  
ipr-mus LD50: 514 mg/kg

GTPZAB 15(2),59,71  
GTPZAB 15(2),59,71  
GTPZAB 15(2),59,71  
PMRSDJ 1,682,81

IARC Cancer Review: Animal No Evidence IMEMDT 32,431,83. EPA Extremely Hazardous Substances List. Reported in EPA TSCA Inventory. EPA Genetic Toxicology Program.

THR: Poison by inhalation. Moderately toxic by ingestion and intraperitoneal routes. An experimental tumorigen. Human mutagenic data. A skin irritant. When heated to decomposition it emits acrid smoke and irritating fumes.

**TOXICITY DATA:**  
ori-rat LD50: 1410 mg/kg  
unr-rat LD50: 900 mg/kg

**CODEN:**  
ARSIM\* 20,7,66  
30ZDA9 -,131,71

THR: Moderately toxic by ingestion and possibly other routes. An insecticide. When heated to decomposition it emits acrid smoke and irritating fumes. See also other pyrethrin entries.

**POO050**

**PYRETHRIN I**

CAS: 121-21-1  
mf: C<sub>21</sub>H<sub>28</sub>O<sub>3</sub> mw: 328.49

**HR: 3**

NIOSH: GZ 1725000

**SYNS:**  
CHRYSANTHEMUM MONOCARBOXYLIC ACID PYRETHROLONE ESTER  
PYRETRINA I (PORTUGUESE)

PYRETHROLONE, CHRYSANTHEMUM MONOCARBOXYLIC ACID ESTER  
(+)-PYRETHONYL (+)-trans-CHRYSANTHEMATE  
RCRA WASTE NUMBER PO08

**PON500**

**N-PYRENE-2-YLACETAMIDE**

CAS: 1732-14-5  
mf: C<sub>18</sub>H<sub>13</sub>NO mw: 259.32

**HR: 3**

NIOSH: AC 7840000

SYN: 2-ACETYLAMINOPYRENE

**TOXICITY DATA:**  
ori-rat TDL<sub>0</sub>: 5508 mg/kg/32W-C:NEO

**CODEN:**  
CNREA8 15,188,55

THR: An experimental neoplastigen. When heated to decomposition it emits toxic fumes of NO<sub>x</sub>.

**TOXICITY DATA:**

ori-rat LD50: 260 mg/kg  
ivn-rat LDLo: 5 mg/kg

**CODEN:**  
PCBPBS 2,308,72  
BIOGAL 41(10),283,75

THR: Poison by ingestion and intravenous routes. When heated to decomposition it emits acrid smoke and irritating fumes. An insecticide. See also other pyrethrin entries.

**POO100**

**PYRETHRIN II**

CAS: 121-29-9  
mf: C<sub>22</sub>H<sub>28</sub>O<sub>5</sub> mw: 372.50

**HR: 3**

NIOSH: GZ 0700000

PROP: Viscous liquid. Bp: 200° @ 0.1 mm (decomp).

**SYNS:**  
CHRYSANTHEMUM DICARBOXYLIC ACID MONOMETHYL ESTER PYRETHROLONE ESTER  
ENT 7,543  
PYRETHRIN  
PYRETHROLONE CHRYSANTHEMUM DICARBOXYLIC ACID-METHYL ESTER ESTER

PYRETHROLONE ESTER OF CHRYSANTHEMUM DICARBOXYLIC ACID MONOMETHYL ESTER  
(+)-PYRETHONYL (+)-PYRETHRATE  
PYRETRIN II

**TOXICITY DATA:**  
unr-man LDLo: 1029 mg/kg  
ori-rat LD50: 200 mg/kg  
ivn-rat LD50: 1 mg/kg

**CODEN:**  
85DCAI 2,73,70  
ARSIM\* 20,17,66  
PCBPBS 2,308,72

Reported in EPA TSCA Inventory.

THR: Poison experimentally by ingestion and intravenous routes. Moderately toxic to humans by unspecified route. An allergen. When heated to decomposition it emits acrid smoke and irritating fumes. An insecticide. See also other pyrethrin entries.

**POO250**

**PYRETHRINS**

CAS: 8003-34-7  
DOT: 9184

**HR: 3**

NIOSH: UR 4200000

**PON750**

**4-PYRENYLOXIRANE**

CAS: 73529-24-5  
mf: C<sub>18</sub>H<sub>12</sub>O mw: 244.30

**HR: D**

NIOSH: RR 0878000

SYN: 4-EPOXYETHYLPYRENE

**TOXICITY DATA:**  
mmo-sar 100 pmol/plate  
msc-ham: lng 1 μmol/L

**CODEN:**  
CNREA8 40,642,80  
CNREA8 40,642,80

THR: Mutagenic data. When heated to decomposition it emits acrid smoke and irritating fumes.

**POO000**

**PYRETHRIN**

CAS: 97-11-0  
mf: C<sub>21</sub>H<sub>28</sub>O<sub>3</sub> mw: 328.49

**HR: 2**

NIOSH: GZ 1575000

**SYNS:**  
2-CYCLOPENTENYL-4-HYDROXY-3-METHYL-2-CYCLOPENTEN-1-ONE CHRYSANTHEMATE  
3-(2-CYCLOPENTEN-1-YL)-2-METHYL-4-OXO-2-CYCLOPENTEN-1-YL CHRYSANTHEMATE

3-(2-CYCLOPENTENYL)-2-METHYL-4-OXO-2-CYCLOPENTENYL CHRYSANTHEMUM MONOCARBOXYLATE  
CYCLOPENTENYLRETHONYL CHRYSANTHEMATE  
ENT 22,952

ARA750  
ARSENIC



HR: 3

CAS: 7440-38-2  
DOT: 1558  
af: As aw: 74.92

NIOSH: CG 0525000

PROP: Silvery to black, brittle, crystalline and amorphous metalloid. Mp: 814° @ 36 atm, bp: subl @ 612°, d: black crystals 5.724 @ 14°; black amorphous 4.7, vap press: 1 mm @ 372° (sublimes). Insol in water; sol in HNO<sub>3</sub>. See also ARSENIC VAPOR.

SYNS:

ARSEN (GERMAN. POLISH)  
ARSENICALS  
ARSENIC-75  
ARSENIC BLACK

COLLOIDAL ARSENIC  
GREY ARSENIC  
METALLIC ARSENIC

TOXICITY DATA:

cyt-mus-*ipr* 4 mg/kg/48H-I  
ori-rat TDLo: 605 µg/kg (35 W  
preg): REP  
ori-mus TDLo: 120 mg/kg  
(preg): TER  
*ipr*-mus TDLo: 40 mg/kg (preg):  
TER  
*imp*-*rbt* TDLo: 75 mg/kg: ETA  
ori-man TDLo: 7857 mg/kg/55Y:  
SKN  
ori-man TDLo: 7857 mg/kg/55Y:  
GIT  
*ims*-rat LDLo: 20 mg/kg  
  
*scu*-*rbt* LDLo: 300 mg/kg  
*ipr*-*gpg* LDLo: 10 mg/kg  
*scu*-*gpg* LDLo: 300 mg/kg

CODEN:

EXPEAM 37,129,81  
GISAAA (8)30,77  
  
TJADAB 15,31A,77  
TJADAB 15,31A,77  
  
ZEKBAI 52,425,42  
CMAJAX 120,168,79  
CMAJAX 120,168,79  
  
NCTUS\* PH 43-64-  
886,SEPT,70  
ASBIAL 24,442,38  
CRSBAW 81,164,18  
ASBIAL 24,442,38

IARC Cancer Review: Human Sufficient Evidence IMEMDT 23,39,80; Human Inadequate Evidence IMEMDT 2,48,73. Reported in EPA TSCA Inventory. Arsenic and its compounds are on the Community Right To Know List.

OSHA PEL: TWA 0.01 mg(As)/m<sup>3</sup>  
ACGIH TLV: TWA 0.2 mg(As)/m<sup>3</sup>  
DFG TRK: 0.2 mg/m<sup>3</sup> calculated as As in that portion of dust that can possibly be inhaled.  
NIOSH REL: CL 2 µg(As)/m<sup>3</sup>

DOT Classification: Poison B, Label: Poison

THR: A human carcinogen. Poison by subcutaneous, intramuscular, and intraperitoneal routes. Human systemic skin and gastrointestinal effects by ingestion. An experimental teratogen and tumorigen. Mutagenic data. Flammable in the form of dust when exposed to heat or flame or by chemical reaction with powerful oxidizers such as bromates; chlorates; iodates; peroxides; lithium; NCl<sub>3</sub>; KNO<sub>3</sub>; KMnO<sub>4</sub>; Rb<sub>2</sub>C<sub>2</sub>; AgNO<sub>3</sub>; NOCl; IF<sub>5</sub>; CrO<sub>3</sub>; ClF<sub>3</sub>; ClO; BrF<sub>3</sub>; BrF<sub>5</sub>; BrN<sub>3</sub>; RbC<sub>3</sub>BCH; CsC<sub>3</sub>BCH. Slightly explosive in the form of dust when exposed to flame. When heated or on contact with acid or acid fumes, emits highly toxic

fumes; can react vigorously on contact with oxidizing materials. Incompatible with bromine azide; dirubidium acetylide; halogens; palladium; zinc; platinum; NCl<sub>3</sub>; AgNO<sub>3</sub>; CrO<sub>3</sub>; Na<sub>2</sub>O<sub>2</sub>; hexafluoro isopropylideneamino lithium. For further information, see Vol. 4, No. 1 of DPIM Report.

ARB000

HR: 3

m-ARSENIC ACID

CAS: 10102-53-1  
mf: AsHO<sub>3</sub> mw: 123.93

NIOSH: CG 0760000

SYN: METAARSENIC ACID

Reported in EPA TSCA Inventory. Arsenic and its compounds are on the Community Right To Know List.

OSHA PEL: TWA 0.01 mg(As)/m<sup>3</sup>  
ACGIH TLV: TWA 0.2 mg(As)/m<sup>3</sup>  
NIOSH REL: CL 2 µg(As)/m<sup>3</sup>/15M

THR: See ARSENIC COMPOUNDS. When heated to decomposition it emits toxic fumes of As.

ARB250

HR: 3

o-ARSENIC ACID

CAS: 7778-39-4  
DOT: 1553/1554  
mf: AsH<sub>3</sub>O<sub>4</sub> mw: 141.95

NIOSH: CG 0700000

SYNS:

ACIDE ARSENIQUE LIQUIDE  
(FRENCH)  
ARSENATE  
ARSENIC ACID, LIQUID (DOT)  
ARSENIC ACID, SOLID (DOT)  
DESICCANT L-10

HI-YIELD DESICCANT H-10  
ORTHOARSENIC ACID  
RCRA WASTE NUMBER P010  
ZOTOX  
ZOTOX CRAB GRASS KILLER

TOXICITY DATA:

cyt-hmn: leu 7200 nmol/L  
cyt-hmn: fbr 100 ppb  
*ipr*-rat TDLo: 30 mg/kg (9D  
preg): TER  
ori-mus TDLo: 120 mg/kg (7-  
15D preg): REP  
*ipr*-mus TDLo: 40 mg/kg (7-15D  
preg): TER  
ori-rat LD50: 48 mg/kg  
ori-dog LDLo: 10 mg/kg  
ori-rbt LDLo: 5 mg/kg  
ori-pgn LDLo: 100 mg/kg  
ori-ckn LDLo: 125 mg/kg

CODEN:

MUREAV 88,73,81  
MUREAV 88,73,81  
JTSCDR 4,405,79  
  
TJADAB 15,301,77  
TJADAB 15,30A,77  
  
FMCHA2 -,C18,83  
FDWU\*\* -,31  
FDWU\*\* -,31  
FDWU\*\* -,31  
FDWU\*\* -,31

Reported in EPA TSCA Inventory. Arsenic and its compounds are on the Community Right To Know List.

OSHA PEL: TWA 0.01 mg(As)/m<sup>3</sup>  
ACGIH TLV: TWA 0.2 mg(As)/m<sup>3</sup>  
NIOSH REL: CL 2 µg(As)/m<sup>3</sup>/15M

DOT Classification: DOT-Hazard: Poison B; Label: Poison

THR: Poison by ingestion. An experimental teratogen. Other experimental reproductive effects. Human mutagenic

**BAG500  
BARBITURATES**

HR: 3

**SYNS:**BARBITAL  
BARBITAL SODIUM  
BARBITONEDERIVATIVES OF BARBITURIC  
ACID, I.E.

THR: Salts or derivatives of barbituric acid. They are central nervous system depressants and are used as hypnotics, sedatives and anesthetics. Usually administered orally. They are strongly habit forming. Several compounds including amobarbital, secobarbital, and pentobarbital are restricted chemicals. Their use can cause a reaction called barbiturism which is marked by chills, headache, fever, and cutaneous eruptions. See BARBITAL SODIUM.

