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# HAZARDOUS AND CONNECTICUT REGULATED WASTES

# PART B

# PERMIT APPLICATION

MacDERMID, INC.
526 HUNTINGDON AVENUE
WATERBURY, CONNECTICUT

VOLUME II

NOVEMBER 8, 1988

REVISED
MARCH 19, 1990
MAY 10, 1990

HRP
ASSOCIATES, INC.

NAME: MACDERMID INC.
I.D. NO. CTD001264597
FILE [illegible] 8-1B
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## 12.0 ENGINEERING DESCRIPTION

[40 CFR 264.18, 264.191, 264.192, 264.198, 264.199, 270.14(b)(10), 270.14(b)(11), 270.1(b)(19), 270.14(b)(20), 270.15, and 270.16]

### 12.1 Traffic [40 CFR 270.14(b)(10)

#### 12.1.1 Traffic Volume

The estimated volume of traffic received at the main loading and unloading dock for containerized waste will average six (6) semi-tractors or trailers per week. The semi-tractors and trailers are capable of transporting eighty, 55 gallon drums each.

The estimated volume of traffic received at the waste storage tanks will average six (6) tankers per week. The approximate storage capacity of the tanker is 4,500 gallons.

#### 12.1.2 Traffic Patterns

Access to Huntingdon Avenue, East Aurora Street and Gear Street, which are the roads that surround the MacDermid plant is provided by Route 8 (See Figure 12.1). Route 8, which is classified as an interstate highway, runs north to south through the State of Connecticut and can be accessed from the east and west via Route 84.

Trucks approaching from the south will take Exit 35 off Route 8 to Route 73 north (Watertown Avenue). On Watertown Avenue where the posted speed limit is 40 mph, the trucks will travel approximately 2/10 of a mile to the first traffic light. At this traffic light, the trucks will turn right onto East Aurora Street and travel approximately 3/10 of a mile to the Gear Street intersection. The posted speed limit on East Aurora Street is 25 mph. At this

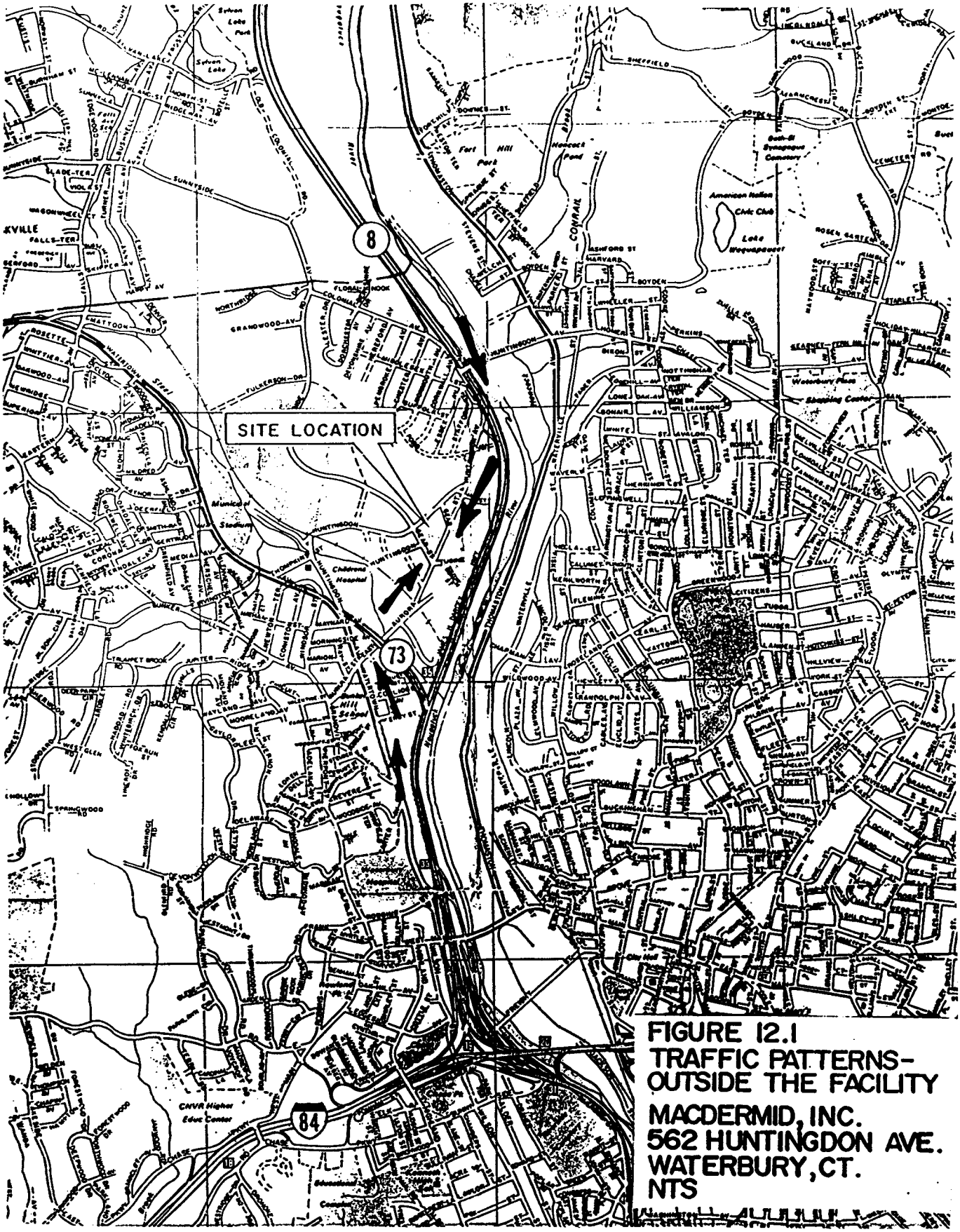


FIGURE 12.1
TRAFFIC PATTERNS-
OUTSIDE THE FACILITY

MACDERMID, INC.
562 HUNTINGDON AVE.
WATERBURY, CT.
NTS



HRP
ASSOCIATES, INC.

intersection, the container trucks (containing free liquids) will continue travelling on East Aurora Street approximately 500 feet and turn left onto MacDermid's property at the first or second entrance gate. Tankers and roll-off transporters will take a left onto Gear Street and travel approximately 1/10 mile to Huntingdon Avenue. At the stop sign, the trucks will turn right onto Huntingdon Avenue and travel approximately 250 feet before turning right onto MacDermid's property.

Trucks approaching from the north will take Exit 36 off Route 8 to Colonial Avenue, turn left and intersect with Huntingdon at the traffic light. From the exit ramp, the trucks will travel approximately 2/10 of a mile in a southerly direction to the Huntingdon Avenue and East Aurora Street intersection. At this intersection, the container trucks (containing free liquids) will bear left onto East Aurora Street and travel approximately 2/10 of a mile to the entrance gates located on the right. At this intersection, the tankers and roll-off transporters will continue travelling on Huntingdon Avenue approximately 2/10 of a mile to the entrance gate located on the left.

12.1.3 Access Roads

All traffic will approach MacDermid, Inc. using one or more of the following access roads, Huntingdon Avenue, East Aurora Street and Gear Street. These bituminous asphalt roads per the City of Waterbury's Engineering Department have no weight limit

restrictions. The maximum allowable weight on Route 8 per CT-DOT is 80,000 pounds.

East Aurora Street and Huntingdon Avenue are heavily travelled during the morning and evening rush hours and moderately travelled during the day by private as well as commercial vehicles. Gear Street which connects East Aurora Street and Huntingdon Avenue is lightly to moderately travelled.

12.1.4 Container Trucks Entering the Site

Container trucks (excluding 26 cubic yard roll-off) which will enter the site via the two gates located on East Aurora Street (see Figure 12.2) and park adjacent to the loading/un loading dock. The driver will then report to the warehouse office with his appropriate paperwork (manifest). Upon approval from the warehouse personnel and/or office personnel, the driver will be instructed to proceed to the container loading/unloading dock.

The container loading/unloading dock consists of a sloped concrete slab. Any spills within this area will be contained by virtue of the sloped concrete floor, concrete berm along the doors and masonry block walls.

When the truck is loaded/unloaded, the driver will pick-up his completed paperwork (manifest) from the shipping/receiving office and exit the site via the two gates. To connect with Route 8 North, the driver will turn left when leaving the site, travel approximately 6/10 of a mile on Huntingdon Avenue which passes under Route 8 and turn left onto the entrance ramp just after the Route 8

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FIGURE 12.2: INTERNAL TRAFFIC PATTERNS

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overpass. To connect with Route 8 South, the driver can exit the site as follows:

- turn left when leaving the site, travel approximately 3/10 of a mile on Huntingdon Avenue and turn right onto the entrance ramp; and
- turn right when leaving the site, travel approximately 3/10 of a mile on East Aurora Street and turn left onto Route 73 South (Watertown Avenue) at the traffic light.

12.1.5 Bulk Tankers and Roll-off Transporters Entering the Site

Tankers and roll-off transporters will enter the site via the Huntingdon Avenue gate (see Figure 12.2). To obtain access through this locked gate, the driver will activate the bell in the etching department to contact manufacturing personnel. Upon entering the site, the driver of the tanker will be directed to the bulk loading/unloading area. The tanker will then be gauged and sampled in accordance with the procedure specified in the Waste Analysis Plan (See Section 5.0). Prior to actual loading/unloading, the storage capacity remaining in the storage tanks or volume in the storage tanks will be noted to prevent overfilling the tanks or tankers.

All tanker loading/unloading operations are performed in a totally enclosed building. Any spills in this area will be contained by virtue of the building's sloped concrete floor and discharged to the waste water treatment system via the floor sump. The roll-off transporter will be directed to the metal hydroxide/sulfide sludge storage area. Any spills of this dewatered sludge (no free liquids) will be placed back into the roll-off using brooms and shovels.

When the tanker roll-off is loaded or unloaded, the driver will pick-up his completed paperwork (manifest) from the traffic department. To connect with Route 8, the driver will exit the site as follows:

Route 8 South

- Turn left when leaving the site, take first left onto Gear Street. At the end of Gear Street, take a right onto East Aurora Street, travel approximately 3/10 of a mile on East Aurora Street, and then turn left onto Route 73 South (Watertown Avenue), and proceed south to the junction with Route 8; and

- Turn right when leaving the site, travel approximately 3/10 of a mile on Huntingdon Avenue and turn right onto the entrance ramp to Route 8.

Route 8 North

- Turn right when leaving the site, travel approximately 6/10 of a mile on Huntingdon Avenue and take right at the light and left after the Route 8 overpass onto the entrance ramp.

12.1.6 On-Site Road Surface Load Bearing Capacity

The road surface at the Huntingdon facility consists of 4" of bituminous concrete covering 4-6" of crushed stone and an 8" subbase. Included in Appendix N is a copy of the graphs for the load bearing capacity of the on-site road.

Based on the existing 4" of pavement over 6" of crushed stone the load bearing capacity meets the specifications of an American Association of State Highway Transportation Officials for a loading of 18,000 lbs./axle. This classification is adequate for typical secondary road traffic including trucks and other equipment travelling at the Huntingdon facility (on-site).

## 12.2 Location Information

### 12.2.1 Seismic Standard [40 CFR 264.18(a) and 270.13(b)(11)(i)]

In accordance with Section 264.18 (a), MacDermid, Inc.'s plant at 526 Huntingdon Avenue is an existing facility and, therefore, need not comply with the seismic standard. Furthermore, Appendix VI of Part 264 does not list Connecticut as a State in which a facility must meet the seismic standard. Consequently, no further information regarding demonstration of compliance with 264.18(a) is, therefore, required.

### 12.2.2 100 Year Flood Plain [40 CFR 264.18(b) and 270.14(b)(11)(iii)]

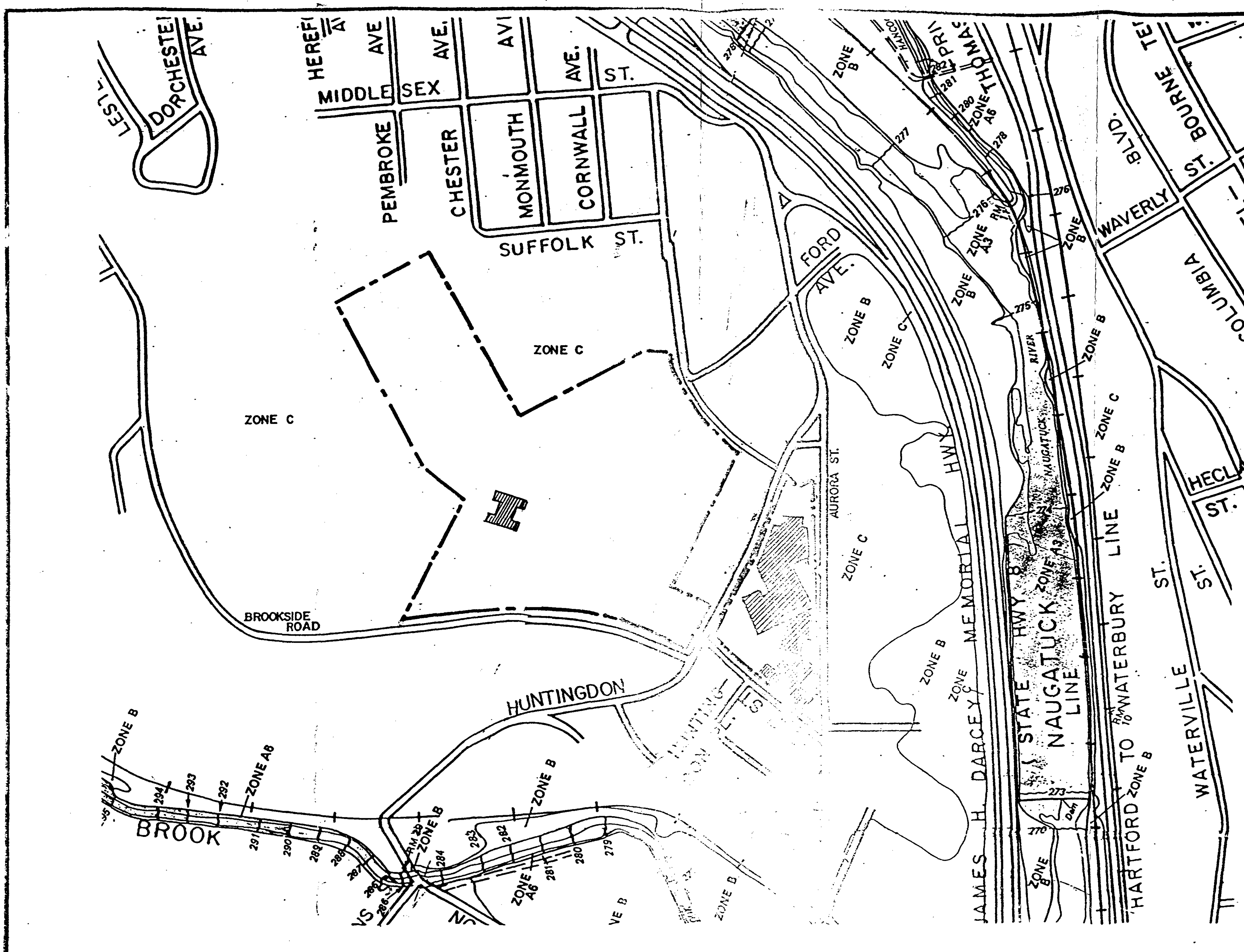
In accordance with Section 264.18(b) and Section 270.14(b)(11)(iii), facilities which are located in a 100 year flood plain must be designed, constructed, operated, and maintained to prevent washout of any hazardous waste by a 100-year flood.