**BAG750  
BARBITURIC ACID**

HR: 1

mf:  $C_4H_4O_3N_2$  mw: 128.1

PROP: Crystals or white to yellow-white powder, mp: 245°, bp: 260° (decomp).

THR: Mildly toxic. Irritating to skin, eyes and mucous membranes. An allergen. Has no hypnotic properties. Combustible.

**BAH250  
BARIUM**

HR: 3

CAS: 7440-39-3  
DOT: 1399/1400/1854  
af: Ba aw: 137.36

NIOSH: CA 8370000

PROP: Silver-white, sltly lustrous, somewhat malleable metal. Mp: 725°, bp: 1640°, d: 3.5 @ 20°, vap press: 10 mm @ 1049°.

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

ACGIH TLV: TWA 0.5 mg/m<sup>3</sup>  
DFG MAK: 0.5 mg/m<sup>3</sup>

DOT Classification: Some barium compounds are flammable or explosive

THR: See BARIUM COMPOUNDS. Water and stomach acids solubilize barium salts and can cause poisoning. Symptoms are vomiting, colic, diarrhea, slow irregular pulse, transient hypertension, and convulsive tremors and muscular paralysis. Death may occur from a few hours to a few days. Half-life of barium in bone has been estimated at 50 days. Dust is dangerous and explosive when exposed to heat, flame, or chemical reaction. Violent or explosive reaction with water; CCl<sub>4</sub>; fluorotrichloromethane; trichloroethylene; and C<sub>2</sub>Cl<sub>4</sub>. Incompatible with acids; C<sub>2</sub>Cl<sub>3</sub>F<sub>3</sub>; C<sub>2</sub>H<sub>2</sub>FCl<sub>3</sub>; C<sub>2</sub>HCl<sub>3</sub> and water; 1,1,2-trichloro trifluoro ethane; and fluorotrichloroethane. The powder may ignite or explode in air or other oxidizing gases. For further information, see Vol. 3, No. 4 of DPIM Report.

**BAH500  
BARIUM ACETATE**

HR: 3

CAS: 543-80-6

NIOSH: AF 4550000

mf: C<sub>4</sub>H<sub>6</sub>O<sub>4</sub>·Ba mw: 255.44

PROP: White crystals. Water-sol.

**SYNS:**ACETIC ACID, BARIUM SALT  
BARIUM DIACETATE

OCTAN BARNATY (CZECH)

**TOXICITY DATA:**ori-rat LD50: 921 mg/kg  
ivn-mus LD50: 11 mg/kg  
ori-rbt LDLo: 236 mg/kg  
scu-rbt LDLo: 96 mg/kg  
ivn-rbt LDLo: 12 mg/kg**CODEN:**MarJV# 29MAR77  
TXAPA9 22,150,72  
EQSSDX 1,1,75  
EQSSDX 1,1,75  
EQSSDX 1,1,75

Reported in EPA TSCA Inventory. Barium and its compounds are on the Community Right To Know List.

OSHA PEL: TWA 500 ppm  
ACGIH TLV: TWA 0.5 mg(Ba)/m<sup>3</sup>

THR: Poison via ingestion, intravenous and subcutaneous routes. When heated to decomposition it emits acrid smoke and fumes. See also BARIUM COMPOUNDS.

**BAH750  
BARIUM ACETYLIDE**

HR: 3

CAS: 12070-27-8

mf: C<sub>2</sub>Ba mw: 161.35

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

Ignites on contact with vapors of water or ethanol in air. Incandescent reaction when heated with: hydrogen @ 150°C; chlorine @ 140°C; bromine @ 130°C; iodine @ 122°C; and selenium @ 150°C. See also BARIUM COMPOUNDS and ACETYLIDES.

**BAI000  
BARIUM AZIDE**

HR: 3

CAS: 18810-58-7

NIOSH: CQ 8500000

DOT: 0224

mf: BaN<sub>6</sub> mw: 221.40

PROP: Monoclinic prisms. Mp: -N<sub>2</sub> @ about 120°, bp: explodes, d: 2.936.

SYN: BARIUM AZIDE, dry or containing less than 50% water (DOT)

Reported in EPA TSCA Inventory. Barium and its compounds are on the Community Right To Know List.

OSHA PEL: TWA 0.5 mg(Ba)/m<sup>3</sup>  
ACGIH TLV: TWA 0.5 mg(Ba)/m<sup>3</sup>

DOT Classification: Class A Explosive; Label: Explosive A and Poison

**CAC500 CADIA DEL PERRO**

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

THR: Poison by most routes. See also ARSENIC COMPOUNDS and SULFIDES. Dangerous fire hazard when exposed to heat or by spontaneous chemical reaction, i.e., in air. Vigorous reaction with oxidizing materials. When heated to decomposition it emits toxic fumes of As.

**CAC500 CADIA DEL PERRO****HR: 3**

NIOSH: EU 9500000

PROP: Aqueous extract from the dried leaves of the plant (JNCIAM 46,1131,71).

**SYNS:**

K. IXINA

KRAMERIA IXINA

**TOXICITY DATA:**

scu-rat TDLo: 300 mg/kg/1Y-1: NEO

ims-rat TDLo: 45 g/kg/1Y-1:ETA  
skn-ham TDLo: 53950 mg/kg/  
65W-1: CAR

scu-rat TD : 990 mg/kg/55W-1: NEO

**CODEN:**

JNCIAM 46,1131,71

JNCIAM 46,1131,71  
JNCIAM 53,1259,74

JNCIAM 52,1579,74

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

**CAD000 CADMIUM**

CAS: 7440-43-9

mf: Cd mw: 112.40

**HR: 3**

NIOSH: EU 9800000

PROP: Hexagonal crystals, silver-white, malleable metal. Mp: 320.9°, bp: 767 ± 2°, d: 8.642, vap press: 1 mm @ 394°.

**SYNS:**

C.I. 77180

KADMIUM (GERMAN)

COLLOIDAL CADMIUM

**TOXICITY DATA:**

cyt-ham: ovr 1 µmol/L

ori-rat TDLo: 220 mg/kg (1-22D  
preg): REP, TERori-rat TDLo: 23 mg/kg (1-22D  
preg): REP, TERivn-rat TDLo: 1250 µg/kg (14D  
preg): REP, TERims-rat TDLo: 40 mg/kg/4W-1:  
CAR

ims-rat TD : 70 mg/kg: ETA

ims-rat TD : 63 mg/kg: ETA

ims-rat TD : 45 mg/kg/4W-1:  
NEOihl-man TCLo: 88 µg/m<sup>3</sup>/8.6Y:  
KIDihl-hmn LCLo: 39 mg/m<sup>3</sup>/20M

unk-man LDLo: 15 mg/kg

**CODEN:**

CGCGBR 26,251,80

TOLEDS 11,233,82

PSEBAA 158,614,78

JJATDK 1,264,81

JEPTDQ 1(1),51,77

BJCAAJ 18,124,64

NATUAS 193,592,62

NCIUS\* PH-43-64-  
886, SEPT, 71

AEHLAU 28,147,74

AJHAAP 31,180,70

85DCAI 2,73,70

ori-rat LD50: 225 mg/kg

ipr-rat LD50: 4 mg/kg

scu-rat LD50: 9 mg/kg

ivn-rat LD50: 1800 µg/kg

unr-rat LD50: 1140 mg/kg

ori-mus LD50: 890 mg/kg

ihl-mus LCLo: 170 mg/m<sup>3</sup>

unr-mus LD50: 890 mg/kg

ori-rbt LDLo: 70 mg/kg

scu-rbt LDLo: 6 mg/kg

ivn-rbt LDLo: 5 mg/kg

ims-ham LDLo: 25 mg/kg

TXAPA9 41,667,77

TXAPA9 41,667,77

TXAPA9 41,667,77

JJATDK 1,264,81

GTPZAB 22(5),6,78

4IHTAH -,14,78

NTIS\*\* PB158-508

GTPZAB 22(5),6,78

AMPMAR 34,127,73

PROTA\* -,55

JOGBAS 35,693,28

NCIUS\* PH-43-64-886

IARC Cancer Review: Animal Sufficient Evidence IMEMDT 11,39,76; IMEMDT 2,74,73. Cadmium and its compounds are on the Community Right To Know List. Reported in EPA TSCA Inventory. EPA Genetic Toxicology Program.

OSHA PEL: TWA 0.1 mg(Cd)/m<sup>3</sup>; CL 0.6 mg(Cd)/m<sup>3</sup> (fume)

ACGIH TLV: TWA 0.01 mg(Cd)/m<sup>3</sup> (dust), Human carcinogen

DFG BAT: Blood 1.5 µg/dL; Urine 15 µg/dL

NIOSH REL: (Cadmium) Reduce to lowest feasible level

THR: A human poison by inhalation and possibly other routes. Poison experimentally by ingestion, inhalation, intraperitoneal, subcutaneous, intramuscular, and intravenous routes. In humans inhalation causes an excess of protein in the urine. An experimental carcinogen, tumorigen, neoplastigen, and teratogen. Experimental reproductive effects. Mutagenic data. The dust ignites spontaneously in air and is flammable and explosive when exposed to heat, flame, or by chemical reaction with oxidizing agents; metals; HN<sub>3</sub>; Zn; Se; and Te. Explodes on contact with hydrazoic acid. Violent or explosive reaction when heated with ammonium nitrate. Vigorous reaction when heated with nitryl fluoride. When heated strongly it emits toxic fumes of Cd. See also CADMIUM COMPOUNDS. For further information, see Vol. 3, No. 5 of DPIM Report.

**CAD250****HR: 3****CADMIUM(II) ACETATE**

CAS: 543-90-8

NIOSH: EU 9810000

DOT: 2570

mf: C<sub>2</sub>H<sub>4</sub>O<sub>2</sub> · 1/2Cd mw: 116.25

PROP: Monoclinic, colorless crystals; odor of acetic acid. Mp: 256°, bp: decomp, d: 2.341.

**SYNS:**

ACETIC ACID, CADMIUM SALT

BISACETOXYCADMIUM

CADMIUM ACETATE (DOT)

CADMIUM DIACETATE

C.I. 77185

**TOXICITY DATA:**

cyt-hma: lym 10 nmol/L

otr-ham: emb 1 µmol/L

dnd-ham: emb 1 µmol/L

**CODEN:**

MUREAV 85,236,81

CNREA8 39,193,79

CNREA8 39,193,79

THR: An experimental carcinogen and neoplastigen. Very powerful oxidizer. See also CHROMIUM COMPOUNDS.

**CM1500****HR: 3****CHROMITE (MINERAL)**

CAS: 1308-31-2

NIOSH: GB 4000000

mf: Cr<sub>2</sub>FeO<sub>4</sub> mw: 223.85**SYNS:**CHROME ORE  
CHROMITECHROMITE ORE  
IRON CHROMITE**TOXICITY DATA:**

mma-sat 2 mg/plate  
cyt-hmn: oth 500 mg/L  
dni-ham: kdy 500 mg/L  
oms-ham: kdy 500 mg/L  
cyt-ham: ovr 5 mg/L  
sce-ham: ovr 10 mg/L

**CODEN:**

CRNGDP 3,1331,82  
BJCAAI 44,219,81  
BJCAAI 44,219,81  
BJCAAI 44,219,81  
BJCAAI 44,219,81  
CRNGDP 3,1331,82

IARC Cancer Review: Animal Inadequate Evidence  
IMEMDT 23,205,80. Chromium and its compounds are on the Community Right To Know List.

OSHA PEL: CL 0.5 mg(Cr)/m<sup>3</sup>ACGIH TLV: TWA 0.05 mg/m<sup>3</sup> (ore processing); Human Carcinogen (ore processing)

THR: A human carcinogen. Human mutagenic data. See also CHROMIUM COMPOUNDS and IRON.

**CM1750****HR: 3****CHROMIUM**

CAS: 7440-47-3

NIOSH: GB 4200000

mf: Cr mw: 52.00

**SYN: CHROME****TOXICITY DATA:**

ivn-rat TDLo: 2160 µg/kg/6W-1:  
ETA  
imp-rat TDLo: 1200 µg/kg/6W-1:  
ETA  
imp-rbt TDLo: 75 mg/kg:ETA  
orl-hmn LDLo: 71 mg/kg:GIT

**CODEN:**

JNCIAM 16,447,55  
JNCIAM 16,447,55  
ZEKBAI 52,425,42  
34ZIAG -,176,69

IARC Cancer Review: Animal Inadequate Evidence  
IMEMDT 23,205,80. Reported in EPA TSCA Inventory. Chromium and its compounds are on the Community Right To Know List.

OSHA PEL: TWA 1 mg/m<sup>3</sup>ACGIH TLV: TWA 0.5 mg/m<sup>3</sup>

THR: Human poison by ingestion with gastrointestinal effects. An experimental tumorigen and suspected carcinogen. Powder will explode spontaneously in air. Ignites and is potentially explosive in atmospheres of carbon dioxide. Violent or explosive reaction when heated with ammonium nitrate. May ignite or react violently with bromine pentafluoride. Incandescent reaction with nitrogen oxide; sulfur dioxide. Incompatible with oxidants. See also CHROMIUM

COMPOUNDS. For further information, see Vol. 3, No. 3 of DPIM Report.

**CMJ000****HR: 3****CHROMIUM ACETATE HYDRATE**

CAS: 628-52-4

NIOSH: AG 3000000

mf: C<sub>4</sub>H<sub>6</sub>O<sub>4</sub>·Cr·H<sub>2</sub>O mw: 188.12

PROP: Red crystals.

**SYNS:**

ACETIC ACID, CHROMIUM (2+) SALT (BCT, 9CI)  
CHROMIUM(2+) ACETATE  
CHROMIUM(III) ACETATE

CHROMIUM DIACETATE  
CHROMOUS ACETATE  
CHROMOUS ACETATE MONO-HYDRATE

**TOXICITY DATA:**

orl-rat LD50: 11260 mg/kg

**CODEN:**

AIHAAP 30,470,69

Reported in EPA TSCA Inventory. Chromium and its compounds are on the Community Right To Know List.

OSHA PEL: CL 0.5 mg(Cr)/m<sup>3</sup>ACGIH TLV: TWA 0.5 mg(Cr)/m<sup>3</sup>

THR: Mildly toxic by ingestion. The anhydrous acetate ignites spontaneously in air. See also CHROMIUM COMPOUNDS. When heated to decomposition it emits acrid smoke and irritating fumes.

**CMJ250****HR: 3****CHROMIUM CHLORIDE**

CAS: 10025-73-7

NIOSH: GB 5425000

mf: Cl<sub>3</sub>Cr mw: 158.35

PROP: Bp: 1300° (subl).

**SYNS:**

CHROMIC CHLORIDE  
CHROMIUM(III) CHLORIDE (1:3)  
CHROMIUM CHLORIDE, ANHYDROUS  
CHROMIUM TRICHLORIDE

C.I. 77295  
PURATRONIC CHROMIUM CHLORIDE  
TRICHLOROCHROMIUM

**TOXICITY DATA:**

pic-esc 500 µmol/L  
cyt-hmn: oth 500 mg/L  
dnd-rat-ivr 80 mg/kg  
dni-mus: fbr 300 µmol/L  
sce-ham: lng 39 mg/L  
ivr-mus TDLo: 44600 µg/kg (8D preg): TER  
ivr-mus TDLo: 59500 µg/kg (9D preg): REP  
scu-mus TDLo: 450 mg/kg (1-17D preg): TER  
skn-rat LDLo: 2 g/kg  
ihl-mus LC50: 31500 µg/m<sup>3</sup>/2H  
ivr-mus LD50: 434 mg/kg  
scu-mus LDLo: 800 mg/kg  
ivr-mus LDLo: 400 mg/kg  
ivr-mus LD50: 40 mg/kg  
skn-rbt LDLo: 1 g/kg

**CODEN:**

ENMDUM 6,59,84  
BJCAAI 44,219,81  
CNREA8 45,1146,85  
JTEHD6 15,237,85  
CRNGDP 4,605,83  
JTSCDR 1,1,76  
JTSCDR 1,1,76  
TJADAB 12,198,75  
8SGMAT -,39,82  
8SGMAT -,39,82  
COREAF 256,1043,63  
AQMOAC #70-15,70  
AQMOAC #70-15,70  
8SGMAT -,39,82  
8SGMAT -,39,82

**CNH785**  
**CONVALLATOXOL**

HR: 3

CAS: 3253-62-1

NIOSH: FH 4900000

mf: C<sub>29</sub>H<sub>44</sub>O<sub>10</sub> mw: 552.73

## SYNS:

CONVALLOTXOL  
CONVALOTOXOL

COVALLATOXOL

α-L-STROPHANTHIDOL-3,6-  
DEOXY-MANNOPYRANOSIDE

## TOXICITY DATA:

ivn-cat LD50: 87 µg/kg  
ivn-rat LD50: 56 mg/kg  
ipr-mus LD50: 30 mg/kg  
ipr-cat LD50: 130 µg/kg

## CODEN:

JPETAB 111,365,54  
AIPTAK 155,165,65  
AIPTAK 155,165,65  
AIPTAK 155,165,65

THR: Poison by intravenous and intraperitoneal routes. When heated to decomposition it emits acrid smoke and fumes.

**CNH789**  
**COONTIE**

HR: 3

PROP: The coontie looks like a low palm with a short trunk and a few 2-foot long pinnate leaves. It produces seed cones. It grows on the southeastern coast of Georgia, Florida, the Bahamas, the northwestern coast of Jamaica, the Dominican Republic and Puerto Rico.

## SYNS:

BAY BUSH (BAHAMAS)  
COMPTIE  
FLORIDA ARROWROOT  
GUAYIGA (DOMINICAN REPUB-  
LIC)  
MARUNGUEY (PUERTO RICO)

PALMITA de JARDIN (PUERTO  
RICO)  
SAGO CYCAS  
SEMINOLE BREAD  
YUGILLA (CUBA)  
ZAMIA PUMILA

THR: The roots and trunk contain the poison cycasin. Ingestion of these plant parts may cause persistent vomiting, diarrhea, colic, depression and muscular paralysis. Washing the grated root with water renders it edible. See also CYCASIN.

**CNH800**  
**COPIAMYCIN**

HR: 2

CAS: 11078-23-2

NIOSH: GL 5300000

mf: C<sub>55</sub>H<sub>97</sub>NO<sub>22</sub> mw: 1124.53

SYN: NSC-110326

## TOXICITY DATA:

ori-mus LD50: 1030 mg/kg  
ipr-mus LD50: 1200 mg/kg  
scu-mus LD50: 1050 mg/kg

## CODEN:

85GDA2 7,53,81  
85GDA2 7,53,81  
85GDA2 7,53,81

THR: Moderately toxic by ingestion, subcutaneous and intraperitoneal routes. When heated to decomposition it emits toxic fumes of NO<sub>2</sub>.

**CNI000**  
**COPPER**

CAS: 7440-50-8

af: Cu aw: 63.54

HR: 3

NIOSH: GL 5325000

PROP: A metal with a distinct reddish color. Mp: 1083°, bp: 2324°, d: 8.92, vap press: 1 mm @ 1628°.

## SYNS:

ALLBRI NATURAL COPPER  
ANAC 110  
ARWOOD COPPER  
BRONZE POWDER  
CDA 101  
CDA 102  
CDA 110  
CDA 122  
C.I. 77400  
C.I. PIGMENT METAL 2  
COPPER-AIRBORNE

COPPER BRONZE  
COPPER-MILLED  
COPPER SLAG-AIRBORNE  
COPPER SLAG-MILLED  
1721 GOLD  
GOLD BRONZE  
KAFAR COPPER  
M1 (COPPER)  
M2 (COPPER)  
OFHC Cu  
RANEY COPPER

## TOXICITY DATA:

ori-rat TDLo: 152 mg/kg (22W  
pre): TER  
iut-rat TDLo: 250 µg/kg (1D  
pre): REP  
ipl-rat TDLo: 100 mg/kg: ETA  
ori-hmn TDLo: 120 µg/kg: GIT

## CODEN:

GISAAA 45(3),8,80  
JEBAA6 19,1124.81  
AIHAAP 41,836,80  
PHRPA6 73,910,58

Reported in EPA TSCA Inventory. Copper and its compounds are on the Community Right To Know List.

ACGIH TLV: TWA (dust, mist) 1 mg(Cu)/m<sup>3</sup>; (fume) 0.2 mg/m<sup>3</sup>

DFG MAK: (dust) 1 mg/m<sup>3</sup>; (fume) 0.1 mg/m<sup>3</sup>

THR: An experimental tumorigen and teratogen. Other experimental reproductive effects. Human systemic effects by ingestion: nausea and vomiting. See also COPPER COMPOUNDS. Liquid copper explodes on contact with water. Potentially explosive reaction with acetylenic compounds; 3-bromopropyne; ethylene oxide; lead azide; and ammonium nitrate. Ignites on contact with chlorine; chlorine trifluoride; fluorine (above 121°C); and hydrazinium nitrate (above 70°C). Reacts violently with C<sub>2</sub>H<sub>2</sub>; bromates; chlorates; iodates: (Cl<sub>2</sub> + OF<sub>2</sub>); dimethyl sulfoxide + trichloroacetic acid; ethylene oxide; H<sub>2</sub>O<sub>2</sub>; hydrazine mononitrate; hydrazoic acid; H<sub>2</sub>S + air, Pb(N<sub>3</sub>)<sub>2</sub>; K<sub>2</sub>O<sub>2</sub>; NaN<sub>3</sub>; Na<sub>2</sub>O<sub>2</sub>; sulfuric acid. Incandescent reaction with potassium dioxide. Incompatible with 1-bromo-2-propyne. For further information, see Vol. 1, No. 5 of DPIM Report.

## CNI250

HR: 3

## COPPER ACETATE

CAS: 142-71-2

NIOSH: AG 3480000

DOT: 9106

mf: C<sub>4</sub>H<sub>6</sub>O<sub>4</sub>•Cu mw: 181.64

PROP: Greenish-blue powder or small crystals.

## SYNS:

ACETATE DE CUIVRE (FRENCH)  
ACETIC ACID, CUPRIC SALT  
COPPER(2+) ACETATE  
COPPER(II) ACETATE  
COPPER DIACETATE  
COPPER(2+) DIACETATE

CRYSTALLIZED VERDIGRIS  
CRYSTALS OF VENUS  
CUPRIC ACETATE  
CUPRIC DIACETATE  
NEUTRAL VERDIGRIS  
OCTAN MEDNATY (CZECH)

**LCC000 LAVENDER ABSOLUTE**

2098

OSHA PEL: TWA 0.2 mg/m<sup>3</sup>  
 NIOSH REL: (To Coal Tar Products) TWA 0.1 mg/m<sup>3</sup>

DOT Classification: Flammable or Combustible; Label  
 Flammable Liquid

THR: An experimental carcinogen and tumorigen. Muta-  
 genic data. A human and experimental skin irritant. When  
 heated to decomposition it emits acrid smoke and irritating  
 fumes.

**LCC000****HR: 1****LAVENDER ABSOLUTE**

CAS: 8000-28-0

NIOSH: OF 6100000

PROP: Found in the flowers of *Lavandula officinalis* chaix.  
 The main constituent is linalyl acetate. A dark green liquid  
 prepared from alcoholic extract of a residue which is ex-  
 tracted from plant material using an organic solvent.

TOXICITY DATA: CODEN:  
 skn-rbt 500 mg/24H MLD FCTXAV 14,449.76  
 ori-rat LD50: 4250 mg/kg FCTXAV 14,449.76

THR: Mildly toxic by ingestion. A skin irritant. When  
 heated to decomposition it emits acrid smoke and irritating  
 fumes. See also 3,7-DIMETHYL-1,6-OCTADIEN-3-OL  
 ACETATE.

**LCD000****HR: 1****LAVENDER OIL**

CAS: 8000-28-0

NIOSH: OF 6110000

PROP: Main constituent is linalyl acetate. Found in the  
 plant *Lavandula officinalis* chaix (*Fam. Labiate*). Prepared  
 by steam distillation of the flowering stalks of the plant.

SYNS:  
 LAVENDEL OEL (GERMAN) OIL OF LAVENDER

TOXICITY DATA: CODEN:  
 skn-rbt 500 mg/24H MLD FCTXAV 14,451.76  
 ori-rat LD50: 9040 mg/kg PHARAT 14,435.59

Reported in EPA TSCA Inventory.