To determine if this site is located in a 100-year floodplain, the Federal Insurance Map for the City of Waterbury, Connecticut was obtained and analyzed (see Figure 12.3). As shown on Figure 12.3, the MacDermid plant at 526 Huntingdon Avenue is located in an area of minimal flooding (zone C).

Therefore, no further information has been provided to demonstrate compliance with Sections 264.18(b) and 270.14(b)(11)(iii).

### 12.2.3 Salt Dome Formations, Salt Bed Formations, Underground Mines and Caves [40 CFR 264.18(c)]

Not applicable to MacDermid, Inc.




KEY TO MAP

500-Year Flood Boundary

100-Year Flood Boundary — ZONE B

Zone Designations* With Date of Identification e.g., 12/2/74

100-Year Flood Boundary — ZONE B

500-Year Flood Boundary

Base Flood Elevation Line With Elevation In Feet** — 513

Base Flood Elevation in Feet Where Uniform Within Zone** — (EL 987)

Elevation Reference Mark — RM7 ×

River Mile — • M1.5

**Referenced to the National Geodetic Vertical Datum of 1929

*EXPLANATION OF ZONE DESIGNATIONS

| ZONE | EXPLANATION |
| --- | --- |
| A | Areas of 100-year flood; base flood elevations and flood hazard factors not determined. |
| AO | Areas of 100-year shallow flooding where depths are between one (1) and three (3) feet; average depths of inundation are shown, but no flood hazard factors are determined. |
| AH | Areas of 100-year shallow flooding where depths are between one (1) and three (3) feet; base flood elevations are shown, but no flood hazard factors are determined. |
| A1-A30 | Areas of 100-year flood; base flood elevations and flood hazard factors determined. |
| A99 | Areas of 100-year flood to be protected by flood protection system under construction; base flood elevations and flood hazard factors not determined. |
| B | Areas between limits of the 100-year flood and 500-year flood; or certain areas subject to 100-year flooding with average depths less than one (1) foot or where the contributing drainage area is less than one square mile; or areas protected by levees from the base flood. (Medium shading) |
| C | Areas of minimal flooding. (No shading) |
| D | Areas of undetermined, but possible, flood hazards. |
| V | Areas of 100-year coastal flood with velocity (wave action); base flood elevations and flood hazard factors not determined. |
| V1-V30 | Areas of 100-year coastal flood with velocity (wave action); base flood elevations and flood hazard factors determined. |

NOTES TO USER

Crrtain areas not in the special flood hazard areas (zones A and V) may be protected by flood control structures.

This map is for flood insurance purposes only; it does not necessarily show all areas subject to flooding in the community or all planimetric features outside special flood hazard areas.

For adjoining map panels, see separately printed Index To Map Panels.

INITIAL IDENTIFICATION:
MARCH 22, 1974

FIGURE 12.3
100 YEAR FLOOD PLAIN MAP
MACDERMID, INC.
526 HUNTINGDON AVE.
WATERBURY, CT.
NTS PB·MAN·Ø
10/88

12.3 Topographic Map [270.14(b)(19)]

MacDermid, Inc. is located on two parcels of property north and south of Huntingdon Avenue. The southern parcel which is approximately 11 acres in area houses all manufacturing and laboratory facilities. The northern parcel which is approximately 42 acres in size is mostly undeveloped except for MacDermid's vacant office building located in the eastern portion.

In accordance with 40 CFR Section 270.14(b)(19), the topographic map provided as Figure 12.4 shows 1000 feet around the hazardous waste facilities located in the southern portion.

Two foot contours as specified under 40 CFR 270.14(b)(19) could not be obtained for the Huntingdon Avenue site. It is therefore requested that a 10 foot contour be used for the following reasons:

(a) All storage and recycling operations conducted at the Huntingdon Avenue facility are performed inside the main plant building.

(b) Shown on Figure 12.4A are drainage patterns for raw materials released outside the main plant building by virtue of a spill.

(c) No waste piles, surface impoundments, or lagoons are used at this facility.

(d) No additional information will be available to the regulatory authorities if MacDermid is required to spend a excess of $50,000 to obtain 2 foot contours for the total area of approximately 30 acres.

The following information is provided on the topographic map (Figure 12.4):

(1) Surface waters;

(2) Legal Boundaries of MacDermid, Inc. excluding the most northern portion of the north parcel.

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FIGURE 12.4: TOPOGRAPHIC MAP

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FIGURE 12.4A: ESTIMATED SURFACE CONTOURS

[ X ] Map [ ] Photograph [ ] Other (Specify Below)

* Please Contact the EPA New England RCRA Records Center to View This Document *

(3) 10 foot contours;

(4) 200 foot scale;

(5) Off-site injection and withdraw wells;

(6) Orientation of the map (north arrow);and

(7) Date.

In addition to this map, the following information as required under Section 270.14(b)(19) has been provided on the following maps:

(1) 100-Year Flood Plan Area [Figure 12.3]

(2) Wind Rose [Figure 12.5]

(3) Buildings, storage and loading/unloading areas [Figure 2.1]

(4) Access Control (gates) [Figure 6.1]

(5) Legal Boundaries [Figure 12.6]

(6) Sanitary Sewer and Pretreatment Systems [Figure 12.8]

(7) Surrounding Land Uses [Figure 12.7]

12.3.1 Map Features

(a) 100-Year Floodplain

MacDermid, Inc. is not within a 100-year floodplain.

(b) Surface Water

The Naugatuck River and Steel Brook are located east and south of MacDermid, Inc. respectively.

(c) Land Use

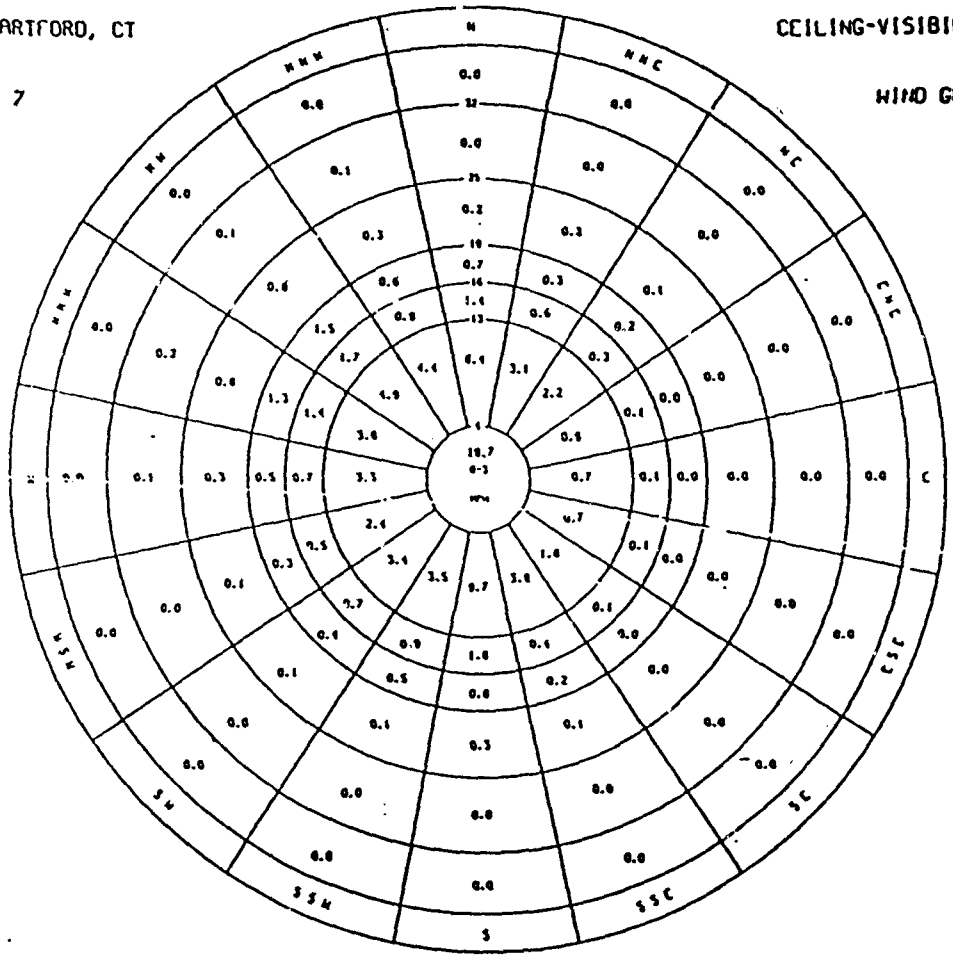
See Map (Figure 12.7)

BDL HARTFORD, CT

CLASS 7

CEILING-VISIBILITY

WIND GRAPH




WIND ROSE

FIG. 12.5
WIND ROSE

MACDERMID, INC.
526 HUNTINGDON AVE.
WATERBURY, CT.



HRP
ASSOCIATES, INC.

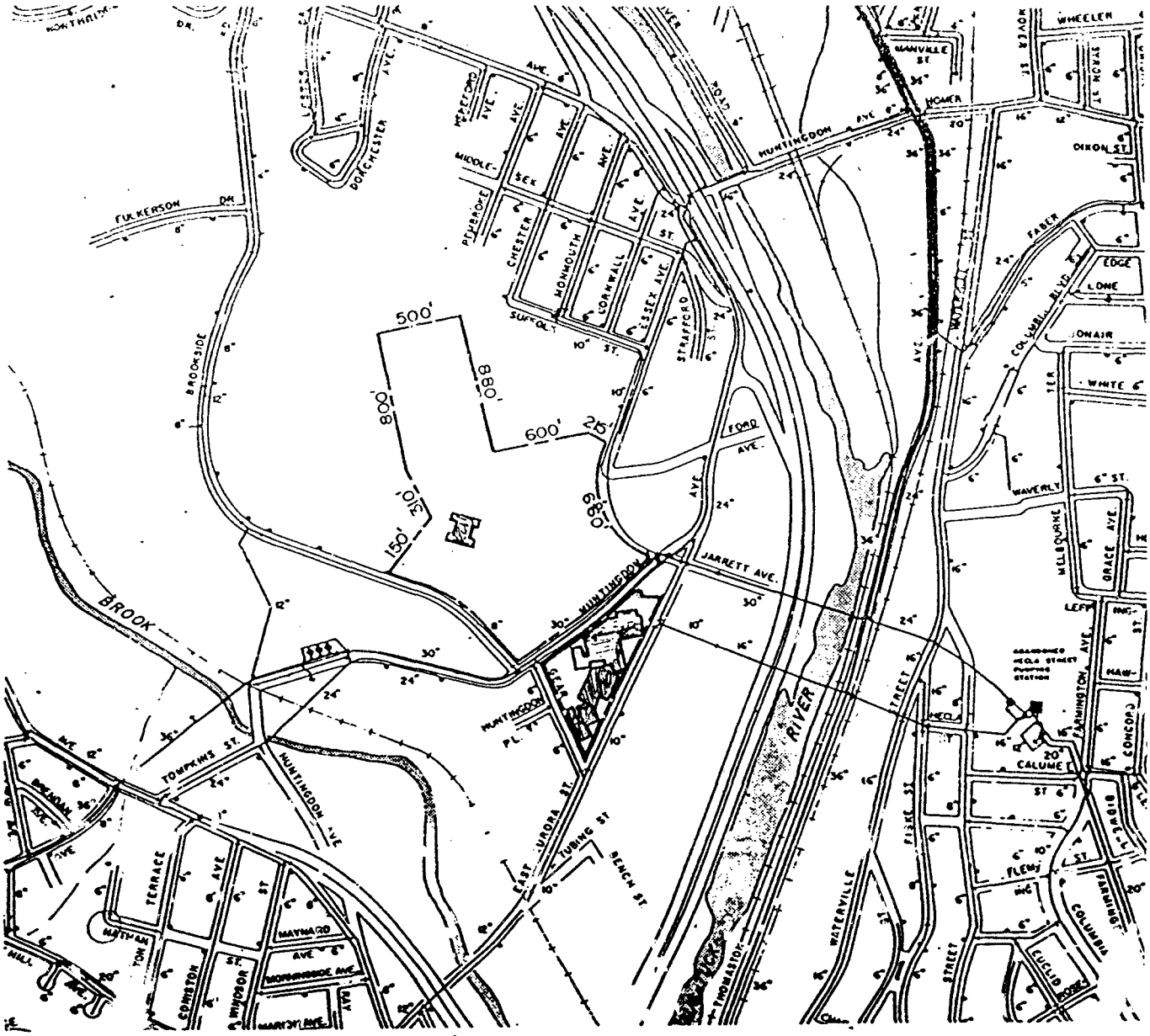



FIG. 12.6
FACILITY PROPERTY LINES
MACDERMID, INC.
526 HUNTINGDON AVE.
WATERBURY, CT.
NTS PB-MAN-Ø
10/88



HRP
ASSOCIATES, INC.

US EPA New England
RCRA Document Management System
Image Target Sheet

RDMS Document ID # 100864

Facility Name: MACDERMID INC

Facility ID#: CTD001164599

Phase Classification: R-1B

Purpose of Target Sheet:

[ X ] Oversized (in Site File) [ ] Oversized (in Map Drawer)

[ ] Page(s) Missing (Please Specify Below)

[ ] Privileged [ ] Other (Provide Purpose Below)

Description of Oversized Material, if applicable:

FIGURE 12.7: ZONING MAP

[ X ] Map [ ] Photograph [ ] Other (Specify Below)

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(d) Wind Rose

As depicted on the chart, the winds are chiefly from the north-northwest at an average speed of less than 10 mph (See Figure 12.5).

(e) Legal Boundaries

See Map (Figure 12.6)

(f) Access Control

See Section 6.0 and Figure 6.1.

(g) Off-Site Injection/Withdrawal Wells

See Map (Figure 12.4)

(h) On-Site Water Supply Systems

See Map (Figure 12.8)

(i) Drainage/Sewerage

See Map (Figure 12.8)

(j) Operational Locations

See Map (Figure 2.1)

12.3.2 Ground Water Protection [40 CFR 270.14(b)(20)]

MacDermid, Inc. located at 526 Huntingdon Avenue in Waterbury, Connecticut, does not treat, store or dispose of hazardous waste in surface impoundments, waste piles, land treatment units or landfills. Therefore, MacDermid, Inc. is not required to comply with the regulations under Section 270.14(b)(20).

US EPA New England
RCRA Document Management System
Image Target Sheet

RDMS Document ID # 100864

Facility Name: MACDERMID INC

Facility ID#: CTD001164599

Phase Classification: R-1B

Purpose of Target Sheet:

[ X ] Oversized (in Site File) [ ] Oversized (in Map Drawer)

[ ] Page(s) Missing (Please Specify Below)

[ ] Privileged [ ] Other (Provide Purpose Below)

Description of Oversized Material, if applicable:

FIGURE 12.8: WATER/ SANITARY SEWER/ STORM SYSTEMS

[ X ] Map [ ] Photograph [ ] Other (Specify Below)

* Please Contact the EPA New England RCRA Records Center to View This Document *

### 12.3.3 Geology

#### 12.3.3.1 Bedrock Geology

According to the "Bedrock Geological Map of Connecticut" compiled in 1985 by the Connecticut Geological and Natural History Survey the bedrock underlying the site is a Basa member of the Taine Mountain formation around Waterbury Dome which consists of well-layered, gray granofels.

#### 12.3.3.2 Surficial Geology

According to the Soil Survey of New Haven County, Connecticut published by the United States Department of Agriculture, Soil Conservation Service the soil underlying the Huntingdon Avenue facility is Urban land soils. Urban land soils consist of small intermingling areas generally less than 2 acres in size of udorthents, smoothed and small areas of undisturbed soils, mainly Cheshire, Charlton, Penwood, Branford, Agawam, Paxton and Wethersfield soils.

According to the soil survey, slopes in this type of soil range from 0 to 25% but are dominantly 0 to 8%.

Soils such as these are generally found in areas covered by buildings, paved roads, and parking lots in larger cities and larger industrial complexes and office complexes throughout New Haven County.

12.3.3.3 Ground Water Classification

According to the water quality classifications map for the Hudson, Housatonic River basins, the ground water underlying the Huntingdon Avenue facility is classified "GB". According to the Water Quality Classification Map of Connecticut, "GB" ground waters are ground waters within highly urbanized areas of intense industrial activities and where public water supply is available. May not be suitable for direct human consumption due to water discharges, spills or leaks of chemical or land use impacts.

12.3.3.4 Depth to Ground Water

According to available hydrogeological data for the lower Housatonic River Basin there is minimal information which would give an accurate assessment of the depth to ground water in this area. The records available indicate two wells within one quarter of a mile of the site yielding data on depth to ground water. These wells indicate depths of 23 and 27 feet.

12.3.3.5 Ground Water Flow Direction

Based on the topographic map for the Waterbury Quadrangle and the location of the Naugatuck River the assumed ground water flow direction is southeast.

12.3.3.6 Record of Wells

Analysis of the Atlas of Public Water Supply Sources and Drainage Basins of Connecticut and Hydrogeologic

Data on the Lower Housatonic Basin indicates there are no public or private water withdrawal wells located within one quarter mile of the site.

Dave Paquette of the Waterbury Water Department indicated four companies surrounding MacDermid: Lee Manufacturing on East Aurora Street, Waterbury Rolling Mills on East Aurora Street, Buell (Anchor) Fasteners on Huntingdon Avenue, and Rafferty Brown on Huntingdon Avenue, all maintain wells for industrial uses only. Mike Tacinelli of the Waterbury Engineering Department indicated the Engineering Department does not keep well records and Mike Carey of the Waterbury Health Department indicated he had no record of wells in the area of 526 Huntingdon Avenue and all drinking water is supplied by city water.

Based on the above information, activities at MacDermid would not effect public or private drinking water supplies.

12.3.3.7 Discharge Permits

A copy of MacDermid's NPDES permit is provided as Appendix O.

## 12.4 Container Storage Areas [40 CFR 270.15]

At MacDermid, Inc. four (4) separate areas are employed to store containerized wastes. The general location of the four storage areas:

Main Container Storage Area; Flammable Material Storage; Combustible Storage Area; and Metal Hydroxide Storage Area, are shown on Figure 2.1. Specific details or each storage area's dimensions and layout are provided on Figure 4.1 through 4.7.

In Section 9.0: container storage area secondary containment systems 264.175; condition of containers 264.171; precautions relating to ignitable wastes 264.176; aisle spacing, management of containers 264.173; and compatibility of wastes with containers 264.172 are described in detail.

Topics discussed in Sections 9.0 and 4.0 will not be repeated in this section. Additional discussion of run-on control and buffer zone requirements is provided below.

12.4.1. Control of Run-On [40 CFR 270.15(a)(4)]

All container storage areas at MacDermid, Inc. are located inside the plant's buildings. Run-on is preventing from entering these areas via the building walls and roof.

12.4.2 Buffer Zone Requirement [40 CFR 270.15(c)]

All flammable wastes generated at MacDermid, Inc. are stored in the Flammable Material Storage Area except for the 1 satellite storage drum in the combustible storage area. This drum when full is transferred to the flammable material storage area. The flammable material storage area as shown on Figure 2.1 is located 125 feet from the nearest property line.

## 12.5 Tank Design and Construction Information

[40 CFR Section 270.16(a)-(f)]

### 12.5.1 Purpose

The information provided in this section is intended to address the issues raised by the U.S. EPA regulations (40 CFR 270.16) regarding tank design and construction. The specific regulations listed under 40 CFR 270.16 are as follows:

(a) A written assessment that is reviewed and certified by an independent, qualified, registered professional engineer as to the structural integrity and suitability for handling hazardous waste of each tank system, as required under §§264.191 and 264.192;

(b) Dimensions and capacity of each tank;

(c) Description of feed systems, safety cut off, bypass systems, and pressure controls (e.g., vents);

(d) A diagram of piping, instrumentation, and process flow for each tank system;

(e) A description of materials and equipment used to provide external corrosion protection, as required under Section 264.192(1)(3)(ii);

(f) For new tank systems, a detailed description of how the tank system(s) will be installed in compliance with §264.192(b), (c), (d), and (e);

(g) Detailed plans and description of how the secondary containment system for each tank system is or will be

designed, constructed, and operated to meet the requirements of §264.193(a), (b), (c), (d), (e), and (f).

(h) For tank systems for which a variance from the requirements of §264.193 is sought (as provided by §264.193(g)):

1. Detailed plans and engineering and hydrogeologic reports, as appropriate, describing alternate design and operating practices that will, in conjunction with location aspects, prevent the migration of any hazardous waste or hazardous constituents into the ground water or surface water during the life of the facility, or
2. A detailed assessment of the substantial present or potential hazards posed to human health or the environment should a release enter the environment.

(i) Description of controls and practices to prevent spills and overflows, as required under §264.194(b); and

(j) For tank systems in which ignitable, reactive, or incompatible wastes are to be stored or treated, a description of how operating procedures and tank system and facility design will achieve compliance with the requirements of §§264.198 and 264.199.

12.5.2 Written Assessment of Structural Integrity

[40 CFR Sections 264.191, 264.192, and 270.16(a)]

The four (4) above ground storage tanks employed at MacDermid, Inc. for the storage of spent copper etchant are housed in the northwestern section of the Huntingdon Avenue

facility (see Figure 2.1). Secondary containment for these tanks is provided by an epoxy coated concrete floor, epoxy coated building walls and epoxy coated 2'7" high block wall located at both entrance ways. As discussed under Section 9.1.1 (4) and displayed on Figures 4.6 and 4.7, the total volume of secondary containment provided for these tanks is 13,509 gallons. The volume of secondary containment required for this area which is based on 10% of the entire storage volume plus 100% of the largest container is 10,900 gallons.

Therefore, since this existing tank storage area complies with the secondary containment and leak detection requirements defined under 40 CFR 264.193 (see Sections 9.1.6.2 and 12.5.7), MacDermid, Inc. is exempted from the following regulatory requirements:

> 40 CFR 270.16(a) - Certification by an independent, qualified, registered professional engineer as to the structural integrity and suitability for handling hazardous waste of each tank system.
>
> 40 CFR 264.191 - Assessment of existing tank system's integrity by an independent, qualified registered professional engineer.
>
> 40 CFR 264.192 - Design and installation of new tank systems or components

However, as requested by the CT-DEP Hazardous Waste Management Unit, included as Appendix P are the plans and specifications for the FRP tanks. These tanks are as demonstrated under Section 5.5 are compatible with the copper etchant.

12.5.3 Tank Dimensions [40 CFR 270.16(b)]

Tank dimensions and capacity are presented on Table 12.1.

12.5.4 Feed Systems/Safety Cutoff/Bypass Systems/Pressure Controls [40 CFR 270.16(c)]

The four (4) storage tanks employed by MacDermid, Inc. are used to temporarily store spent copper etchant prior to recycling. All transfer operations to and from these tanks are performed using air pressure. These pumps are manually operated. Pneumatic volume (bubble) gages located on the building wall and external sight gages are used to monitor tank volumes. In addition, high level alarms placed 10 inches below the top of each tank will audibly and visually indicate when liquid reaches this level. At this point operators will cease loading activities. No automatic cut-off systems, by-pass systems or pressure controls are provided on these atmospheric tanks.

12.5.5 Process Diagrams [40 CFR 270.16(d)]

A process flow diagram for the four waste storage tanks is provided as Figure 12.9.

12.5.6 Corrosion Protection [40 CFR 270.16(e)]

The four waste storage tanks are constructed of fiberglass reinforced vinyl ester resin (Derakane 411 brand). Fiberglass reinforced vinyl ester is chemically resistant to the corrosion effects of the alkaline spent copper etchant (see Section 5.5).

## TABLE 12.1

## WASTE STORAGE TANKS DIMENSIONS

**MACDERMID, INC.**
**526 HUNTINGDON AVENUE**
**WATERBURY, CONNECTICUT**

| Tank # | Tank Dimensions | Storage Capacity | Tank Age |
|---|---|---|---|
| 1 | 9'8" Diameter<br>14'6" High | 8,000 gallons | 7 yrs., 6 months |
| 2 | 9'8" Diameter<br>14'6" High | 8,000 gallons | 7 yrs., 6 months |
| 3 | 9'8" Diameter<br>14'6" High | 8,000 gallons | 7 yrs., 6 months |
| 4 | 10'0" Diameter<br>9'0" High | 5,000 gallons | 7 yrs., 6 months |