THR: Mildly toxic by ingestion. A skin irritant. When  
 heated to decomposition it emits acrid smoke and irritating  
 fumes. See also 3,7-DIMETHYL-1,6-OCTADIEN-3-OL  
 ACETATE.

**LCE000****HR: 3****LD-813**

CAS: 64083-05-2

NIOSH: OF 6730000

PROP: Commercial mixture of aromatic amines containing  
 approx 40% MOCA.

TOXICITY DATA: CODEN:  
 ori-rat TDLo: 37 g/kg/2Y-C: CAR TXAPA9 31,159.75

THR: An experimental carcinogen. When heated to decom-  
 position it emits toxic fumes of NO<sub>x</sub>. See also AROMATIC  
 AMINES.

**LCF000****LEAD**

CAS: 7439-92-1

af: Pb aw: 207.19

**HR: 3**

NIOSH: OF 7525000

PROP: Bluish-gray, soft metal. Mp: 327.43°, bp: 1740°,  
 d: 11.34 @ 20°/4°. vap press: 1 mm @ 973°.

**SYNS:**

C.I. 77575  
 C.I. PIGMENT METAL 4  
 GLOVER  
 LEAD FLAKE  
 LEAD S2

OLOW (POLISH)  
 OMAHA  
 OMAHA & GRANT  
 SI  
 SO

**TOXICITY DATA:**

cyt-hmn-uar 50 µg/m<sup>3</sup>  
 cyt-rat-ihl 23 µg/m<sup>3</sup>/16W  
 cyt-mky-ori 42 mg/kg/30W  
 ori-rat TDLo: 790 mg/kg  
 (MGN): REP  
 ori-rat TDLo: 1140 mg/kg (14D  
 pre-21D post): REP  
 ori-rat TDLo: 1100 mg/kg (1-22D  
 preg): TER  
 ihl-rat TCLo: 10 mg/m<sup>3</sup>/24H  
 (1-21D preg): TER  
 ori-wmn TDLo: 450 mg/kg/6Y:  
 PNS: CNS  
 ihl-hma TCLo: 10 µg/m<sup>3</sup>: GIT:  
 LIV  
 ipr-rat LDLo: 1000 mg/kg  
 ori-pgn LDLo: 160 mg/kg

**CODEN:**

MUREAV 147,301.85  
 GTPZAB 26(10),38.82  
 TOLEDS 8,165.81  
 AEHLAU 23,102.71  
 PHMCAA 20,201.78  
 FEPRA7 37,895.78  
 ZHPMAT 165,294.77  
 JAMAAP 237,2627.77  
 VRDEAS (5),107.81  
 EQSSDX 1,1,75  
 HBAMAK 4,1289,35

IARC Cancer Review: Animal Inadequate Evidence  
 IMEMDT 23,325,80. Lead and its compounds are on the  
 Community Right To Know List. Reported in EPA TSCA  
 Inventory. EPA Genetic Toxicology Program.

OSHA PEL: TWA 0.05 mg(Pb)/m<sup>3</sup>  
 ACGIH TLV: TWA 0.15 mg(Pb)/m<sup>3</sup>  
 NIOSH REL: TWA (Inorganic Lead) 0.10 mg(Pb)/m<sup>3</sup>

THR: Poison by ingestion. Moderately toxic by intraperito-  
 neal route. It is a suspected carcinogen of the lungs and  
 kidneys. Human systemic effects by ingestion and inhala-  
 tion: loss of appetite, anemia, malaise, insomnia, headache,  
 irritability, muscle and joint pains, tremors, flaccid paralysis  
 without anesthesia, hallucinations and distorted percep-  
 tions, muscle weakness, gastritis and liver changes. The  
 major organ systems affected are the nervous system, blood  
 system, and kidneys. Lead encephalopathy is accompanied  
 by severe cerebral edema, increase in cerebral spinal fluid  
 pressure, proliferation and swelling of endothelial cells in  
 capillaries and arterioles, proliferation of glial cells, neu-  
 ronal degeneration and areas of focal cortical necrosis in  
 fatal cases. Experimental evidence now suggests that blood  
 levels of lead below 10 µg/dl can have the effect of dimin-

ishing the IQ scores of children. Low levels of lead impair neurotransmission and immune system function and may increase systolic blood pressure. Reversible kidney damage can occur from acute exposure. Chronic exposure can lead to irreversible vascular sclerosis, tubular cell atrophy, interstitial fibrosis, and glomerular sclerosis. Severe toxicity can cause sterility, abortion and neonatal mortality and morbidity. An experimental teratogen. Experimental reproductive effects. Human mutagenic data. Very heavy intoxication can sometimes be detected by formation of a dark line on the gum margins, the so-called "lead line."

When lead is ingested, much of it passes through the body unabsorbed, and is eliminated in the feces. The greater portion of the lead that is absorbed is caught by the liver and excreted, in part, in the bile. For this reason, larger amounts of lead are necessary to cause toxic effects by this route, and a longer period of exposure is usually necessary to produce symptoms. On the other hand, upon inhalation, absorption takes place easily from the respiratory tract and symptoms tend to develop more quickly. For industry, inhalation is much more important than is ingestion. For the general population, exposure to lead occurs from inhaled air, dust of various types, and food and water with an approximate 50/50 division between inhalation and ingestion routes. Lead occurs in water in either dissolved or particulate form. At low pH, lead is more easily dissolved. Chemical treatment to soften water increases the solubility of lead. Adults absorb about 5-15% of ingested lead and retain less than 5%. Children absorb about 50% and retain about 30%.

Lead produces a brittleness of the red blood cells so that they hemolyze with but slight trauma; the hemoglobin is not affected. Due to their increased fragility, the red cells are destroyed more rapidly in the body than is normal, producing an anemia which is rarely severe. The loss of circulating red cells stimulates the production of new young cells which, on entering the blood stream, are acted upon by the circulating lead, with resultant coagulation of their basophilic material. These cells after suitable staining, are recognized as "stippled cells." There is no uniformity of opinion regarding the effect of lead on the white blood cells.

In addition to its effect on the red blood cells, lead produces a damaging effect on the organs or tissues with which it comes in contact. No specific or characteristic lesion is produced. Autopsies in deaths attributed to lead poisoning and experimental work on animals have shown pathological lesions of the kidneys, liver, male gonads, nervous system, blood vessels and other tissues. None of these changes, however, has been found consistently. In cases of severe lead poisoning, the amount of lead found in the blood is frequently in excess of 0.07 mg per 100 cc of whole blood. The urinary lead excretion generally exceeds 0.1 mg per liter of urine.

Flammable in the form of dust when exposed to heat

or flame. Moderately explosive in the form of dust when exposed to heat or flame. Mixtures of hydrogen peroxide + trioxane explode on contact with lead. Rubber gloves containing lead may ignite in nitric acid. Violent reaction on ignition with chlorine trifluoride; concentrated hydrogen peroxide; ammonium nitrate (below 200°C with powdered lead); sodium acetylide (with powdered lead). Incompatible with  $\text{NaN}_3$ ; Zr; disodium acetylide; oxidants. Can react vigorously with oxidizing materials. A common air contaminant. When heated to decomposition it emits highly toxic fumes of Pb. See also LEAD COMPOUNDS. For further information, see Vol. 1, No. 1 of *DPIM Report*.

## LCG000

HR: 3

## LEAD ACETATE

CAS: 301-04-2

NIOSH: AI 5250000

DOT: 1616

mf:  $\text{C}_4\text{H}_6\text{O}_4 \cdot \text{Pb}$  mw: 325.29

PROP: Trihydrate: colorless crystals or white granules or powder. Slightly acetic odor, slowly effloresces. D: 2.55, mp: 75° (when rapidly heated), decomp above 200°. Very sol in glycerol.

## SYNS:

ACETATE de PLOMB (FRENCH)

ACETIC ACID LEAD (2+) SALT

BLEIACETAT (GERMAN)

DIBASIC LEAD ACETATE

LEAD (2+) ACETATE

LEAD(II) ACETATE

LEAD DIACETATE

LEAD DIBASIC ACETATE

NORMAL LEAD ACETATE

PLUMBOUS ACETATE

RCRA WASTE NUMBER U144

SALT OF SATURN

SUGAR OF LEAD

## TOXICITY DATA:

sln-smc 250  $\mu\text{mol/L}$ 

cyt-hmn:lym 1 mmol/L/24H

mnt-rat-ivr 51800  $\mu\text{g/kg}$ 

otr-rat:emb 200 mg/L

oms-rat-ivr 10400  $\mu\text{g/kg}$ 

cyt-rat-uar 9 mg/kg/26W-C

cyt-rat-ivr 51800  $\mu\text{g/kg}$ ori-rat TDLo: 600  $\mu\text{g/kg}$  (30D

male): REP

ori-rat TDLo: 1413 mg/kg (1-18D

preg): TER

ori-mus TDLo: 236 mg/kg

(7-16D preg): TER

ori-rat TDLo: 900 mg/kg/60D-C:

NEO

ori-rat TD : 250 g/kg/47W-C:

ETA

ori-rat TD : 2430 mg/kg/23W-C:

ETA

ori-rat TD : 4605 mg/kg/44W-C:

ETA

ori-rat TD : 7560 mg/kg/72W-C:

NEO

ori-rat TD : 9150 mg/kg/44W-C:

NEO

ori-rat TD : 218 g/kg/1Y-C:ETA

ori-rat TD : 138 g/kg/76W-C:

ETA

## CODEN:

MUTAEX 1,21,86

TXCYAC 10,67,78

AEHLAU 40,144,85

JJIND8 67,1303,81

AEHLAU 40,144,85

GISAAA 49(3),15,84

AEHLAU 40,144,85

AJOGAH 115,1058,73

ENVRAL 30,152,83

ARTODN 41,125,78

ENVRAL 24,391,81

BJCAAI 16,283,62

ENVRAL 24,391,81

ENVRAL 24,391,81

ENVRAL 24,391,81

AJPAA4 50,571,67

BECTA6 23,464,79

TOPADD 13,50,85

## TOXICITY DATA:

skn-rbt 500 mg open MLD  
orl-rat LD50: 20 g/kg

Reported in EPA TSCA Inventory.

THR: Mildly toxic by ingestion. A skin irritant.

NCV500

NIAX TRIOL 6000

CAS: 102395-10-8

## TOXICITY DATA:

skn-rbt 500 mg open MLD  
orl-rat LD50: 57 g/kg

THR: Mildly toxic by ingestion. A skin irritant.

NCW000

NIAZOL

CAS: 550-99-2

mf: C<sub>14</sub>H<sub>14</sub>N<sub>2</sub>·ClH

mw: 246.76

## SYNS:

ALBALON LIQUIFILM  
CLERA  
COLDAN  
4,5-DIHYDRO-2-(1-NAPHTHALE-  
NYLMETHYL)-1H-IMIDAZOLE  
MONOHYDROCHLORIDE  
NAPHAZOLINE HYDROCHLORIDE  
NAPHCON  
NAPHCON PORTE  
2-(1-NAPHTHYLMETHYL)IMID-  
AZOLINE HYDROCHLORIDE

2-(1-NAPHTHYLMETHYL)-2-IM-  
IDAZOLINE HYDROCHLORIDE  
PRIVINE HYDROCHLORIDE  
PRIZOLE HYDROCHLORIDE  
RHINANTIN  
RHINOPERD  
SANORIN-SPOFA  
STRICYLON  
VASOCON

## TOXICITY DATA:

ipr-rat LD50: 50 mg/kg  
scu-rat LD50: 325 mg/kg  
ivn-rat LD50: 6 mg/kg  
scu-mus LD50: 170 mg/kg  
ivn-mus LD50: 16500 µg/kg  
scu-rbt LD50: 950 mg/kg  
ivn-rbt LD50: 800 µg/kg  
ims-rbt LD50: 950 µg/kg

THR: Poison by intraperitoneal, subcutaneous, intravenous and intramuscular routes. An FDA over the counter and proprietary drug. When heated to decomposition it emits very toxic fumes of NO<sub>x</sub> and HCl.

NCW300

NICERITROL

CAS: 5868-05-3

mf: C<sub>29</sub>H<sub>24</sub>N<sub>4</sub>O<sub>8</sub>

mw: 556.57

PROP: Crystals. Mp: 160-164°.