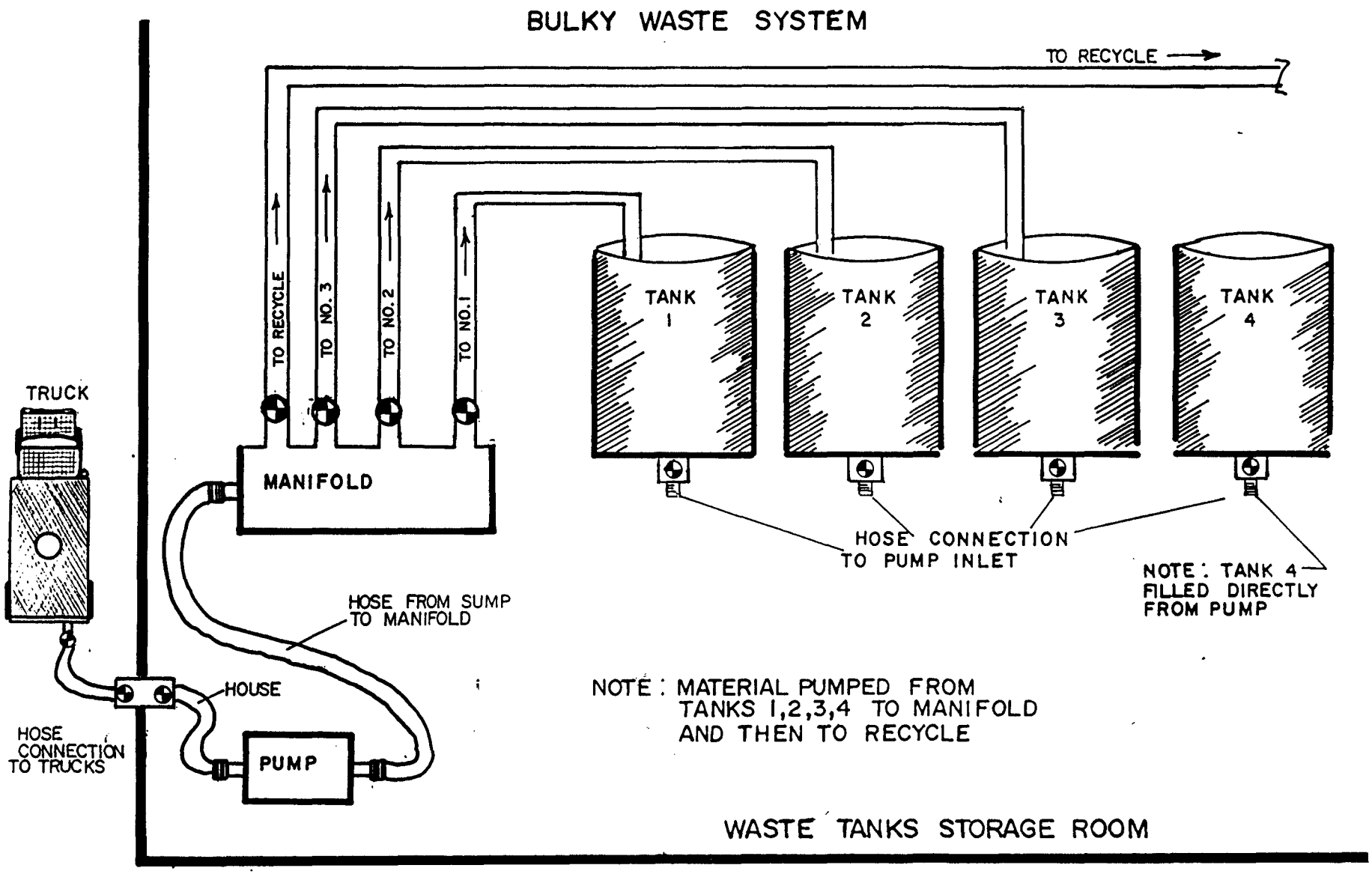


FIGURE 12.9
MACDERMID, INC.
526 HUNTINGTON AVE.
WATERBURY, CT.
PB-MAN-Ø

The concrete floor, building walls and 2'7" high block walls of this storage area have also been coated with a suitable epoxy resin for corrosion protection.

12.5.7 Secondary Containment
[40 CFR 264.193(a)-(f) and 40 CFR 270.16(g)]

A detailed description of the secondary containment system for the four waste storage tanks is provided under Sections 2.1.5 and 9.1.1(4) of this application. A detailed plan of the storage area is provided as Figure 4.6.

12.5.8 Variance for Secondary Containment
[40 CFR 264.193(g) and 270.16(h)]

Not applicable to MacDermid, Inc.

12.5.9 Tank Controls to Prevent Overfilling
[40 CFR 264.194(b) and 270.16(i)]

The specific procedures followed by MacDermid, Inc. to prevent overfilling the waste storage tanks are provided under Section 2.3.2 and 9.1.2(2) of this application.

12.5.10 Ignitable/Reactive/Incompatible Wastes
[40 CFR 264.198, 264.199 and 270.16(j)]

The waste storage tanks at MacDermid, Inc. are used to store only spent copper etchant. Therefore, since the copper etchant is a non-flammable and non-reactive waste, MacDermid, Inc. is exempted from the regulatory requirements defined under 40 CFR 264.198, 264.199, and 270.16(j).

# 13.0 CLOSURE PLAN

## 13.1 Introduction

In accordance with RCRA regulations contained in 40 CFR Parts 264.111 through 264.115 (General Closure Requirements and Subparts I and J (Specific Facility Requirements), and analogous State regulations, all owners and operators of hazardous waste facilities and commercial Connecticut regulated waste facilities must close their facilities in a manner that:

- Minimizes the need for further maintenance;
- Controls, minimizes or eliminates, to the extent necessary to protect human health and the environment, post-closure release of hazardous waste, hazardous constituents, leachate, contaminated run-off or hazardous waste decomposition products, to the ground water or surface water or to the atmosphere; and
- Complies with the closure requirements of 40 CFR Subpart G, including, but not limited to, the requirements of 40 CFR Sections 264.197, 264.228, 264.258, 264.280, 264.310, 264.351, 264.381, and 264.404.

The Closure Plan must include, at a minimum:

- A description of how and when the facility will be partially closed and ultimately closed;
- An estimate of the maximum inventory of wastes in storage or treatment at any given time;
- A description of the steps needed to decontaminate facility equipment, structures, etc., during closure;
- A description of any additional activities required during partial or final closure such as ground water monitoring, leachate collection, etc; and
- A schedule for final closure.

The procedures outlined in the following sections are to be followed for closure of the existing hazardous and CT-regulated waste storage facilities and recycling processes (see Figure 2.1) at MacDermid, Inc.'s 526 Huntingdon Avenue facility in Waterbury, Connecticut.

## 13.2 Closure Performance Standard

The closure performance standard set forth in this Plan requires that each storage area and recycling process be decontaminated to a level where all possible hazardous constituents have been removed to health and environmental based standards for all exposure pathways in order to achieve the goal of "clean" closure. The three exposure pathways of concern are inhalation, dermal contact, and ingestion.

It is, therefore, necessary to identify all Appendix VIII, 40 CFR 261 hazardous constituents which may be present. Due to the number of chemical compounds used to date at MacDermid, Inc., it was not possible to identify all Appendix VIII constituents which have been used or managed on-site. Therefore, sampling for 40 CFR Part 264 Appendix IX constituents[1] as described in Section 13.4.3.2 of application will be performed. Listed under Table 13.1 are the hazardous constituents identified to date and their respective health and environmental based standards. Any constituents identified in the Appendix IX analysis will be added to those shown on Table 13.1.

[1]The 40 CFR Part 264 Appendix IX constituents have been identified by the EPA (July 9, 1987 Federal Register) to make up those compounds in Appendix VIII to Part 261 which can be analyzed in ground water samples plus 17 chemicals routinely monitored in the SuperFund Program.

## TABLE 13.1

### CLOSURE PERFORMANCE STANDARD FOR EACH HAZARDOUS CONSTITUENT

MACDERMID, INC.
526 HUNTINGDON AVENUE
WATERBURY, CT

| Hazardous Constituent | MCL[1,2] (mg/l) | RSD[3] Water (mg/l) | RSD[3] Concrete (mg/kg) | RFD[4] Water (mg/l) | RFD[4] Concrete (mg/kg) |
|---|---|---|---|---|---|
| Barium | 1.0[5] | --- | --- | 2.0 | 900 |
| Cadmium | 0.01[5] | --- | --- | --- | --- |
| Chromium, Total | 0.05[5] | --- | --- | 40 | 20,000 |
| Cyanide | 0.2[5] | --- | --- | 0.7 | 300 |
| Copper | 1.0[6] | --- | --- | --- | --- |
| Lead | 0.05[5] | --- | --- | --- | --- |
| Nickel | 1.0[6] | --- | --- | 0.7 | 300 |
| Tin | --- | --- | --- | --- | --- |
| Zinc | 5.0[6] | --- | --- | --- | --- |
| Chlorobenzene | 0.1[7] | --- | --- | 1.0 | 500 |
| Ethyl Benzene | 0.1[7] | --- | --- | --- | --- |
| Isobutanol | --- | --- | --- | 10.0 | 5,000 |
| Methylene Chloride | 0.025[7] | 0.0047 | 47 | 2.0 | 1,000 |
| Methyl Ethyl Ketone | 1.0[7] | --- | --- | 2.0 | 900 |
| Tetrachloroethylene | 0.02[7] | 0.0069 | 69.0 | 0.4 | 200 |
| Toluene | 1.0[7] | --- | --- | 10.0 | 5,000 |
| 1,1,1-Trichloroethane | 0.2[7] | --- | --- | 3.0 | 2,000 |
| Trichlorofluoromethane | --- | --- | --- | 10.0 | 5,000 |
| Trichloroethylene | 0.005[7] | 0.0032 | 32 | --- | --- |
| Xylene | --- | --- | --- | --- | --- |

1 Maximum Contaminant Level
2 When MCL's are not available other standards such as Connecticut Volatile Organic Action Levels will be used if available.
3 Risk-Specific Doses
4 Verified Reference Doses
5 U.S. EPA Drinking Water Standard
6 CT Drinking Water Standard
7 CT-Volatile Organic Action Level

The chief exposure pathway of concern has been determined to be ingestion. The inhalation and dermal exposure pathways are not expected to pose a risk to the general public. To demonstrate clean closure, however, theoretical concentration of each constituent with respect to the air pathway will be calculated and compared to the applicable TLV or other health-based standard. To minimize the threat to closure personnel, closure personnel will be equipped with the appropriate personal protection equipment as described in Section 13.4.7.

The health-based levels for the ingestion pathways are as follows:

- Maximum Containment Levels (MCL's)
- Risk Specific Doses (RSD's)
- Verified References Doses (RFD's)

The known MCL's, RSD's and RFD's for the hazardous constituents listed under Table 13.1 will be referred to as the closure performance standards and will be used to determine when clean closure has been achieved at this site.

## 13.3 Closure Performance Determination

The following hierarchies will be used to determine when the closure satisfies the clean closure performance standards shown on Table 13.1. These hierarchies have been developed for the different exposure routes (i.e. ingestion of leachate, or concrete) and to take into consideration background levels.

For liquid matrices (i.e. concrete leachate and tank wipe samples), the analytical results for specific constituents will be compared

to the MCL's, RSD's, RFD's and background levels depending upon availability. In the event that the background level for a specific constituent is higher than the corresponding MCL's, RSD's and RFD's, the background level will be used as the clean standard. If the background level is less than the MCL, if one is available, the MCL will be used as the clean standard. If there is not an MCL and the background level is less than the RSD, if one is available, the RSD will be used as the clean standard.

If there is not an RSD and the background level is less than the RFD, if one is available, the RFD will be used as the clean standard. If there are no relevant health-based standards, the applicable minimum detection limits for the appropriate test method will be used. The exception to this order would be in a case that an RFD were lower than a corresponding RSD. In that case, the RFD would take precedence over the RSD. In summary, the order of closure standards for liquid matrices will be as follows:

- Background
- MCL's
- RSD's
- RFD's
- Other Relevant Health-Bases Standards (as approved by CT-DEP)
- Minimum Detection Limits

For solid matrices (i.e. concrete), the analytical results for specific constituents will be compared to the RSD's, RFD's, and background levels depending upon availability. In the event that the background level for a specific constituent is higher than the corresponding RSD's and RFD's, the background level will be used as the

clean standard. If the background level is less than the RSD, if one is available, the RSD will be use as the clean standard.

If there is not an RSD and the background level is less than the RFD, if one is available, the RFD will be used as the clean standard. If there are no relevant health-based standards, the applicable minimum detection limit for the appropriate test method will be used. The exception to this order would be in a case that an RFD were lower than a corresponding RSD. In that case, the RFD would take precedence over the RSD. In summary, the order for the closure standards for solid matrices will be as follows:

- Background
- RSD's
- RFD's
- Other Relevant Health-Based Standards (as approved by CT-DEP)
- Minimum Detection Limits

In the case of the tanks used for storage and recycling (metal and FRP), only wipe samples will be collected to determine if the clean closure has been achieved. To achieve clean closure, all contaminants of concern must be below minimum detection limits. If these standards cannot be achieved, the tanks will be disposed of off-site at a permitted hazardous waste facility.

In the case of the concrete floors located in the storage areas, the certification concrete samples must meet the closure performance standard for direct ingestion by mass analysis and soil leachability by the EP Toxic extracts for metals and the TCLP extract for organics. The concrete mass analysis results will be compared to the hierarchy

for solid matrices, while the concrete's leachability results will be compared to the hierarchy for liquid matrices.

For the inhalation pathway, the theoretical concentration of each volatile contaminant will be calculated as follows:

(a) determine average concentration of volatile contaminent present in each storage area (using sampling results collected for the ingestion pathway);

(b) determine volume of concrete in each storage area;

(c) determine the volume air space surrounding each storage area;

(d) calculate the mass of the remaining volatile contaminant from (a) and (b) above;

(e) calculate the theoretical concentration of each volatile contaminant from (c) and (d) above; and

(f) compare to the applicable TLV or other health-based standards (Note: These standards are not provided under Table 13.1).

In the event, it is determined that clean closure cannot be achieved at this site, "an unexpected event", a modified plan will be submitted to U.S. EPA and CT-DEP within thirty (30) days (see Section 13.4.11).

To achieve "clean closure", all constituents tested for within each storage area must not exceed the clean standard for all pathways.

## 13.4 Closure Plan

The facilities employed at MacDermid's 526 Huntingdon Avenue plant for the storage and recycling of hazardous/CT-regulated wastes include the following:

- Main Container Storage Area;
- Flammable Material Storage Area;
- Combustible Storage Area;

- Metal Hydroxide/Sulfide Sludge Storage Area;
- Waste Storage Tanks; and
- Recycling Tanks

The procedures to be followed by MacDermid, Inc. to close these facilities in a manner which will minimize the need for further maintenance and protect human health and the environment are provided in the following sections.