## SYNS:

2,2-BIS((3-PYRIDINYLCAR-  
BONYLOXY)METHYL)-3-  
PROPANEDIYL ESTER of 3-  
PYRIDINECARBOXYLIC ACID  
BURPOR

CARDIOLIPOL  
PENTAERYTHRITOL TETRANICO-  
TINATE  
PERYCT  
SK 1

## CODEN:

UCDS\*\* 4/29/69  
UCDS\*\* 4/29/69

NIOSH: QR 4600000

## CODEN:

UCDS\*\* 6/15/71  
UCDS\*\* 6/15/71

NIOSH: NJ 4375000

## CODEN:

JPETAB 86,284,46  
JPETAB 86,284,46  
JPETAB 113,341,55  
JPETAB 86,280,46  
JPETAB 113,341,55  
JPETAB 86,284,46  
JPETAB 86,284,46  
JPETAB 86,284,46

## TOXICITY DATA:

orl-rat TDLo: 42 g/kg (35D pre):  
REP

orl-rat TDLo: 45500 mg/kg (91D  
male): REP

orl-rat LD50: 20 g/kg  
ipr-rat LD50: 5000 mg/kg  
scu-rat LD50: 5000 mg/kg  
orl-mus LD50: 20 g/kg  
ipr-mus LD50: 5000 mg/kg  
scu-mus LD50: 5000 mg/kg  
orl-dog LD50: 5000 mg/kg  
orl-rbt LD50: 10 g/kg  
ipr-rbt LD50: 5000 mg/kg

THR: Mildly toxic by ingestion. Experimental reproductive effects. When heated to decomposition it emits toxic fumes of NO<sub>x</sub>. See also ESTERS.

NCW500

NICKEL

CAS: 7440-02-0

af: Ni aw: 58.71

PROP: A silvery-white, hard, malleable and ductile metal. D: 8.90 @ 25°, vap press: 1 mm @ 1810°. Crystallizes as metallic cubes. Mp: 1455°, bp: 2730°. Stable in air at room temp.

## SYNS:

C.I. 77775  
Ni 270  
NICKEL 270  
NICKEL (DUST)  
NICKEL (ITALIAN)  
NICKEL PARTICLES

NICKEL SPONGE  
Ni 0901-S  
Ni 4303T  
NP 2  
RANEY ALLOY  
RANEY NICKEL

## TOXICITY DATA:

otr-ham: kdy 400 mg/L  
otr-ham: emb 5 µmol/L  
orl-rat TDLo: 158 mg/kg  
(MGN): TER  
scu-rat TDLo: 3000 mg/kg/6W-1:  
ETA  
ims-rat TDLo: 56 mg/kg: CAR  
ipl-rat TDLo: 100 mg/kg/21W-1:  
ETA  
par-rat TDLo: 40 mg/kg/52W-1:  
ETA, TER  
imp-rat TDLo: 250 mg/kg: CAR  
ims-mus TDLo: 200 mg/kg: NEO  
imp-rbt TDLo: 165 mg/kg/2Y-1:  
NEO, TER  
ihl-gpg TClO: 15 mg/m<sup>3</sup>/91W-1:  
ETA  
ims-ham TDLo: 200 mg/kg/21W-1:  
ETA  
ims-rat TD : 58 mg/kg: ETA  
imp-rat TD : 23 mg/kg: ETA  
ims-rat TD : 125 mg/kg/13W-1:  
NEO  
ims-mus TD : 800 mg/kg/13W-1:  
NEO

## CODEN:

IAPUDO 53,193,84  
TOXID9 1,132,81  
AEHLAU 23,102,71  
JNCIAM 16,55,55  
IAPUDO 53,127,84  
PWPSA8 16,150,73  
AEHLAU 5,445,62  
JNCIAM 16,55,55  
NCIUS\* PH 43-64-  
886, SEPT, 70  
JNCIAM 16,55,55  
AMPLAO 65,600,58  
PWPSA8 14,68,71  
PAACA3 17,11,76  
JNCIAM 16,55,55  
NCIUS\* PH 43-64-  
886, JUL, 68  
NCIUS\* PH 43-64-  
886, JUL, 68

HR: 1

HR: 3

HR: 3



**NICKEL**

ims-rat TD : 90 mg/kg/18W-1: NCIUS\* PH 43-64-886,AUG,69  
 ETA  
 ims-rat TD : 889 µg/kg:ETA JPTLAS 97,375,69  
 ipl-rat TD : 1250 mg/kg/17W-1: TRBMAV 10,167,52  
 ETA  
 ipl-rat TD : 125 mg/kg/21W-1: PWPSA8 16,150,73  
 ETA  
 ims-rat TD : 200 mg/kg/21W-1: PWPSA8 14,68,71  
 NEO  
 ims-rat TD : 1 g/kg/17W-1:CAR PAACA3 9,28,68  
 itr-rat LDLo:12 mg/kg NTIS\*\* AEC-TR-6710  
 ivn-mus LDLo:50 mg/kg FATOAO 23,549,60  
 ivn-dog LDLo:10 mg/kg 14CYAT 2,1120,63  
 scu-rat LDLo:12500 µg/kg NTIS\*\* PB158-508  
 ipr-rbt LDLo:7 mg/kg NTIS\*\* PB158-508  
 scu-rbt LDLo:7500 µg/kg NTIS\*\* PB158-508  
 orl-gpg LDLo:5 mg/kg AMPMAR 25,247,64

IARC Cancer Review: Animal Inadequate Evidence IMEMDT 2,126,73; Animal Sufficient Evidence IMEMDT 11,75,76. Reported in EPA TSCA Inventory. Community Right To Know List. EPA Extremely Hazardous Substances List.

OSHA PEL: TWA 1 mg(Ni)/m<sup>3</sup>  
 ACGIH TLV: TWA 1 mg/m<sup>3</sup>  
 NIOSH REL: (Inorganic Nickel) TWA 0.015 mg(Ni)/m<sup>3</sup>

THR: Poison by ingestion, intratracheal, intraperitoneal, subcutaneous and intravenous routes. An experimental carcinogen, neoplastigen, tumorigen, and teratogen. Experimental reproductive effects. Ingestion of soluble salts causes nausea, vomiting, diarrhea. Mutagenic data. Hypersensitivity to nickel is common and can cause allergic contact dermatitis, pulmonary asthma, conjunctivitis, and inflammatory reactions around nickel-containing medical implants and prostheses. Powders may ignite spontaneously in air. Reacts violently with F<sub>2</sub>; NH<sub>4</sub>NO<sub>3</sub>; hydrazine; NH<sub>3</sub>; (H<sub>2</sub> + dioxane); performic acid; P; Se; S; (Ti + KClO<sub>3</sub>). Incompatible with oxidants (e.g., bromine pentafluoride; peroxyformic acid; potassium perchlorate; chlorine; nitryl fluoride; ammonium nitrate). Raney-nickel catalysts may initiate hazardous reactions with ethylene + aluminum chloride; p-dioxane; hydrogen; hydrogen + oxygen; magnesium silicate; methanol; organic solvents + heat; sulfur compounds. Nickel catalysts have caused many industrial accidents. For further information, see Vol. 3, No. 3 of *DPIM Report*.

**NCX000**

**HR: 3**

**NICKEL(II) ACETATE (1:2)**

CAS: 373-02-4 NIOSH: QR 6125000  
 mf: C<sub>4</sub>H<sub>6</sub>O<sub>4</sub>·Ni mw: 176.81

PROP: Green prisms. Mp: decomp, d: 1.798.

**SYNS:**

ACETIC ACID, NICKEL(2+) SALT NICKELOUS ACETATE

**TOXICITY DATA:**

pic-esc 160 µmol/L  
 dns-rat-ivr 129 µmol/kg/5D-1

**CODEN:**

ENMUDM 6,59,84  
 CRNGDP 6,1819,85

otr-ham: kdy 225 mg/L IAPUDO 53,193,84  
 ivn-ham TDLo: 10 mg/kg (8D ADTEAS 5,51,72  
 preg):REP  
 ims-rat TDLo:420 mg/kg/47W-1: NCIUS\* PH 43-64-886,JUL,68  
 NEO PAACA3 5,50,64  
 imp-rat TDLo:95 mg/kg/78W-C: ETA  
 ipr-mus TDLo:360 mg/kg/8W-1: CNREA8 36,1744,76  
 NEO  
 ims-rat TD : 225 mg/kg/46W-1: NCIUS\* PH 43-64-886,AUG,69  
 ETA  
 orl-rat LD50:350 mg/kg PWPSA8 11,39,68  
 ipr-rat LD50:23 mg/kg PWPSA8 11,39,68  
 orl-mus LD50:410 mg/kg PWPSA8 11,39,68  
 ipr-mus LD50:32 mg/kg PWPSA8 11,39,68  
 scu-gpg LDLo:20 mg/kg JOHYAY 8,565,08

Nickel and its compounds are on the Community Right To Know List. Reported in EPA TSCA Inventory.

OSHA PEL: TWA 1 mg(Ni)/m<sup>3</sup>  
 ACGIH TLV: TWA 0.1 mg(Ni)/m<sup>3</sup>  
 NIOSH REL: (Inorganic Nickel) TWA 0.015 mg(Ni)/m<sup>3</sup>

THR: Poison by ingestion, intraperitoneal and subcutaneous routes. An experimental neoplastigen and tumorigen. Experimental reproductive effects. Mutagenic data. When heated to decomposition it emits irritating fumes. See also NICKEL COMPOUNDS.

**NCX500**

**HR: 3**

**NICKEL ACETATE TETRAHYDRATE**

CAS: 6018-89-9 NIOSH: QR 6126000  
 mf: C<sub>4</sub>H<sub>6</sub>O<sub>4</sub>·Ni·4H<sub>2</sub>O mw: 248.89

**TOXICITY DATA:**

cyt-mus: mnr 100 µmol/L  
 ipr-mus LD50:45700 µg/kg

**CODEN:**

MUREAV 68,337,79  
 RCOCB8 30,133,80

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

OSHA PEL: TWA 1 mg(Ni)/m<sup>3</sup>  
 ACGIH TLV: TWA 0.1 mg(Ni)/m<sup>3</sup>  
 NIOSH REL: (Inorganic Nickel) TWA 0.015 mg(Ni)/m<sup>3</sup>

THR: Poison by intraperitoneal route. Mutagenic data. When heated to decomposition it emits acrid smoke and irritating fumes. See also NICKEL(II) ACETATE and NICKEL COMPOUNDS.

**NCY000**

**HR: D**

**NICKEL ALLOY, Ni,Be**

CAS: 37227-61-5 NIOSH: QR 6126300

SYN: BERYLLIUM-NICKEL ALLOY

IARC Cancer Review: Animal Inadequate Evidence IMEMDT 23,143,80. Nickel and its compounds as well as beryllium and its compounds are on the Community Right To Know List.

## SYNS:

BETAMETHASONE VALERATE  
BETAMETHASONE 17-VALERATE  
BETNOVATE  
BETNOVATEAT  
CELESTODERM

9-FLUORO-11- $\beta$ ,17,21-TRIHY-  
DROXY-16- $\beta$ -METHYLPREGNA-  
1,4-DIENE-3,20-DIONE-17-  
VALERATE  
 $\beta$ -METHASONE-17-VALERATE

## TOXICITY DATA:

skn-rat TDLo: 42 mg/kg (35D  
male): REP  
skn-rat TDLo: 19800  $\mu$ g/kg  
(7-17D preg): TER  
scu-mus TDLo: 1 mg/kg (11D  
preg): TER  
scu-rat LDLo: 2000 mg/kg  
ori-mus LD50: 4067 mg/kg  
ipr-mus LD50: 632  
scu-mus LD50: 496 mg/kg  
scu-rbt LD50: 61200  $\mu$ g/kg

## CODEN:

OYYAA2 27,1217.84  
YACHDS 9,3045,81  
YKRYAH 10,1585,77  
ARZNAD 27,2102,77  
SKIZAB 29,153,73  
SKIZAB 29,153,73  
SKIZAB 29,153,73  
OYYAA2 28,687,84

THR: Poison by subcutaneous route. Moderately toxic by intraperitoneal route. Mildly toxic by ingestion. An experimental teratogen. Experimental reproductive effects. When heated to decomposition it emits toxic fumes of F<sup>-</sup>.

## VCK000

## VALONEA TANNIN

HR: 3

NIOSH: YW 0305000

## SYNS:

QUERCUS AEGILOPS L. TANNIN

TANNIN from VALONEA

## TOXICITY DATA:

scu-rat TDLo: 750 mg/kg/2W-1:  
CAR  
ipr-mus LD50: 110 mg/kg  
scu-mus LD50: 170 mg/kg  
ivn-mus LD50: 50 mg/kg  
ims-mus LD50: 280 mg/kg

## CODEN:

BJCAAI 14,147,60  
JPPMAB 9,98,57  
JPPMAB 9,98,57  
JPPMAB 9,98,57  
JPPMAB 9,98,57

THR: Poison by intraperitoneal, intravenous, subcutaneous and intramuscular routes. An experimental carcinogen. See also TANNIC ACID.

## VCP000

## VANADIUM

CAS: 7440-62-2

af: V aw: 50.94



HR: 3

NIOSH: YW 1355000

PROP: A bright, white, soft, ductile metal; sltly radioactive. Bp: 3000°, d: 6.11 @ 18.7°, mp: 1917°. Insol in water.

## TOXICITY DATA:

ims-rat TDLo: 340 mg/kg/43W-1:  
ETA  
scu-rbt LD50: 59 mg/kg

## CODEN:

NCIUS\* PH 43-64-  
886,SEPT,71  
FATOAO 28,83,65

Reported in EPA TSCA Inventory.

NIOSH REL: TWA 1.0 mg(V)/m<sup>3</sup>

THR: Poison by subcutaneous route. An experimental tumorigen. Flammable in dust form from heat, flame or

sparks. Violent reaction with BrF<sub>3</sub>; Cl<sub>2</sub>; lithium; nitryl fluoride; oxidants. When heated to decomposition it emits toxic fumes of VO<sub>x</sub>. See also VANADIUM COMPOUNDS.

## VCU000

## VANADIUM AZIDE TETRACHLORIDE

mf: Cl<sub>4</sub>N<sub>3</sub>V mw: 234.76

HR: 3

Community Right To Know List.

THR: Explosive. When heated to decomposition it emits very toxic fumes of VO<sub>x</sub>, Cl<sup>-</sup> and NO<sub>x</sub>. See also VANADIUM COMPOUNDS, AZIDES, and CHLORIDES.

## VCZ000

## VANADIUM COMPOUNDS

HR: D

THR: Variable toxicity. Vanadium compounds act chiefly as an irritant to the conjunctivae and respiratory tract. Acute and chronic exposure can give rise to conjunctivitis, rhinitis, reversible irritation of the respiratory tract, and to bronchitis, bronchospasms, and asthma-like diseases in more severe cases. There is still some controversy as to the effects of industrial exposure on other systems of the body. Responses are mostly acute, seldom chronic. The first report of human vanadium poisoning described rather widespread systemic effects, consisting of polycythemia, followed by red blood cell destruction and anemia, loss of appetite, pallor and emaciation, albuminuria and hematuria, gastrointestinal disorders, nervous complaints and cough, sometimes severe enough to cause hemoptysis. More recent reports describe symptoms which, for the most part, are restricted to the conjunctivae and respiratory system, no evidence being found of disturbances of the gastrointestinal tract, kidneys, blood or central nervous system. Vanadate (VO<sub>3</sub><sup>-</sup>) is a potent inhibitor of the sodium pump, an enzyme universally present in eukaryotic organisms. The absorption of V<sub>2</sub>O<sub>5</sub> by inhalation is nearly 100%. Though certain workers believe that it is only the pentoxide which is harmful, other investigators have found that patronite dust (chiefly vanadium sulfide) is quite toxic to animals, causing acute pulmonary edema. Acute poisoning in animals by ingestion of vanadium compounds causes nervous disturbances, paralysis of legs, respiratory failure, convulsions, bloody diarrhea, and death. Poisoning by inhalation causes bleeding of the nose and acute bronchitis. Some compounds have mutagenic effects. VF<sub>3</sub> and the oxyhalogenides of pentavalent vanadium (VOF<sub>3</sub>, VOCl<sub>3</sub>, VOBr<sub>3</sub>) are volatile. Vanadium compounds are common air contaminants. The fumes are highly toxic. The major use of vanadium and its alloys is in the steel industry. When heated to decomposition it emits toxic fumes of VO<sub>x</sub>. See also specific compounds.

## VDA000

## VANADIUM DICHLORIDE

CAS: 10580-52-6

mf: Cl<sub>2</sub>V mw: 121.84

HR: 3

NIOSH: YW 1575000

THR: Mutagenic data.

ZBAS00

ZIMELIDINE

CAS: 56775-88-3

mf: C<sub>16</sub>H<sub>17</sub>BrN<sub>2</sub> mw: 317.26

HR: 3

NIOSH: UC 6555000

SYNS:

(Z)-3-(4-BROMOPHENYL)-3-(3-PYRIDYL)DIMETHYL-ALLYLAMINE

3-(4-BROMOPHENYL)-N,N-DIMETHYL-3-(3-PYRIDINYL)-2-PROPEN-1-AMINE

3-(p-BROMOPHENYL)-N,N-DIMETHYL-3-(3-PYRIDYL)ALLYLAMINE.

cis-H 102.09  
cis-ZIMELIDINE  
(Z)-ZIMELIDINE

TOXICITY DATA:

ori-wm TDLo: 56 mg/kg/14D:

CODEN:

BMJOAE 285,1009,82

GIT,CNS

ori-rat LD50: 900 mg/kg

ivn-rat LD50: 50 mg/kg

ori-mus LD50: 800 mg/kg

ivn-mus LD50: 60 mg/kg

DRUGAY 24,169,82

DRUGAY 24,169,82

DRUGAY 24,169,82

DRUGAY 24,169,82

THR: Poison by intravenous route. Moderately toxic by ingestion. Human systemic effects by ingestion: muscle weakness, headache and nausea. When heated to decomposition it emits toxic fumes of Br<sup>-</sup> and NO<sub>2</sub>.

ZBA525

ZIMELIDINE DIHYDROCHLORIDE

CAS: 60525-15-7

mf: C<sub>16</sub>H<sub>17</sub>BrN<sub>2</sub>·2ClH mw: 356.70

HR: 3

NIOSH: UC 6555200

SYNS:

(Z)-3-(4-BROMOPHENYL)-N,N-DIMETHYL-3-(3-PYRIDINYL)-2-PROPEN-1-AMINE DIHYDROCHLORIDE

H102.09 HYDROCHLORIDE  
ZIMELIDINE HYDROCHLORIDE

TOXICITY DATA:

ori-rat TDLo: 120 mg/kg (6-17D

preg): REP

ori-rat TDLo: 12 mg/kg (6-17D

preg): REP

ori-rat LD50: 844 mg/kg

ipr-rat LD50: 99800 µg/kg

scu-rat LD50: 227 mg/kg

ivn-rat LD50: 45800 µg/kg

ori-mus LD50: 341 mg/kg

ipr-mus LD50: 84400 µg/kg

scu-mus LD50: 154 mg/kg

ivn-mus LD50: 27700

µg/kg

ori-dog LD50: 271 mg/kg

ivn-dog LD50: 57 mg/kg

ori-cat LDLo: 80 mg/kg

ori-rbt LD50: 300 mg/kg

ivn-rbt LD50: 50800 µg/kg

CODEN:

KSRNAM 17,1833,83

KSRNAM 17,1833,83

APSXAS 20,295,83

APSXAS 20,295,83

APSXAS 20,295,83

KSRNAM 17,1833,83

KSRNAM 17,1833,83

APSXAS 20,295,83

KSRNAM 17,1833,83

KSRNAM 17,1833,83

KSRNAM 17,1833,83

KSRNAM 17,1833,83

APSXAS 20,295,83

KSRNAM 17,1833,83

KSRNAM 17,1833,83

THR: Poison by ingestion, subcutaneous, intravenous and intraperitoneal routes. Experimental reproductive effects.

When heated to decomposition it emits toxic fumes of Br<sup>-</sup>, NO<sub>2</sub> and HCl. See also ZIMELIDINE.

ZBJ000

ZINC

CAS: 7440-66-6

DOT: 1383/1436

af: Zn aw: 65.37

HR: 3

NIOSH: ZG 8600000

PROP: Bluish-white, lustrous, metallic element. Mp: 419.8°, bp: 908°, d: 7.14 @ 25°, vap press: 1 mm @ 487°. Stable in dry air.

SYNS:

BLUE POWDER

C.I. 77945

C.I. PIGMENT BLACK 16

C.I. PIGMENT METAL 6

EMANAY ZINC DUST

GRANULAR ZINC

IASAD

MERRILLITE

PASCO

ZINC DUST

ZINC POWDER

ZINC, POWDER OR DUST, NON-

PYROPHORIC (DOT)

ZINC, POWDER OR DUST, PYRO-

PHORIC (DOT)

TOXICITY DATA:

skn-hmn 300 µg/3D-1:MLD

ihl-hmn TCLo: 124 mg/m<sup>3</sup>/50M:

PUL,SKN

CODEN:

85DKA8 -,127,77

AHYGAJ 72,358,10

Zinc and its compounds are on the Community Right To Know List. Reported in EPA TSCA Inventory. EPA Genetic Toxicology Program.

DOT Classification: Flammable Solid; Label: Dangerous When Wet, non-pyrophoric; Flammable Solid; Label: Spontaneously Combustible, pyrophoric

THR: Human systemic effects by ingestion: cough, dyspnea and sweating. A human skin irritant. Pure zinc powder, dust, fume is relatively non-toxic to humans by inhalation. The difficulty arises from oxidation of zinc fumes immediately prior to inhalation or presence of impurities such as Cd, Sb, As, Pb. Inhalation may cause sweet taste, throat dryness, cough, weakness, generalized aches, chills, fever, nausea, vomiting.

Flammable in the form of dust when exposed to heat or flame. May ignite spontaneously in air when dry. Explosive in the form of dust when reacted with acids. Incompatible with NH<sub>4</sub>NO<sub>3</sub>; BaO<sub>2</sub>; Ba(NO<sub>3</sub>)<sub>2</sub>; Cd; CS<sub>2</sub>; chlorates; Cl<sub>2</sub>; ClF<sub>3</sub>; CrO<sub>3</sub>; (ethyl acetoacetate + tribromoneopentyl alcohol); F<sub>2</sub>; hydrazine mononitrate; hydroxylamine; Pb(N<sub>3</sub>)<sub>2</sub>; (Mg + Ba(NO<sub>3</sub>)<sub>2</sub> + BaO<sub>2</sub>); MnCl<sub>2</sub>; HNO<sub>3</sub>; performic acid; KClO<sub>3</sub>; KNO<sub>3</sub>; K<sub>2</sub>O<sub>2</sub>; Se; NaClO<sub>3</sub>; Na<sub>2</sub>O<sub>2</sub>; S; Te; H<sub>2</sub>O; (NH<sub>4</sub>)<sub>2</sub>S; As<sub>2</sub>O<sub>3</sub>; CS<sub>2</sub>; CaCl<sub>2</sub>; NaOH; chlorinated rubber; catalytic metals; halocarbons; o-nitroanisole; nitrobenzene; non-metals; oxidants; paint primer base; pentacarbonyliron; transition metal halides; seleninyl bromide. To fight fire, use special mixtures of dry chemical. When heated to decomposition it emits toxic fumes of ZnO. See also ZINC COMPOUNDS. For further information, see Vol. 1, No. 7 of DPIM Report.