13.4.1 Closure Plan for Container Storage Areas

| | |
|---|---|
| EPA ID Number: | CTD 001164599 |
| Owner/Operator: | MacDermid, Inc. |
| Plant Phone Number: | (203) 575-5700 |
| Facility Address: | 526 Huntingdon Avenue<br>Waterbury, Connecticut |

13.4.1.1 Facility Operation

MacDermid, Inc. employs four (4) separate areas for the storage of containers at its Huntingdon Avenue facility. The maximum storage capacity of these areas and their intended use are as follows:

| Storage Area | Maximum Capacity | Intended Use |
|---|---|---|
| Main Container Storage Area | 77,000 gallons (1,280 55-gallon drums 20 330-gallon totes) | Used finishing chemicals received from customers and MacDermid off-site facilities for recycling and miscellaneous liquids and semi-liquids generated on-site and received from 245 Freight Street which have been designated for off-site disposal. |

| | | |
|---|---|---|
| Flammable Material Storage Area | 880 gallons (16 55-gallon drums) | Flammable liquids generated on-site and received from 245 Freight Street designated for off-site disposal. |
| Combustible Storage Area | 4,290 gallons (54 55-gallon drums and 4 330-gallon totes) | Used finishing chemical generated on-site and received from customers/off-site MacDermid facilities for recycling. |
| Metal Hydroxide/Sulfide Sludge Storage Area | 1 26-cubic yard roll-off | Dewatered metal hydroxide/sulfide sludge generated from the on-site industrial waste water treatment system. |

Within these areas, all containers, except the 330 gallon storage totes and 26 cubic yard roll-off are stored on wooden pallets to prevent contact with any spilled/ leaked waste. To provide access for inspection, all container rows are separated by a minimum of 2' and a maximum of 6'9" wide aisles.

13.4.1.2 <u>Waste Disposal</u>

It has been assumed for the purpose of this plan, that all wastes will require off-site disposal and the storage areas are at their maximum storage capacity. All con-

tainerized waste will be disposed of off-site at a permitted hazardous waste facility.

13.4.1.3 Closure Procedures

The procedures for closing each container storage area will incorporate the following steps:

Step 1: Dispose of all left over waste stored on-site at a permitted hazardous waste facility.

Step 2: Remove any loose dirt or dust using a dry vacuum. All dirt/ dust collected in this operation will be placed in a 55 gallon drum, and disposed of off-site at a permitted hazardous waste facility.

Step 3: Collect a concrete sample from the floor which exhibits the greatest contamination (staining, spalling, etc.) and submit for Appendix IX analysis. Sampling and analysis procedures are provided under Section 13.4.3. Any parameter determined under this analysis will be added to Table 13.1.

Step 4: Remove any hazardous constituents which may have contaminated the concrete floor using a high pressure steam cleaner. An alkaline industrial cleaner which is phosphate free will be used with the steam cleaner.

Step 5: Collect all cleaning water generated in Step 4 using a wet vacuum. All cleaning water will be collected in 55 gallon drums

or a vacuum truck and disposed of off-site at a permitted hazardous waste facility.

Step 6: Steam clean the floor after Step 5 using clean water only.

Step 7: Collect five concrete samples from each storage area using the sampling procedures described under Section 13.4.3.3. Four of the five sampling locations will be determined by dividing each storage area into 20 subsections and then using a random number generator (computer) to select each sampling point. The fifth sampling location will be located in the area of suspected highest contamination (e.g. stained, corroded concrete).

Step 8: Inspect the area for cracks, gaps or other surface damage which may have allowed migration of wastes to subgrade.

Step 9: For suspect areas determined under Step 8, a core drill will be used to determine if waste constituents have migrated to the subgrade. This will be accomplished by inspecting the concrete core for stains and extent of cracks and gaps.

Step 10: From each area evaluated under Step 9, a sample will be collected from the side wall of the core hole and if necessary from the subgrade for analysis of Table 13.1 parameters. The sampling procedures are described under Section 13.4.3.

Step 11: Submit the samples collected under Steps 9 and 10 to a certified laboratory for analysis. Each sample will be analyzed for the parameters listed under Table 13.1 plus additional parameters detected under Step 3. The specific analytical procedures to be followed for the known hazardous constituents are listed under Table 13.4.

Step 12: Compare the analytical results under Step 11 to the closure performance standards listed under Table 13.1.

Step 13: If closure performance standards cannot be achieved (an unexpected event), a modified Closure Plan will be submitted to the U.S. EPA and CT-DEP within thirty days (see Section 13.4.11).

Step 14: All contaminated personal equipment and spill control equipment will be collected in 55 gallon drums and disposed of off-site at a permitted facility.

Step 15: To store wastes generated from closure activities, temporary storage areas will be utilized. These areas will be located away from any floor drains, floor trenches, etc. and provided with containment berms constructed of absorbent material (sandbags, etc.).

All waste generated during the closure of the container storage areas will be manifested and shipped off-site by a licensed

waste hauler for treatment and/or disposal at a permitted hazardous waste facility. Since no testing is proposed for these waste streams (sweepings, residues, rinsewaters and discarded personal protective equipment) these wastes will be managed and handled as hazardous wastes. Rinse or cleaning water generated in the decontamination process is estimated to be 1% of the area'a maximum storage capacity.

All closure work will be supervised and performed using qualified off-site personnel. Off-site personnel will be equipped with the personal equipment described under Section 13.4.7. Chemical neutralization and spill control pillows will be employed in the event of the spills resulting from the container storage area decontamination process. Strict supervision will include provisions for no open flames, hot surfaces or smoking to be present in and around the work areas.

## 13.4.2 Closure Plan for Waste Storage/Recycling Tanks and Storage Areas

| | |
|---|---|
| EPA ID Number: | CTD 001164599 |
| Owner/Operator: | MacDermid, Inc. |
| Plant Phone Number: | (203) 575-5700 |
| Facility Address: | 526 Huntingdon Avenue<br>Waterbury, Connecticut |

### 13.4.2.1 Facility Operation

MacDermid, Inc. employs four (4) above ground storage tanks for the storage of bulk recyclable wastes received from customers and off-site MacDermid facilities. All wastes stored in these areas are designated for recycling. The total storage capacity for these three 8,000 gallon tanks and one 5,000 gallon tank is 29,000 gallons.

These tanks are located on the west side of the Huntingdon Avenue plant.

Under MacDermid recycling operations, the following tanks are employed:

Solder Stripper Recycling Operation

(1) 3,000 gallon FRP tanks
(2) 1,000 gallon Electrolysis Cells
(1) 1,500 gallon Coppe Treatment Tank

Copper Etchant Recycling Operation

(3) 8,000 gallon FRP tanks (bulk waste storage tanks)*
(1) 5,000 gallon FRP tank (bulk storage tank)*

(1) 5,000 gallon Stainless Steel Reactor
(1) 3,800 gallon Stainless Steel Reactor
(6) 3,500 gallon FRP tanks
(2) 4,000 gallon FRP tanks
(3) 6,300 gallon Storage tanks

NMP Recycling Operation

(1) 500 gallon Stainless Steel tank
(1) 20 gallon distilled water vacuum receiver
(1) 55 gallon distilled NMP vacuum receiver

*Note: These tanks are already included under the total tank storage capacity of 29,000 gallons listed under page 13-14.

13.4.2.2 Waste Disposal

For the purpose of this plan, it has been assumed that all bulk waste will require off-site disposal and the storage tanks are at their maximum storage capacities. All bulk waste will be disposed of off-site at a permitted facility.

13.4.2.3 Closure Procedures

The procedures for closing the bulk waste storage and recycling tanks and the storage areas are as follows:

Step 1: Dispose of all left over waste stored on-site at a permitted hazardous waste facility.

Step 2: Remove any loose dirt or dust using a dry vacuum. All dirt/ dust collected in this operation will be placed in a 55 gallon drum, and disposed of off-site at a permitted hazardous waste facility.

Step 3: Collect a concrete sample from the floor area which exhibits the greatest contamination (staining, spalling, etc.) and submit for Appendix IX analysis. Sampling and analysis procedures are provided under Section 13.4.3. Any parameter determined under this analysis will be added to Table 13.1.

Step 4: Using a high pressure steam cleaner with an alkaline industrial cleaner (phosphate free) wash the inside of the tanks, the outside of the tanks, piping, structure supports and the floor of the storage area.

Step 5: Steam clean the tanks (inside and outside) piping, structural supports and floor after Step 5 using clean water only.

Step 6: Collect all cleaning water generated in Steps 4 and 5 (55 gallon drums or vacuum truck) and ship to a permitted hazardous waste facility for final treatment/disposal.

Step 7: Collect 1 wipe sample from the inside and outside of each storage and recycling tank using the sampling procedure described under Section 13.4.3. The sampling areas will be located in the areas exhibiting the greatest contamination.

Step 8: Submit the wipe samples to a certified laboratory for analysis. Each sample will be sampled for the parameters listed under Table 13.1 plus any additional parameters detected under Step 3. The specific analytical procedures to be followed are listed under Table 13.4.

Step 9: Compare the analytical results under Step 8 to closure performance standards listed under Table 13.1.

Step 10: Based on the analytical results the tank, piping, structural supports will either be disposed of off-site at a permitted hazardous waste facility (cannot meet closure performance standards) or disposed of at a used equipment supplier or scrap metal dealer (meets closure performance standards). In all cases, tanks will be removed to allow for assessment of the underlying floor.

Step 11: The floor underneath the tanks and surrounding the tanks will be inspected for cracks, gaps or other surface damage which may have allowed migration of wastes to subgrade.

Step 12: For suspect areas determined under Step 11, a core drill will be used to determine if waste constituents have migrated to the subgrade. This will be accomplished by inspecting the concrete core for stains and extent of cracks and gaps.

Step 13: From each area evaluated under Step 12, a sample will be collected from the side wall of the core hole and, if necessary, from the subgrade, for analysis of Table 13.1 parameters. The sampling procedures are described under Section 13.4.4.

Step 14: From each storage/recycling area, collect five concrete samples from the storage areas' floor using the sampling procedures described under Section 13.4.3.3. Four of the five sampling locations will be determined by dividing the storage area into 20 subsections and then using a random number generator (computer) to select each sampling point. The fifth sampling location will be located in the area of suspected highest contamination (e.g. stained, corroded concrete).

Step 15: Submit the samples collected under Steps 13 and 14 to a certified laboratory for analysis. Each sample will be analyzed for the parameters listed under Table 13.1 plus any additional parameters detected under Step 3. The specific analytical procedures to be followed for the known hazardous constituents are listed under Table 13.4.

Step 16: Compare the analytical results under Step 15 to the closure performance standards listed under Table 13.1.

Step 17: If closure performance standards cannot be achieved (an unexpected event), a modified closure plan will be submitted to the U.S. EPA and CT-DEP within thirty days (see Section 13.4.11).

Step 18: All contaminated personal equipment and spill control equipment will be collected in 55 gallon drums and disposed of off-site at a permitted facility.

Step 19: To store wastes generated from closure activities, temporary storage areas will be utilized. These areas will be located away from any floor drains, floor trenches, etc. and provided with containment berms constructed of absorbent materials (sandbags, etc.).

All waste generated during the closure of the bulk waste storage tanks will be manifested and shipped off-site by a licensed waste hauler for treatment and/or disposal at a permitted hazardous waste facility. Since no testing is proposed for these waste streams (sweepings, residues, rinsewaters, and discarded personal protective equipment), these wastes will be managed and handled as hazardous wastes. Rinse or cleaning water generated in the decontamination process is estimated at

10% of the tanks maximum storage capacity.

All closure work will be supervised and performed using qualified off-site personnel. Off-site personnel will be equipped with the personal protective equipment described under Section 13.4.7. Chemical neutralization and spill control pillows will be employed in the event of the spills resulting from the container storage area decontamination process. Strict supervision will include provisions for no open flames, hot surfaces or smoking to be present in and around the work areas.

13.4.3 Methods for Sampling and Analysis

The procedures described in this section will be used to sample and analyze the various media for the following events:

- Ambient air monitoring;
- Appendix IX sampling;
- Concrete certification sampling;
- Cracks or gaps in concrete floor sampling;
- Concrete background sampling; and
- Wipe sampling.

13.4.3.1 Ambient Air Monitoring

The storage and recycling areas are expected to pose a minimal inhalation risk only during closure activities. As such, air monitoring will be conducted to protect the health of closure personnel and off-site personnel.

Air monitoring for gross organic vapors will be conducted utilizing an HNU Organic Vapor Analyzer or an equivalent. This monitoring will be conducted to determine background levels, property boundary levels, and work area levels. This instrument yields direct measurements, therefore, no laboratory analyses are necessary. These readings will be taken continuously and recorded hourly relative to background levels.

If at any time during the closure activities, levels on the photoionization unit are detected greater than 5 ppm above background levels, the area will be temporarily evacuated and the class of personal

protection used during the closure activities will be upgraded.

The metallic constituents of concern should not pose an inhalation based threat as the materials which will be handled during the closure will be wetted to control or eliminate the risk of inhaling metal bearing dusts.

13.4.3.2 Appendix IX Sampling

To determine the hazardous constituents which may be present within the storage and the recycling areas, a concrete sample of the floor will be collected and analyzed for 40 CFR 264 Appendix IX constituents. The Appendix IX samples will be collected in the following manner:

Step 1: Inspect the floor of storage or recycling area to determine the area of greatest contamination (staining, corrosion, etc.).

Step 2: Collect a concrete sample of at least 200 grams using a hand chisel.

Step 3: Decontaminate sampling equipment after use as follows:

- wash with a suitable laboratory soap (alconox);
- rinse with tap water;

- rinse with 1:4 solution of nitric acid/distilled water;
- rinse with distilled water;
- rinse with hexane; and
- air dry.

Step 4: Store concrete samples in glass jars with teflon seals and place on ice.

Step 5: Submit samples to a certified laboratory for analysis of Appendix IX constituents. All samples will be accompanied with a chain of custody (see Appendix Q).

The parameters to be analyzed, recommended analytical procedures and corresponding detection limits to be followed by the certified laboratory are included in Appendix R. The most appropriate analytical method for a particular constituent will be chosen when a choice is given in Appendix R.

13.4.3.3 Certification Sampling of Concrete Floors

The concrete floor (base) within each storage and recycling area will be sampled to determine if the closure performance standards have been met. Each area will be sampled in the following manner.