CONTAMINANT (Synonym)	CHEM/PHYS. PROPERTIES	INCOMPATIBILITIES	TLV/PEL	IDLH	ROUTE	EXPOSURE SYMPTOMS	FIRST AID	COMMENTS
Dichlorodifluoro- methane (Freon 12)	IP: 11.75 eV VP: >1 atm MP: -252 F.	Chemically active metals: sodium, potassium, calcium, powdered aluminum, zinc, magnesium	NIOSH/ OSHA 1000 ppm	50,000 ppm	inh. con.	Dizziness, tremors, cardiac arrest	Irrig. immed. water flush, Art. resp.	
* 1,1 Dichloroethane (Ethylidene)	FL.P: (oc)22 F. IP: 11.06 eV VP: 230 mm UEL: 16% LEL: 5.6%	Strong oxidizers and caustics	NIOSH/ OSHA 100 ppm	4,000 ppm	inh. ing. con.	Central nervous sys. depress. skin irrit., drowsiness	Irrig. immed., soap flush Art. resp., immed. med.	
1,1-Dichloroethylene (1,1-Dichloroethene)	colorless BP: 31.6 FP: -122 FL.P: 0 autoign: 1050	chlorosulfonic acid HNO <sub>3</sub> , oleum, oxidizing materials	TLV 5ppm TWA	ND	inh. ing. inh.	poison by inhalation, ingestion, and intravenous. liver and kidney damage	ND	
* 1,2 Dichloroethylene (Acetylene dichloride) (Dioform) (1,2 Dichloroethene)	FL.P: 36 F. IP: 9.65 eV VP: 180-264 mm UEL: 12.8% LEL: 5.6%	Strong oxidizers	NIOSH/ OSHA 200 ppm	4,000 ppm	inh. ing. con.	Irrit. eyes, resp. system, Central nervous system depress	Irrig. immed. soap wash Art. resp. immed. med.	
Dichloroethyl ether bis(2-Chloroethyl) ether	FL.P: 131 F. VP: 0.7 mm	Strong oxidizers	NIOSH/ OSHA 5ppm ceiling ST 10 ppm	250 ppm CA	inh. abs. ing. con.	Irrit. nose, throat; cough, nausea, vomiting	Irrig. immed. soap wash Art. resp., immed. med.	
Dichloromono- fluoromethane (Freon 21)	IP: 12.39 eV	Chemically active metals: sodium, potassium, calcium, powdered aluminum, zinc, magnesium	NIOSH/ OSHA 10 ppm	50,000 ppm	inh. ing. con.	Asphyxia, Cardiac arrest	Irrig. immed. water flush, Art. resp. immed. med.	
1,2-Dichloropropene	colorless liquid BP: 96.8 FP: 60 F VP: 3.9	aluminum; oxidizing materials	TLV 75ppm TWA PEL 75ppm TWA	ND	inh. ing. con.	Eye irrit. Causes liver, kidney, and heart damage	ND	
Diethylamine	FL.P: -15 F. IP: 8.01 eV VP: 192 mm UEL: 10.1% LEL: 1.8%	Strong oxidizers and acids	NIOSH/ OSHA 10 ppm ST 25 ppm	2,000 ppm	inh. abs. ing. con.	Eye, skin, resp. irrit.	Irrig. immed. water flush, Art. resp. immed. med.	

Methoxychlor	FLP: ? IP: ? VP: low UEL: ? LEL: ?	Oxidizers	OSHA 10 mg/m <sup>3</sup>	Ca	inh. ing.	None known in humans; in animals: fecal trembling convuls; kidney; liver; damage	Skin: soap wash Breath: fresh air Swallow: medical attent immed
Methyl acetate (Acetic acid) (Methyl ester)	FL.P: 14 F. IP: 10.27 eV VP: 173 mm UEL: 16% LEL: 3.1%	Nitrates; strong oxidizers, alkalis, and acids	NIOSH/ OSHA 200 ppm ST250 ppm	10,000 ppm	inh. ing. con.	Irrit. nose, throat; headache, drowsy	Irrig. immed. water flush Art. resp. immed. med.
Methyl Acetylene	FL.P: NA IP: 10.36 eV VP: 3800 mm UEL: 11.7% LEL: 1.7%	Strong oxidizers, chlorine, copper, copper alloys	NIOSH/ OSHA 1000 ppm	15,000 ppm based on LEL.	inh.	Drowsy, unconsciousness	Art. resp.
Methyl alcohol (Methanol) (Wood alcohol)	FL.P: 52 F. IP: 10.84 eV VP: 92 mm UEL: 36% LEL: 6.0%	Strong oxidizers	NIOSH/ OSHA 200 ppm ST250 ppm	25,000 ppm	inh. ing. con.	Irrit. eyes; headache, drowsy, light-headed, nausea; vomit	Irrig. immed. water flush Art. resp. immed. med.
Methyl bromide (Bromomethane)	IP: 10.54 eV VP: 1.8 atm UEL: 16% LEL: 10%	Aluminum, strong oxidizers	NIOSH Lowest Feas. Conc. OSHA 5 ppm	CA 2,000 ppm	inh. ing. abs. con.	Headache, vertigo, nausea, vomit, convulsions; irrit. eyes, skin (Carc)	Irrig. immed. water flush Art. resp. immed. med.
Methyl chloride (Chloromethane)	FL.P: NA IP: 11.28 eV VP: 4.8 atm UEL: 17.4% LEL: 8.1%	Chemically active metals; potassium, powdered alum., zinc, magnesium	OSHA 50 ppm ST100 ppm NIOSH Lowest Conc.	CA 10,000 ppm	inh. con.	Dizzy, nausea, vomit, slurred speech (Carc)	Irrig. immed. water flush Art. resp.
* Methyl chloroform (1,1,1-Trichloroethane)	VP: 100 mm UEL: 12.5% LEL: 7.5%	Strong caustics, strong oxidizers, chemically active metals, as alum., magnesium powders, sodium, potassium	NIOSH/ OSHA 350 ppm ST450 ppm	1,000 ppm	inh. ing. con.	Headache, central nervous syst depress., irrit. eyes	Irrig. immed. soap wash Art. resp. immed. med.
Methylene bisphenyl isocyanate	FL.P(oc): 396 F VP: 0.001 mm	Strong alkalis, acid alcohol	OSHA 0.02 ppm NIOSH 0.005 ppm	10 ppm	inh. ing. con.	Irrit. eyes, nose, throat; cough, chest pain	Irrig. immed. soap wash

CONTAMINANT (Synonym)	CHEM/PHYS. PROPERTIES	INCOMPATIBILITIES	TLV/PEL	IDLH	ROUTE	EXPOSURE SYMPTOMS	FIRST AID	COMMENTS
Methylene chloride (Dichloromethane) (Methylene dichloride)	IP: 11.32 eV VP: 350 mm UEL: 22% LEL: 14%	Strong oxidizers and caustics, chemically active metals, as alum. or magnesium powders, sodium, potassium	OSHA 500 ppm	CA 5,000 ppm	inh. ing. con.	Fatigue, weakness, sleepy, nausea; irrit. eyes, skin; vertigo, angina (Carc)	Irrig. immed. soap wash Art. resp. immed. med.	
Methyl isocyanate	FL.P: 19 F. VP: 348 mm UEL: 26% LEL: 5.9%	Water, rapid reaction in presence of acid alkalis, amine; iron, tin, copper, their salts, other catalyst	NIOSH/ OSHA 0.02 ppm	20 ppm	inh. ing. con.	Irrit. eyes, nose, throat; cough, chest pain	Irrig. immed. water flush Art. resp. immed. med.	
* Naphthalene	FL.P: 174 F IP: 8.12 eV VP: 0.06 mm UEL: 5.9% LEL: 0.9%	Strong oxidizers, chromic anhydride	NIOSH/ OSHA 10 ppm ST 15 ppm	500 ppm	inh. abs. ing. con.	Eye irrit; head; conf, excitement, mal; nau, vomit, abdom pain; irrit bladder; profuse sweat; jaun; hema, hemog, renal shutdown; derm	Irr immed, Molten: flesh immed/Sol-Liq; soap wash prompt, resp support, medical attn immed	
Naphtha (Coal tar)	FL.P: 100-109 F VP: <5 mm	Strong oxidizers	NIOSH/ OSHA 100 ppm	10,000 ppm	inh. ing. con.	Light-headed, drowsy; Irrit. eyes, nose, skin	Irrig. immed. soap wash Art. resp. immed. med.	
Nitric acid	NOT COMBUSTIBLE IP: 11.95 eV VP: 48 mm	Combustible organics, oxidisable matter; wood, turp. metal powder, hydrogen sulfide, etc.; strong bases	NIOSH/ OSHA 2 ppm ST 4 ppm	100 ppm	inh. ing. con.	Irrit. eyes, mucous membrane; skin	Irrig. immed. water flush Art. resp. immed. med.	
Nitrobenzene	FL.P: 190 F. IP: 9.92 eV VP: 1 mm LEL: 1.8%	Concentrated nitric acid, nitrogen tetroxide, caustic, chemically active metals: zinc, tin	NIOSH/ OSHA 1 ppm	200 ppm	inh. abs. ing. con.	Irrit. eyes; dizzy, nausea, vomit	Irrig. immed. soap wash Art. resp. immed. med.	
p-Nitrochlorobenzene (4-Chloronitrobenzene)	FL.P: 261 F. IP: 9.96 eV VP: <1 mm	Strong oxidizers	OSHA 1 mg/m3 NOISH CA	1,000 ppm	inh. ing. abs. con.	Dizzy, weakness, nausea, vomit	Irrig. immed. soap wash Art. resp. immed. med.	

CONTAMINANT (Synonyms)	CHEM/PHYS. PROPERTIES	INCOMPATIBILITIES	TLV/PEL	IDLH	ROUTE	EXPOSURE SYMPTOMS	FIRST AID	COMMENTS
Styrene	FL.P: 88 F. IP: 8.40 eV VP: 5 mm UEL: 7.0% LEL: 1.1%	Oxidizers, catalysts for vinyl polymers, peroxides, strong acids, alum. chloride	NIOSH/OSHA 50 ppm ST100 ppm	5,000 ppm	inh. ing. con.	Irrit. eyes, nose; drowsy, weakness, unsteady gait	Irrig. immed. water flush Art. resp. immed. med.	
Sulfuric acid	NOT COMBUSTIBLE BUT HIGHLY REACTIVE VP: 1 mm	Organics: chlorates, carbides, metals, fulminates, picrates	NIOSH/OSHA 1 mg/m <sup>3</sup>	80 mg/m <sup>3</sup>	inh. ing. con.	Eye, nose, throat irrit.; burns skin, eyes	Irrig. immed. water flush Art. resp. immed. med.	
1,1,2,2-Tetrachloroethane (Acetylene tetrachloride)	FLP: NA IP: 11.10 eV LEL: NA UEL: NA	Chemically active metals, strong caustics, fuming sulfuric acid (Note: degrades slowly when exposed to air)	NIOSH/OSHA 1 ppm (7 mg/m <sup>3</sup> )	Ca	inh. abs. ing. con.	Nau. vomit, abdom pain; tremor fingers; jaun, enlarged tend liver; derm monocy; kidney damage	Eye: irr immed Skin: soap wash prompt Breath: resp support Swallow: medical attent immed	
* Tetrachloroethylene (1,1,2,2-Tetrachloroethylene, Tetrachloroethene)	FL.P: NA IP: 9.32 eV VP: 14 mm UEL: NA LEL: NA	Strong oxidizers Chemically active metals (Li, Be, Ba, caustic soda, sodium hydroxide, potash)	NIOSH Ca OSHA 25 ppm	Ca	inh. ing. con.	Irrit eyes, nose, throat; neu flush face, neck; verti, diz, inco; head, som; skin eryt; liver damage; (cerc)	Irr. immed. soap wash prompt, Resp support Medical attention immed	
Tetraethyl lead (Motor fuel anti-knock)	FL.P: 200 F. IP: 11.1 eV VP: 0.2 mm	Strong oxidizers, sulfuryl chloride, potassium permanganate	NIOSH/OSHA 0.075 mg/m <sup>3</sup>	40 mg/m <sup>3</sup>	inh. abs. ing. con.	Anxiety tremor, nausea, convulsions, eye irrit.	Irrig. immed. soap wash Art. resp. immed. med.	
Toluene	FL.P: 40 F. VP: 20 mm UEL: 7.1% LEL: 1.2%	Strong oxidizers	NIOSH/OSHA 100 ppm ST 150 ppm	2,000 ppm	inh. abs. ing. con.	Fatigue, weakness, dizzy, headache	Irrig. immed. soap wash Art. resp. immed. med.	
o-Toluidine	FL.P: 185 F VP: 0.3 mm UEL: ? LEL: ?	Strong oxidizers, Nitric Acid	NIOSH 2 ppm OSHA 5 ppm	100 ppm	inh. abs. ing. con.	Anoxia, head, cyan; weak, diz, drow; micro hematuria, eye burns; derm; (cerc)	Eye: Irr immed Skin: Soap wash immed Breath: Resp support Swallow: Medical attention immed	
Toluene-2,4-diisocyanate	FL.P: 260 F. VP: .01mm (77 F.) UEL: 9.5% LEL: 0.9%	Strong oxidizers, water, acids, bases, amines, etc., cause foam and spatter	NIOSH-Ca ST0.02 ppm OSHA 0.005 ppm	10 ppm CA	inh. ing. con.	Irrit. nose, throat; choke. Nausea, abdom. pain	Irrig. immed. soap wash Art. resp. immed. med.	

Toxaphene

yellow solid,  
piney odor  
MP: 65-90  
insol. in water

ND

TLV 0.5  
m/cu m  
(skin)  
PEL 0.5  
m/cu m  
(skin)  
all TWA

ND

ing.  
inh.  
abs.

Skin irrit., possibly a  
carcinogen. Liver injury  
reported.

ND

X 1,1,1. Trichlorethane  
(methylchloroform)

FL.P: None  
IP: 11.00 eV  
VP: 100 mm  
UEL: 12.5%  
LEL: 7.5%

Strong Caustics  
Strong Oxidizers  
Chemically Active  
metals

NIOSH/  
OSHA  
350 ppm  
15-min  
ceil.  
ST 450ppm

1,000 ppm

inh  
ing  
con

headache, lassitude  
poor equilibrium,  
irritated eyes  
dermatitis  
cardiac arrhythmias

eye: irrig, immed  
skin: soap wash promptly  
breath: art resp.  
swallow: medical  
attention  
immed

CONTAMINANT (Synonyms)	CHEM/PHYS. PROPERTIES	INCOMPATIBILITIES	TLV/PEL	IDLE	ROUTE	EXPOSURE SYMPTOMS	FIRST AID	COMMENTS
1,1,2-Trichloroethane	FL.P: NONE VP: 11 mm UEL: NA LEL: NA	Strong oxidizers and caustics, chemically active metals; alum. magnesium powders, sodium, potassium	NIOSH/ OSHA 10 ppm	CA	inh. abs. ing. con.	Irrit. nose, eyes; central nervous system depress.	Irrig. immed. soap wash Art. resp. immed. med.	
* Trichloroethylene (Trichloroethene)	FL.P: 90 F. IP: 9.45 eV VP: 58 mm UEL: 10.5% LEL: 8%	Strong caustics; when acidic reacts with alum.; chemically active metals; barium lithium, sodium, magnesium, titanium	NIOSH CA, 25ppm OSHA 50 ppm ST 200ppm	CA	inh. ing. con.	Headache, tremors, nausea, vomit, irrit. eyes (Care)	Irrig. immed. soap wash Art. resp. immed. med.	
Trichlorofluoromethane	MP: 111 BP: 24.1	Aluminum, barium, or lithium	TLV 1000 ppm C1 PEL 1000 ppm TWA	ND	inh.	Conjunctive irritation, fibrosing alveolitis, and liver changes	ND	
Turpentine	FL.P: 95 F. VP: 5 mm LEL: 0.8%	Strong oxidizers, chlorine	NIOSH/ OSHA 100 ppm	1,500 ppm	inh. ing. abs.	Irrit. eyes, nose, throat; headache	Irrig. immed. soap wash Art. resp. immed. med.	
Vinyl chloride	FL.P: -108 F. IP: 9.995 eV VP: 2580 mm UEL: 33% LEL: 3.6%	Copper oxidizing materials	OSHA 1 ppm NIOSH CA	CA	inh.	Weakness, abdom. pain, GI bleeding (Carc)	Art. resp.	
Vinyltoluene (Methylstyrene)	FL.P: 120 F. IP: 8.20 eV VP: 1.1 mm UEL: 11% LEL: 0.8%	Oxidizing agents, catalyze for vinyl polymerization, such as peroxides, strong acids, aluminum chloride	NIOSH/ OSHA 100 ppm	5,000 ppm	inh. con. ing.	Irrit. eyes, skin, upper resp.; drowsy	Irrig. immed. soap flush Art. resp. immed. med.	

**METALS**

CONTAMINANT (Synonym)	CHEM/PHYS. PROPERTIES	INCOMPATIBILITIES	TLV/PEL	IDLH	ROUTE	EXPOSURE SYMPTOMS	FIRST AID	COMMENTS
Antimony and compounds (as Sb)	VP: ~0 mm	Oxidizers, acids, halogenated acids	NIOSH/ OSHA 0.5 mg/m <sup>3</sup>	80 mg/m <sup>3</sup>	inh. con.	Irrit. nose, throat, mouth; cough, dizzy, headache, nausea, vomit	Immed. soap wash Immed. med.	
* Arsenic and compounds (as As)	Varies	Strong oxidizers, bromine azide	OSHA 10 ug/m <sup>3</sup> NIOSH 2 ug/m <sup>3</sup> 15-min. ceil.	CA	inh. ing. abs. con.	GI disturbances, resp. irrit. (Carc)	Irrig. immed. soap wash Immed. med.	
* Barium (soluble compound as Ba)	Varies	Varies	NIOSH/ OSHA 0.5 mg/m <sup>3</sup>	1100 mg/m <sup>3</sup>	inh. ing. con.	Upper resp. irrit., slow pulse Irrit. eyes, burns skin	Irrig. immed. water flush Art. resp. immed. med.	
Beryllium and compounds (as Be)	Varies	None	OSHA 2.0 ug/m <sup>3</sup> NIOSH CA	CA	inh.	Resp. symptoms, weakness (Carc)	Irrig. immed.	
* Cadmium dust (as Cd)	Varies	Strong oxidizers, elemental sulfur, selenium, tellurium	OSHA 0.2 mg/m <sup>3</sup> NIOSH CA	CA	inh. ing.	Cough, tight chest, headache chills, muscle aches, nausea, diarrhea (Carc)	Irrig. immed. soap wash Art. resp. immed. med.	
* Chromium metal (as Cr)	Varies	Strong oxidizers	NIOSH 0.5 mg/m <sup>3</sup> OSHA 1 mg/m <sup>3</sup>	NA	inh. ing.	Histologic fibrosis of lungs (Carc)	Irrig. immed. soap wash Art. resp. immed. med.	
Cobalt metal, fume, dust (as Co)	VP: 0 mm	Strong oxidizers	NIOSH/ OSHA 0.05mg/m <sup>3</sup>	20 mg/m <sup>3</sup>	inh. ing. con.	Cough, decrease pulm. function Resp. hypersensitivity	Irrig. immed. soap wash Art. resp. immed. med.	
* Copper dust and mist (as Cu)	VP: NA	Acetylene gas, magnesium metal	NIOSH/ OSHA 1 mg/m <sup>3</sup>	NA	inh. ing. con.	Irrit. mucous membrane, eye irrit., metal taste	Irrig. immed. soap wash Art. resp. immed. med.	

**METALS**

CONTAMINANT (Synonym)	CHEM/PHYS. PROPERTIES	INCOMPATIBILITIES	TLV/PEL	IDLH	ROUTE	EXPOSURE SYMPTOMS	FIRST AID	COMMENTS
Cyanides (as CN)	NOT COMBUSTIBLE VP: -0 mm	Strong oxidizers, such as nitrates, chlorates, acid, acid salts.	NIOSH/ OSHA 5 mg/m3	50 mg/m3	inh. ing. abs. con.	ASPHYXIA AND DEATH CAN OCCUR. Weakness, headache, nausea, vomit, irrit. skin	Irrig. immed. soap wash Art. resp. immed. med.	Odor of almonds
Iron Oxide dust and fumes (as Fe)	FIP:NA VP: 0 mm LEL:NA UEL:NA	Calcium Hypochlorite	NIOSH 5 mg/m3 OSHA 10 mg/m3	N.E.	Inh	Benign pneumoconiosis with X-ray shadows indistinguishable from fibrotic pneumoconiosis	Breath: Resp Support	
* Lead, inorganic fumes and dusts (as Pb)	Varies	Strong oxidizers, hydrogen peroxide, active metals: sodium, potassium	OSHA 0.05mg/m3 NIOSH 0.100mg/m3	700 mg/m3	inh. ing. con.	Abdom. pain	Irrig. immed. soap flush Art. resp. immed.med.	
Manganese and compounds (as Mn)	VP:(2240 F.) 1 mm	Varies	NIOSH 1 mg/m3 ST 3mg/m3 OSHA 5 mg/m3 ceil.	NA	inh. ing.	Dry throat, cough, tight chest, vomit	Art. resp. immed. med.	
Mercury and inorganic compounds (as Hg)	NOT COMBUSTIBLE VP: 0.0012 mm	Acetylenes, ammonia gases	NIOSH/ OSHA 0.1 mg/m3 ceil. ST 0.03 mg/m3	10 mg/m3	inh. abs. con.	Cough, headache, fatigue, weakness; irrit. eyes, skin	Irrig. immed. soap wash Art. resp. immed. med.	
Molybdenum (soluble compds as MO)	Varies	Alkali metals, sodium potassium, molten magnesium	OSHA 5 mg/m3	NE	inh. ing. con.	Irrit eyes, nose, throat; dysp anemia	Irr immed; water flush resp support, medical attention immed	
Molybdenum (insoluble compds as MO)	Varies	Strong oxidizers	OSHA 10 mg/m3	NE	inh. ing.	Irrit eyes, nose, throat; anor diarr, low-wgt; listlessness; liver, kidney damage	Resp support, medical attention immed	

**METALS**

CONTAMINANT (Synonym)	CHEM/PHYS. PROPERTIES	INCOMPATIBILITIES	TLV/PEL	IDLH	ROUTE	EXPOSURE SYMPTOMS	FIRST AID	COMMENTS
* Nickel, metal and soluble compounds (as Ni)	Varies	Strong acids; sulfur, wood, other combust.	NIOSH 0.015 mg/m <sup>3</sup> OSHA 0.1 mg/m <sup>3</sup> (soluble cmpds) 1 mg/m <sup>3</sup> (metal insoluble cmpds)	CA	inh. ing. con.	Nasal cavities (Carc)	Water flush immed. Art. resp. immed. med.	
Selenium compounds (as Se)	Varies	Strong oxidizing agents, acids	NIOSH/ OSHA 0.2 mg/m <sup>3</sup>	100 mg/m <sup>3</sup>	inh. abs. ing. con.	Irrit. eyes, nose, throat; headache, chills, garlic breath	Irrig. immed. soap wash Art. resp. immed. med.	

**METALS**

CONTAMINANT (Synonym)	CHEM/PHYS. PROPERTIES	INCOMPATIBILITIES	TLV/PEL	IDLH	ROUTE	EXPOSURE SYMPTOMS	FIRST AID	COMMENTS
Silver - metal and soluble compounds (as Ag)	Varies	Acetylene, ammonia, hydrogen peroxide	NIOSH/ OSHA 0.2 mg/m <sup>3</sup>	NA	inh. ing. con.	Irrit. skin; turns eyes blue/gray	Irrig. immed. water flush Art. resp. immed. med.	
Thallium, soluble compounds (as Tl)	Varies	None hazardous	NIOSH/ OSHA 0.1 mg/m <sup>3</sup>	20 mg/m <sup>3</sup>	inh. abs. ing. con.	Nausea, diarrhea, abdom. pain chest pain	Irrig. immed. water flush Art. resp. immed. med.	
Tin, organic compounds (as Sn)	Varies	Strong oxidizers	NIOSH/ OSHA 2 mg/m <sup>3</sup>	400 mg/m <sup>3</sup>	inh. abs. ing.	Headache, irrit. eyes; sore throat, cough; vomit	Irrig. immed. water flush Art. resp. immed. med.	

METALS

CONTAMINANT (Synonym)	CHEM/PHYS. PROPERTIES	INCOMPATIBILITIES	TLV/PEL	IDLH	ROUTE	EXPOSURE SYMPTOMS	FIRST AID	COMMENTS
* Zinc	VF: 1mm	Barium Oxide, Cadmium Ammonium Nitrate, Barium Nitrate, Cadmium, Carbondi- sulfide, Chlorates, Chlorine, Lead Aside, Flourine, Hydrazine, Mononitrate, Hydroxylamine, Performic Acid, Chlorine Triflouride, Chromic Acid, Chlorinated rubber, Manganesechloride, Nitric Acid, Potassium Chlorate, Catalytic Metals, Potassium Nitrate, Potassium Peroxide, Selenium, Sodium Chlorate, Sodiumper- oxide, Sulfur, Tellurium, Water, Catalytic Metals, Halocarbons, o-Nitro- anisole, Nitrobenzene Non-metals, oxidants, paint primer base, Pentacarbonyliron, Transition Metal Halides, Seleninyl Bromide, Calcium Chloride, Sodium Hydroxide, Ammonium Sulfide, Arsenic- trioxide			con. inh. abs.	sweet taste, throat dryness, cough, weakness, aching, chills, fever, nausea, vomiting, skin irritant, pulmonary system affects	Irrig. immed. soap wash immed. med.	