Step 1: Divide the base of each area into 20 equal sections.

Step 2: Using a random number generator select four (4) sampling sites for each area. Select 1 additional sample from the area exhibiting the greatest contamination.

Step 3: Collect at least a 200 gram concrete sample from the center of each sampling section by one of the following methods: powered jack hammer or hand chisel.

Step 4: To prevent cross contamination between sampling points, sampling equipment will be decontaminated after each sample by the following:

- wash with a suitable laboratory soap (alconox);
- rinse with tap water;
- rinse with 1:4 solution of nitric acid/distilled water;
- rinse with distilled water;
- rinse with hexane; and
- air dry.

Step 5: Store concrete samples in glass jars with teflon seals and place on ice.

Step 6: Submit samples to a certified laboratory for analysis. All samples will be accompanied with a chain of custody (see Appendix Q).

The certification samples for a particular area will be analyzed for all parameters shown on Table 13.1 and any additional constituents identified by that area's Appen-

dix IX sampling event. The samples will be pretreated as discussed in Section 13.4.5.

13.4.3.4 Sampling of Cracks and Gaps in Concrete Floor

To determine if the waste constituents have migrated to the subgrade level, the floor within each storage and recycling area will be inspected for cracks, gaps or other surface damage. Each suspect area (cracks or gaps with width 1/16" or greater) will be sampled in the following manner.

Step 1: Using a 3 inch or larger diameter core drill, core down a minimum of six inches or to the next subgrade level.

Step 2: Inspect the concrete core to determine if the crack or gap extends to the subgrade level.

Step 3: Collect at least a 200 gram sample from the subgrade level if the cracks or gaps extend to the sublevel.

Step 4: To prevent cross contamination between sampling points, sampling equipment will be decontaminated after each sample by the following:

- wash with a suitable laboratory soap (alconox);
- rinse with tap water;
- rinse with 1:4 solution of nitric acid/distilled water;
- rinse with distilled water;

- rinse with hexane; and
- air dry.

Step 5: Store concrete samples in glass jars with teflon seals and place on ice.

Step 6: Submit samples to a certified laboratory for analysis. All samples will be accompanied with a chain of custody (see Appendix Q).

The samples from a particular area will be analyzed for all parameters shown on Table 13.1 and any additional constituents identified by that area's Appendix IX sampling event. The samples will be pretreated as discussed in Section 13.4.5.

13.4.3.5 Concrete Background Samples

To determine if any metal hazardous constituents are inherent characteristics of the concrete within the storage and recycling areas, background concrete samples, if available, will be collected ana analyzed. Background concrete samples must be collected from an area where no manufacturing processes, waste or product storage, etc. have occurred which might have caused contamination of the sample.

If such an area cannot be located in the same construction phase of the building, background samples will not be utilized.

Background concrete samples, if available, will be sampled in the following manner:

Step 1: Inspect the surrounding area of each storage and recycling area to locate an area where no manufacturing processes waste or product storage has occurred.

Step 2: Using a core drill, core down a minimum of six inches or to the next subgrade level. Collect three samples from each background sampling location.

Step 3: Remove approximately one (1) inch of concrete from the bottom of each core using a hand chisel.

Step 4: To prevent cross contamination between sampling points, sampling equipment will be decontaminated after each sample by the following:

- wash with a suitable laboratory soap (alconox);
- rinse with tap water;
- rinse with 1:4 solution of nitric acid/distilled water;
- rinse with distilled water;
- rinse with hexane; and
- air dry.

Step 5: Collect at least a 200 gram sample from the bottom of each core sample.

Step 6: Store concrete samples in glass jars with teflon seals and place on ice.

Step 7: Submit samples to a certified laboratory for analysis. All samples will be accomplished with a chain of custody (see Appendix Q).

Step 8: Use the method described below to statistically verify background levels.

To ensure the virgin concrete and not the subgrade and/or contaminated concrete is being analyzed, the procedure described above has been developed. Concrete background samples will also be analyzed for all parameters listed under Table 13.1 and additional Appendix IX parameters (identified in that area) to verify the concrete has not been contaminated from past operations. The presence of hazardous constituents other than metallic would indicate contamination from past operations.

A statistical analysis will also be performed on the background samples to determine if the metal constituents are

representative of on-site background levels. The statistical approach discussed in Chapter 9 of Test Methods for Evaluating Solid Waste for Simple Random Sampling (See Appendix S) will be followed.

13.4.3.6 Wipe Samples

To determine if the closure performance standards have been met for the storage/recycling tanks, the tanks will be sampled in the following manner:

Step 1: Mark off one (1) area of $0.50m^2$ on the inside and the outside surface of the storage and recycling tanks ($0.25m^2$ is for organic sampling and $0.25m^2$ is for metals sampling).

Step 2: For organic analysis, hold cotton gauze in a metal clamp (or equivalent and saturate the gauze with hexane. For metal analyses, use dilute nitric acid (1:4 nitric acid/deionized water) in place of hexane.

Step 3: While still holding the hexane saturated gauze in the clamp, wipe half ($0.25m^2$) of the sampling area back and forth repeatedly in vertical direction, applying moderate pressure. Turn the gauze over and wipe back and forth in the horizontal direction.

Step 4: Place the gauze in a glass jar with a teflon seal and store in a cooler on ice.

Step 5: Repeat steps 3 and 4 with the dilute nitric acid saturated gauze.

Step 6: Submit samples to a certified laboratory with a chain of custody (see Appendix Q).

The wipe samples for a particular tank will be analyzed for all parameters shown on Table 13.1 and any additional constituents identified by that area's Appendix IX sampling event. The samples will be pretreated as discussed in Section 13.4.5).

13.4.4 Sample Containers and Preservation

The various samples (concrete and wipe) collected under Section 13.4.3 will be placed into the appropriate container and preserved as shown on Table 13.2.

13.4.5 Analytical Procedures

The various samples will be collected and stored as described above and in previous sections. Upon delivery to the certified laboratory, the samples will be analyzed for the appropriate parameters as discussed in the preceding sections. Due to the sample matrices (solids such as concrete), and pathways of concern, some samples must be pretreated prior to analysis by

the appropriate method for a given parameter. The recommended pretreatment methods for the various samples are shown on Table 13.3. The recommended analytical methods for the identified hazardous constituents are included as Table 13.4.

## TABLE 13.2

## SAMPLE COLLECTION/PRESERVATION REQUIREMENTS

MACDERMID, INC.
526 HUNTINGDON AVENUE
WATERBURY, CONNECTICUT

| Sample Type (sample size) | Parameter | Container | Preservation | Holding Time |
|---|---|---|---|---|
| Concrete (200 g) | Metals | Glass | Cool to 4°C | 6 months |
| Concrete (200 g) | Organics | Glass[1] | Cool to 4°C | 7 days[2] |
| Wipe (N/A) | Metals | Glass | Cool to 4°C | 6 months |
| Wipe (N/A) | Organics | Glass[1] | Cool to 4°C | 7 days[2] |

[1] With teflon seal.
[2] Until extraction, 40 days after extraction.

TABLE 13.3

RECOMMENDED PRETREATMENT METHODS[1]

MACDERMID, INC.
526 HUNTINGDON AVENUE
WATERBURY, CONNECTICUT

Recommended Pretreatment Methods

| Sample | Parameter | Mass Analysis | Leachability | Description |
|---|---|---|---|---|
| Concrete | Metals | 3050 | 1310 | Certification Sampling |
| Concrete | Volatile Organics | 5030 | TCLP[2] | Certification Sampling |
| Concrete | Metals | 3050 | 1310 | Background Sampling |
| Concrete | Volatile Organics | 5030 | TCLP[2] | Background Sampling |
| Concrete | Metals | 3050 | 1310 | Appendix IX Sampling |
| Concrete | Volatile Organics | 5030 | TCLP[2] | Appendix IX Sampling |
| Wipe | Metals | 3050 | N/A | Certification Sampling |
| Wipe | Volatile Organics | 5030 | N/A | Certification Sampling |

1 Test Methods for the Evaluation of Solid Waste Physical/Chemical Methods, EPA Sw-846, 3rd Edition, November, 1986.

2 Toxicity Characteristic Leaching Procedure, 40 CFR Part 268, Appendix I.

## TABLE 13.4

## RECOMMENDED ANALYTICAL METHODS[1]

MACDERMID, INC.
526 HUNTINGDON AVENUE
WATERBURY, CONNECTICUT

| Parameter | EPA Method[2] |
|---|---|
| Barium | 7080 |
| Cadmium | 7130/7131 |
| Chromium | 7190/7191 |
| Copper | 7210 |
| Lead | 7420/7421 |
| Nickel | 7520 |
| Tin | 7870 |
| Zinc | 7950 |
| Chlorobenzene | 8010 |
| Ethyl Benzene | 8020 |
| Isobutanol | 8015 |
| Methylene Chloride | 8010 |
| Tetrachloroethylene | 8010 |
| Toluene | 8020 |
| 1,1,1-Trichloroethane | 8010 |
| Trichlorofluoromethane | 8010 |
| Trichloroethylene | 8010 |
| Xylene | 8020 |

1 Test Methods for the Evaluation of Solid Waste Physical/Chemical Methods, EPA SW-846, 3rd Edition, November, 1986.

2 When analyzing a sample, the most appropriate analytical method for a particular constituent will be chosen when a choice is listed.

13.4.6 Field Quality Assurance/Quality Control Program

To monitor the field sampling activities certain QA/QC activities must be performed to ensure the accuracy and validity of samples collected and the corresponding results. During closure activities, equipment, field and trip blanks will be utilized. These blanks will be utilized for the background concrete, certification concrete and certification wipe. These blanks will be taken with a minimum frequency of one of each type per twenty samples per day. Equipment blanks will consist of deionized water that is transported to the site, opened in the field, poured through or over the sampling device, collected in a sample container and sent to the laboratory. Field blanks will consist of deionized water that is transported to the site, transferred from one container to another, and sent to the laboratory. Trip blanks will consist of deionized water that is transported to the site and sent to the laboratory without being opened.

13.4.7 Personnel Protection

All personnel involved in the inspection, sampling, decontamination, and removal activities will have been trained with respect to the applicable provisions of the Occupational Health and Safety Act. To ensure the safety of the site workers, appropriate personal protec-

tion equipment will be utilized as required for the site activity in progress.

Recommended personal protection levels for the different site activities are shown on Table 13.5. The appropriate personal protective equipment for the different levels of protection is shown on Table 13.6.

To determine when conditions exist which would cause the contingent level of protection to be utilized, ambient air monitoring of the work area will be conducted as described in Section 13.4.1.1.

13.4.8 Equipment Decontamination

To carry out the closure activities outlined in this report, the following equipment will be utilized:

- Dry/wet vacuums
- Vacuum truck with necessary hoses (if necessary)
- Roll-off
- Shovels
- Steam jenny
- 55-gallon drums
- Squeegees
- Concrete core drill
- hammer and chisel
- Air purification respirators
- Jackhammer

Prior to placing this equipment back into service, the procedure outlined below will be followed to remove any residue.

TABLE 13.5

RECOMMENDED LEVELS
OF
PERSONAL PROTECTION

MACDERMID, INC.
526 HUNTINGDON AVENUE
WATERBURY, CONNECTICUT

| Activity | Personnel | Recommended Level of Protection |
|---|---|---|
| Removal of Waste Material | All personnel | Level C |
| Decontamination of the Floors and Tanks | All personnel | Level C |
| Sampling | All personnel | Level D (Level C) |

Criteria for upgrading to the contingent level of personal protection are as follows:

| | |
|---|---|
| Level D - Level C | Ambient air reading in the breathing zone above background readings. |

TABLE 13.6

PERSONAL PROTECTIVE EQUIPMENT

MACDERMID, INC.
526 HUNTINGDON AVENUE
WATERBURY, CONNECTICUT

| Level | Equipment |
|---|---|
| D | Work Clothes<br>Work Boots<br>Gloves<br>Safety Glasses<br>Chemical-Resistant Boots*<br>Hard Hat* |
| C | Full-Face Air Purifying Respirator<br>Chemical-Resistant Clothing<br>Chemical-Resistant Gloves<br>Chemical-Resistant Boots |

* Optional

Step 1: All decontamination procedures will be performed in an area located away from any floor drains, floor trenches, etc. To prevent any runoff from this area, a 4-6 mil piece of plastic will be elevated 6-8 inches using sandbags or bags of absorbent material stationed around the decontamination area.

Step 2: Equipment will be first cleaned using brushing and brooms to remove any visible residue.

Step 3: All residue (liquid) collected from this operation will be placed in 55-gallon drums for off-site disposal at a permitted hazardous waste facility.

Step 4: To remove any residue remaining on the equipment, the following washing procedure will be followed:

Small Equipment

A. Small equipment such as shovels will be washed and rinsed over an open 55-gallon drum. A laboratory soap, containing the active ingredient trisodium phosphate will be used in the washing operation.

B. The wash and rinse waters will be collected in the 55-gallon drum for off-site disposal at a permitted hazardous waste facility, if required after analysis.

C. Any spillage from this operation will be absorbed with speedi-dry or sand and shoveled in a 55-gallon drum for off-site disposal at a permitted hazardous waste facility.

Large Equipment

A. Large equipment such as the back-hoe, if required, will be first stationed on a 4-6 mil piece of plastic. The four sides of this plastic will then be elevated 6-8 inches using bags of sand/absorbent material to form a dike to collect wash and rinse waters.

B. Using brushes and brooms, the large equipment will be washed using a laboratory soap containing the active ingredient trisodium phosphate.

C. Using pressurized water, all soap will be removed.

D. The wash and rinses collected in the dike will then be pumped into 55-gallon drums for off-site disposal at a permitted hazardous waste facility.

E. Following removal of wash and rinse water, the piece of plastic will be placed in a 55-gallon drum for off-site disposal at a permitted hazardous waste facility.

Step 5: All disposable safety equipment such as coveralls, gloves, etc., will be collected in 55-gallon drums and disposed of off-site at a permitted hazardous waste facility.

Sampling and analysis of equipment after decontamination is not considered necessary. Rather, a visual examination verifying removal of all soil and stains should be sufficient to ensure that all contaminants are removed.

All decontamination work will be supervised and performed using qualified personnel. Qualified personnel will be required to be trained regarding the hazards of the substances which they may be exposed to and in the proper use of personal protective equipment prior to the start of decontaminating activities.

13.4.9 Schedule for Closure

The expected year for closing MacDermid, Inc.'s facility is projected to be 2050. Tables 13.7 and 13.8 detail the closure schedules for the container storage areas and the storage/recycling tanks.

13.4.10 Extension of Closure Time

If, after the approval of the closure plan, it is determined the closure time period is to exceed 180 days, MacDermid, Inc. will submit a petition for a closure time extension which justifies that a longer period of closure time is necessary. This petition will be submitted at least 30 days prior to the expiration of the 180 day closure period.

TABLE 13.7

CLOSURE SCHEDULE FOR CONTAINER STORAGE AREAS

MACDERMID, INC.
526 HUNTINGDON AVENUE
WATERBURY, CONNECTICUT

| | Closure Activity | Completion Date |
|---|---|---|
| 1. | Notify the EPA and CT-DEP of expected closure | Day 1 |
| 2. | Final date for accepting wastes | Day 180 |
| 3. | Removal of leftover wastes | Day 210 |
| 4. | Conducted Appendix IX Sampling as discussed in Section 13.4.3.2 | Day 240* |
| 5. | Decontaminate the concrete floors as discussed in Section 13.4.1.3 | Day 300 |
| 6. | Inspect concrete floors for cracks and gaps | Day 300* |
| 7. | Sample the concrete floor and suspect areas as discussed in Sections 13.4.3.3, 13.4.3.4, and 13.4.3.5 | Day 310* |
| 8. | Review analytical results to determine if clean closure has been achieved. If cannot be achieved submit a modified closure plan to US EPA and CT-DEP (See Section 13.4.11) | Day 330* |
| 9. | Disposal of rinse water, contaminated clean-up material and contaminated personal protective equipment | Day 330 |
| 10. | Certification of closure by a Professional Engineer | Day 360* |

*NOTE: Closure activity will be supervised by the certifying organization.

TABLE 13.8

CLOSURE SCHEDULE FOR WASTE
STORAGE/RECYCLING TANKS AND STORAGE AREAS

MACDERMID, INC.
526 HUNTINGDON AVENUE
WATERBURY, CONNECTICUT

| | Closure Activity | Completion Date |
|---|---|---|
| 1. | Notify the EPA and CT-DEP of expected closure | Day 1 |
| 2. | Final date for accepting wastes | Day 180 |
| 3. | Removal of leftover wastes | Day 210 |
| 4. | Conduct Appendix IX sampling as discussed in Section 13.4.3.2 | Day 220* |
| 5. | Decontaminate the inside and outside of the tanks, piping and structural supports as discussed in Section 13.4.2.3 | Day 240* |
| 6. | Collect wipe samples as discussed in Section 13.4.3.6 | Day 250* |
| 7. | Review analytical results to determine if closure performance standards can be achieved | Day 280* |
| 8. | Based on results, remove tanks and dispose of off-site at a permitted hazardous waste facility or used equipment supplier/scrap metal dealer | Day 280* |
| 9. | Inspect concrete floors for cracks and gaps | Day 300* |
| 10. | Sample the concrete floor and suspect areas as discussed in Sections 13.4.3.3, 13.4.3.4 and 13.4.3.5 | Day 300* |
| 11. | Review analytical results to determine if clean closure has been achieved. If cannot be achieved, submit a modified closure plan to US EPA and CT-DEP (see Section 13.4.11) | Day 330* |
| 12. | Disposal of rinse water, contaminated clean-up material and contaminated personal protective equipment | Day 330 |
| 13. | Certification of closure by a Professional Engineer | Day 360* |

*NOTE: Closure activity will be supervised by the certifying organization.

13.4.11 Amendment of Closure Plan

In accordance with Section 265.112(c), MacDermid will amend the closure plan prior to closure whenever: (1) changes in operating plans or facility design affects the closure plan; or (2) whenever there is a change in the expected year of closure of the facility. These amendments will be made at least 60 days prior to the proposed change in facility design or operation, or no later than 60 days after an unexpected event has occurred which has affected the closure plan.

Following approval of the closure plan and implementation of the closure activities, MacDermid, Inc. will submit a modified plan within thirty (30) days after an unexpected event. Such unexpected event shall include the inability to close the regulated units "clean". If extensive contamination exists and closure cannot be completed according to the approved plan, MacDermid, Inc. will submit a modified plan to close the storage/recycling area with the appropriate post-closure. If the amendment to the plan is defined as a major modification according to 40 CFR 270.41 and 270.42, the modification to the plan will have to be approved according to the procedures in 40 CFR 265.112(d)(4).

### 13.4.12 Closure Cost Estimate

In accordance with Section 265.142 and 265.197, the estimated costs to complete closure of the storage/ recycling area is provided in Tables 13.9 and 13.10. All costs are based on 1990 dollars and assume a third party to perform the closure activities. These costs are based upon the following:

1. Operator @ $40/hour
2. Supervisor @ $50/hour
3. Disposal of wastes at the following rates

| | |
|---|---|
| • Contaminated clean-up and personal protective equipment | $250/drum |
| • Decontamination rinse water | $150/drum<br>$.50/gal.(bulk) |

4. Waste transportation @ $300/trip
5. Equipment

| | |
|---|---|
| • Basic safety equipment (per person) | $ 75/day |
| • Tools | $ 25/day |
| • Air Monitoring Equipment | $100/day |
| • Pressure Washer | $150/day |

6. Professional Engineer @ $95/hour
7. Laboratory Analysis

| | |
|---|---|
| • Wipe sample | $ 250 |
| • Concrete sample | $ 500 |
| • Appendix IX sample | $3,000 |

8. Waste Materials

| | |
|---|---|
| • 55 gallon drums | $200/drum |
| • Bulk Waste | $1/gallon |
| • Metal Hydroxide/Sulfide Sludge | $250/cu.yd. |
| • Storage Tote (330 gallons) | $750/tote |
| • Tanks | $350/ton |

TABLE 13.9
CLOSURE COSTS - CONTAINER STORAGE AREAS

MACDERMID, INC.
526 HUNTINGDON AVENUE
WATERBURY, CONNECTICUT

| | | |
|---|---|---|
| A. | Disposal of drummed wastes and roll-off | |
| | • 1,280 drums x $200/drum (main container storage area) | $256,000 |
| | • 20 totes x $750/tote (main container storage area) | 15,000 |
| | • 16 drums x $200/drum (flammable materials storage area) | 3,200 |
| | • 54 drums x $200/drum (combustible storage area) | 10,800 |
| | • 5 totes x $750/tote (combustible storage area) | 3,750 |
| | • 1 roll-off x 26 cubic yards/roll-off x $250/cubic yard | 6,500 |
| B. | Transportation of drummed wastes and roll-off | |
| | • 1,375 drums/totes x trip/80 containers x $300/trip | 5,156 |
| | • 1 roll-off x trip/roll-off x $1,500/trip | 1,500 |
| C. | Labor to handle drummed wastes and roll-off | |
| | • 1,375 drums ÷ 80 drums/hr. x $40/hr. | 688 |
| | • 1 roll-off x 1 hr./roll-off x $40/hr. | 40 |
| | • 7 hours supervision x $50/hr. | 350 |
| D. | Decontamination of Storage Areas | |
| | • 2,000 gallons of rinse water @ $.50/gal. | 1,000 |
| | • Transportation | 300 |
| | • Operators (2) time @ 80 hrs./each x $40/hr. | 6,400 |
| | • Supervisor time @ 16 hrs. x $50/hr. | 800 |
| | • Pressure washer rental @ 5 days x $150/day | 750 |
| | • Safety equipment & tools @ $200/day x 15 days x 2 operators | 6,000 |
| | • Appendix IX Analysis @ 4 samples x $3,000/sample | 12,000 |
| | • Laboratory Analysis of concrete @ 20 samples x $500/sample | 10,000 |
| E. | Disposal of Personal Protective Equipment | |
| | • Disposal of 1 drum x $750/drum | 750 |
| | • Transportation | 300 |
| F. | Professional Engineer Certification of Closure | |
| | • 8 hours x $95/hr. | 760 |
| | TOTAL | $342,044 |
| | SAY | $342,000 |

TABLE 13.10

CLOSURE COSTS - WASTE STORAGE/RECYCLING TANKS AND STORAGE AREAS

MACDERMID, INC.
526 HUNTINGDON AVENUE
WATERBURY, CONNECTICUT

| | | |
|---|---|---|
| A. | Disposal of bulk waste | |
| | • 29,000 gallons x $100/gallon (waste storage tanks) | $ 92,775 |
| | • 63,775 gallons x $100/gallon (recycling tanks) | |
| B. | Transportation | |
| | • 92,775 gallons x trip/5,000 gallons x $300/trip | 5,700 |
| C. | Labor to handle bulk waste | |
| | • 4 hours operators time x $40/hour | 160 |
| | • 2 hours supervisors time x $50/hour | 100 |
| D. | Decontamination of Storage Area & Tanks | |
| | • 9,275 gallons of rinse water @ $0.50/gallon | 4,638 |
| | • Transportation | 600 |
| | • Operators (2) time @ 20 hours/each x $40/hour | 1,600 |
| | • Supervisor time @ 4 hours x $50/hour | 200 |
| | • Pressure washer rental @ 2 days x $150/day | 300 |
| | • Safety equipment & tools @ $200/day x 2 operators x 2 days | 800 |
| | • Laboratory analysis | |
| | 4 Appendix IX samples @ $3,000/sample | 12,000 |
| | 24 concrete samples x $500/sample | 10,000 |
| | 48 wipe samples x $250/sample | 12,000 |
| E. | Disposal of personal protective equipment | |
| | • Disposal of 1 drum x $750/drum | 750 |
| | • Transportation | 300 |
| F. | Professional Engineer - Certification of Closure | |
| | • 2 hours x $95/hour | 190 |
| | TOTAL | $142,118 |
| | SAY | $142,000 |

13.4.13 Certification of Closure

Certification at the completion of closure by a Licensed Professional Engineer is required. A member of the certifying organization will be present during all major closure activities to assure that the approved closure plan is executed (see Tables 13.7 and 13.8). The following certification will be submitted to the EPA Region I Administrator and the Connecticut Department of Environmental Protection within 60 days of completion of closure activities.

"I, _____, for_____ or _____, a hazardous waste TSDF, and I, _____, P.E., employed by _____ certify by means of signatures, that the facility named above has been closed in accordance with the method specified by the Closure Plan and attached hereto.

Closure was completed on _____, after receiving the final volume of material on _____.

| | |
|---|---|
| _____ | _____P.E. |
| Company Name | Engineer |
| _____ | _____ |
| Date | Date |

Along with the closure certification, a list of departures from the plan, a photographic record, sampling results, manifests and any other pertinent documents verifying closure will be provided to the CT-DEP and EPA.

13.5 Partial Closure

Partial closure is not expected nor projected for this facility. In the event that the facility determines that it is necessary to close a part of this facility, the closure plan will be amended to indicate the closure schedule for partial closure. In such circumstances, the amended closure plan will be submitted to the EPA Regional Administrator 180 days before partial closure is expected to begin.

Partial closure of any portion of the facility will be carried out according to the procedures detailed in Section 13.4.

13.6 Closure Cost Adjustment [40 CFR 264.142(b) and (c)]

Within thirty (30) days after the end of MacDermid, Inc.'s fiscal year, the closure cost estimate (see Section 13.4.12) will be adjusted using the Department of Commerce's Annual Implicit Price Deflator for the Gross National product. The closure cost will also be revised no later than thirty (30) days following DEP's approval of a modification request (e.g. determine contamination is to the subgrade), if the change in the closure plan increases the cost of closure.

## 14.0 FINANCIAL REQUIREMENTS [40 CFR 264 Subpart H, 270.14(b)(16), (b)(17) and (b)(18)]

### 14.1 Financial Assurance for Closure [40 CFR 264.143(f)]

MacDermid, Inc. has and will continue to provide financial assurance for closure of the 526 Huntingdon Avenue facility by the financial test.

Provided in Appendix T is a copy of the letter signed by the Treasurer and worded as specified in 40 CFR Section 264.151(f). A copy of the independent certified public accountant's report on the examination of MacDermid's latest financial statements and a special report from MacDermid's certified public accountant as required under 40 CFR 264.143(f)(3)(ii) and (f)(3)(iii) are also provided under Appendix T.

### 14.2 Cost Estimate for Post-Closure Care [40 CFR 264.144]

Not applicable to MacDermid, Inc.

### 14.3 Financial Assurance for Post-Closure Care [40 CFR 264.145]

Not applicable to MacDermid, Inc.

### 14.4 Use of a Mechanism for Financial Assurance of Both Closure and Post-Closure Care [40 CFR 264.146]

MacDermid, Inc. has provided financial assurance of closure for the 526 Huntingdon Avenue by the financial test (see Section 14.1). The requirements of post-closure care are not applicable to MacDermid, Inc.

## 14.5 Liability Requirements [40 CFR 264.174]

### 14.5.1 Coverage for Sudden Accidental Occurrences [40 CFR 264.147(a)]

MacDermid, Inc. has met the requirements of this section by means of obtaining liability coverage for sudden and non-sudden accidental occurrences in the amount of $3,000,000 per occurrence and $6,000,000 annual aggregate from the National Union Fire Insurance Company (see Appendix U). In accordance with 264.147(a), MacDermid, Inc. will maintain a minimum liability coverage for sudden and non-sudden accidental occurrences in the amount of $1,000,000 per occurrence and $2,000,000 annual aggregate.

### 14.5.2 Coverage for Non-Sudden Accidental Occurrences [40 CFR 264.147(b)]

Not applicable to MacDermid, Inc.

### 14.5.3 Request for Variance [40 CFR 264.147(c)]

Not applicable to MacDermid, Inc.

### 14.5.4 Adjustments by the Regional Administrator [40 CFR 264.147(d)]

MacDermid, Inc. will provide, within a reasonable time, any information requested by EPA and DEP to determine whether cause exists for an adjustment in the level or type of coverage for the 526 Huntingdon Avenue facility in Waterbury, Connecticut.

14.5.5 Period of Coverage [40 CFR 264.147(e)]

In accordance with this Section, the EPA and DEP must notify MacDermid, Inc. within sixty (60) days after receiving final closure certifications from MacDermid, Inc. and an independent registered professional engineer that liability coverage is no longer required for the 526 Huntingdon Avenue facility.

14.5.6 Financial Test for Liability Coverage [40 CFR 264.147(f)]

Not applicable to MacDermid, Inc.

14.5.7 Hazardous Waste Facility Liability Endorsement or certificate of liability Insurance [40 CFR 264.147(g)]

Not applicable to MacDermid, Inc.

14.6 Incapacity of Owners or Operators, Guarantors, or Financial Institutions [40 CFR 264.148]

In accordance with 40 CFR Section 264.148, MacDermid, Inc. will establish, in the event of bankruptcy, other financial assurance or liability coverage within sixty (60) days after such an event.

14.7 Use of State-Required Mechanisms [40 CFR 264.149]

Not applicable to MacDermid, Inc.

14.8 State Assumption of Responsibility [40 CFR 264.150]

Not applicable to MacDermid, Inc.

14.9 Wording of the Instruments [40 CFR 264.151]

The wording of the instruments used by MacDermid, Inc. for closure care and liability coverage meet the criteria specified in 40 CFR 264.151(f) and 264.151(i), respectively (see Appendices T and U).

14.10 Part B - Post-Closure Cost Estimate [40 CFR 270.14(b)(16)]

Not applicable to MacDermid, Inc.

14.11 Part B - Insurance Policy [40 CFR 270.14(b)(17)]

A copy of MacDermid's insurance policy documentation is provided in Appendices T and U.

14.12 Part B - State Financial Mechanism [40 CFR 270.14(b)(18)]

Not applicable to MacDermid, Inc.

## 15.0 OTHER FEDERAL LAWS [40 CFR Section 270.14(b)(20)]

MacDermid, Inc.'s 526 Huntingdon Avenue facility in Waterbury, Connecticut is believed to be in compliance with the following Federal laws: Clean Water Act; Clean Air Act; Toxic Substance Control Act' Occupational Safety and Health Act; Fungicides, Insecticide, Rodenticide Act; Wild an Scenic Rivers Act; National Historic Preservation Act of 1966; Endangered Species Act; Coastal Zone Management Act; Fish and Wildlife Coordination Act.

MacDermid, Inc. will provide information as necessary for the Regional Administrator to carry out his duties under other Federal laws.

## 16.0 APPLICATION CERTIFICATION

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this document and all attachments and that, based upon my inquiry of those individuals immediately responsible for obtaining the information, I believe that the information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including possible fines and imprisonment.

Date: 5-10-90 Signature: Michael A. Pfaff

# APPENDIX A

## MARCH 19, 1985
## PART A APPLICATION

HRP
ASSOCIATES, INC.

...es are spaced for elite type, i.e., 12 characters/inch). Form Approved OMB No. 158-R0175

FORM 1 GENERAL

U.S. ENVIRONMENTAL PROTECTION AGENCY

# GENERAL INFORMATION

Consolidated Permits Program

(Read the "General Instructions" before starting.)

**I. EPA I.D. NUMBER**

F CTD001164599

LABEL ITEMS

I. EPA I.D. NUMBER

III. FACILITY NAME

V. FACILITY MAILING ADDRESS

VI. FACILITY LOCATION

PLEASE PLACE LABEL IN THIS SPACE

GENERAL INSTRUCTIONS

If a preprinted label has been provided, ... it in the designated space. Review the inf... ation carefully; if any of it is incorrect, ... through it and enter the correct data i... appropriate fill-in area below. Also, if a... the preprinted data is absent (*the area to... left of the label space lists the inform... that should appear*), please provide it in... proper fill-in area(s) below. If the lab... complete and correct, you need not com... items I, III, V, and VI (*except VI-B w... must be completed regardless*). Complet... items if no label has been provided. Refe... the instructions for detailed item des... tions and for the legal authorizations u... which this data is collected.

## II. POLLUTANT CHARACTERISTICS

INSTRUCTIONS: Complete A through J to determine whether you need to submit any permit application forms to the EPA. If you answer "yes" to a... questions, you must submit this form and the supplemental form listed in the parenthesis following the question. Mark "X" in the box in the third colum... if the supplemental form is attached. If you answer "no" to each question, you need not submit any of these forms. You may answer "no" if your activi... is excluded from permit requirements; see Section C of the instructions. See also, Section D of the instructions for definitions of bold-faced terms.

| SPECIFIC QUESTIONS | MARK "X" YES | NO | FORM ATTACHED | SPECIFIC QUESTIONS | MARK "X" YES | NO | FORM ATT... |
|---|---|---|---|---|---|---|---|
| A. Is this facility a publicly owned treatment works which results in a discharge to waters of the U.S.? (FORM 2A) | | X | | B. Does or will this facility (*either existing or proposed*) include a concentrated animal feeding operation or aquatic animal production facility which results in a discharge to waters of the U.S.? (FORM 2B) | | X | |
| C. Is this a facility which currently results in discharges to waters of the U.S. other than those described in A or B above? (FORM 2C) | | X | | D. Is this a proposed facility (*other than those described in A or B above*) which will result in a discharge to waters of the U.S.? (FORM 2D) | | X | |
| E. Does or will this facility treat, store, or dispose of hazardous wastes? (FORM 3) | XX | | | F. Do you or will you inject at this facility industrial or municipal effluent below the lowermost stratum containing, within one quarter mile of the well bore, underground sources of drinking water? (FORM 4) | | X | |
| G. Do you or will you inject at this facility any produced water or other fluids which are brought to the surface in connection with conventional oil or natural gas production, inject fluids used for enhanced recovery of oil or natural gas, or inject fluids for storage of liquid hydrocarbons? (FORM 4) | | X | | H. Do you or will you inject at this facility fluids for special processes such as mining of sulfur by the Frasch process, solution mining of minerals, in situ combustion of fossil fuel, or recovery of geothermal energy? (FORM 4) | | X | |
| I. Is this facility a proposed stationary source which is one of the 28 industrial categories listed in the instructions and which will potentially emit 100 tons per year of any air pollutant regulated under the Clean Air Act and may affect or be located in an attainment area? (FORM 5) | | X | | J. Is this facility a proposed stationary source which is NOT one of the 28 industrial categories listed in the instructions and which will potentially emit 250 tons per year of any air pollutant regulated under the Clean Air Act and may affect or be located in an attainment area? (FORM 5) | | X | |

## III. NAME OF FACILITY

1 SKIP MACDERMID INCORPORATED

## IV. FACILITY CONTACT

| A. NAME & TITLE (last, first, & title) | B. PHONE (area code & no.) |
|---|---|
| 2 KOEHLER, FORBES R CORP IND ENGR | 203 575 5700 |

## V. FACILITY MAILING ADDRESS

A. STREET OR P.O. BOX

3 526 HUNTINGDON AVENUE

| B. CITY OR TOWN | C. STATE | D. ZIP CODE |
|---|---|---|
| 4 WATERBURY | CT | 06708 |

## VI. FACILITY LOCATION

A. STREET, ROUTE NO. OR OTHER SPECIFIC IDENTIFIER

5 526 HUNTINGDON AVENUE

B. COUNTY NAME

NEW HAVEN

| C. CITY OR TOWN | D. STATE | E. ZIP CODE | F. COUNTY CODE (if known) |
|---|---|---|---|
| 6 WATERBURY | CT | 06708 | |

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CONTINUE ON RE...

SIC CODES (4-digit, in order of priority)

| A. FIRST | B. SECOND |
|---|---|
| 2899 (specify) CHEMICAL PREPARATIONS | (specify) |
| C. THIRD | D. FOURTH |
| (specify) | (specify) |

## VIII. OPERATOR INFORMATION

| A. NAME | B. Is the name listed in Item VIII-A also the owner? |
|---|---|
| MACDERMID INCORPORATED | XX YES ☐ NO |

| C. STATUS OF OPERATOR (Enter the appropriate letter into the answer box; if "Other", specify.) | D. PHONE (area code & no.) |
|---|---|
| F = FEDERAL M = PUBLIC (other than federal or state) S = STATE O = OTHER (specify) P = PRIVATE — P (specify) | A 203 575 5700 |

| E. STREET OR P.O. BOX | F. CITY OR TOWN | G. STATE | H. ZIP CODE | IX. INDIAN LAND |
|---|---|---|---|---|
| 526 HUNTINGDON AVENUE | WATERBURY | CT | 06708 | Is the facility located on Indian lands? ☐ YES XXX NO |

## X. EXISTING ENVIRONMENTAL PERMITS

| A. NPDES (Discharges to Surface Water) | D. PSD (Air Emissions from Proposed Sources) |
|---|---|
| 9 N CT0024988 | 9 P |
| **B. UIC (Underground Injection of Fluids)** | **E. OTHER (specify)** |
| 9 U | 9 [illegible] DEP/HWM 028 (specify) Ct Interim Storage Permit |
| **C. RCRA (Hazardous Wastes)** | **E. OTHER (specify)** |
| 9 R | 9 [illegible] CTHW-330 (specify) Ct Waste Hauler Permit |

## XI. MAP

Attach to this application a topographic map of the area extending to at least one mile beyond property boundaries. The map must show the outline of the facility, the location of each of its existing and proposed intake and discharge structures, each of its hazardous waste treatment, storage, or disposal facilities, and each well where it injects fluids underground. Include all springs, rivers and other surface water bodies in the map area. See instructions for precise requirements.

## XII. NATURE OF BUSINESS (provide a brief description)

The principle business of MacDermid, Inc. is the blending or compounding of chemical materials used for processing by the metal finishing, plating on plastics and printed cirucit industries. As an adjunct to the principle business, the company provides the facilities and capability for beneficially recovering for recycling certain materials such as copper, ammonia, chromium, tin-lead and nickel compounds which are by-products of the manufacturing processes of customers of the company. Through such processes, they are temporarily stored on-site. Ultimately, all recycled material is removed from the site through off-site reclamation or on-site reclamation.

## XIII. CERTIFICATION (see instructions)

*I certify under penalty of law that I have personally examined and am familiar with the information submitted in this application and all attachments and that, based on my inquiry of those persons immediately responsible for obtaining the information contained in the application, I believe that the information is true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.*

| A. NAME & OFFICIAL TITLE (type or print) | B. SIGNATURE | C. DATE SIGNED |
|---|---|---|
| Reginald H. Post, VP Manufacturing | Reginald H Post | 3-19-85 |

COMMENTS FOR OFFICIAL USE ONLY

spaced for elite type, i.e., 12 characters/inch). Form Approved OMB No. 158-S0004

U.S. ENVIRONMENTAL PROTECTION AGENCY

# EPA HAZARDOUS WASTE PERMIT APPLICATION

Consolidated Permits Program

(This information is required under Section 3005 of RCRA.)

RCRA

I. EPA I.D. NUMBER: F C T D 0 0 1 1 6 4 5 9 9 T/A C 1

**FOR OFFICIAL USE ONLY**

| APPLICATION APPROVED | DATE RECEIVED (yr., mo., & day) | COMMENTS |
|---|---|---|
| | | |

## II. FIRST OR REVISED APPLICATION

Place an "X" in the appropriate box in A or B below *(mark one box only)* to indicate whether this is the first application you are submitting for your facility or a revised application. If this is your first application and you already know your facility's EPA I.D. Number, or if this is a revised application, enter your facility's EPA I.D. Number in Item I above.

A. FIRST APPLICATION *(place an "X" below and provide the appropriate date)*

☐ 1. EXISTING FACILITY *(See instructions for definition of "existing" facility. Complete item below.)*

C 8 — YR. 7 2 — MO. 0 5 — DAY 0 1

FOR EXISTING FACILITIES, PROVIDE THE DATE (yr., mo., & day) OPERATION BEGAN OR THE DATE CONSTRUCTION COMMENCED *(use the boxes to the left)*

☐ 2. NEW FACILITY *(Complete item below.)*

YR. — MO. — DAY

FOR NEW FACILITIES, PROVIDE THE DATE *(yr., mo., & day)* OPERATION BEGAN OR IS EXPECTED TO BEGIN

B. REVISED APPLICATION *(place an "X" below and complete Item I above)*

☒ 1. FACILITY HAS INTERIM STATUS Presently for wastes as of 3/85

☐ 2. FACILITY HAS A RCRA PERMIT

## III. PROCESSES – CODES AND DESIGN CAPACITIES

A. PROCESS CODE – Enter the code from the list of process codes below that best describes each process to be used at the facility. Ten lines are provided for entering codes. If more lines are needed, enter the code(s) in the space provided. If a process will be used that is not included in the list of codes below, then describe the process *(including its design capacity)* in the space provided on the form *(Item III-C)*.

B. PROCESS DESIGN CAPACITY – For each code entered in column A enter the capacity of the process.

1. AMOUNT – Enter the amount.
2. UNIT OF MEASURE – For each amount entered in column B(1), enter the code from the list of unit measure codes below that describes the unit of measure used. Only the units of measure that are listed below should be used.

| PROCESS | PROCESS CODE | APPROPRIATE UNITS OF MEASURE FOR PROCESS DESIGN CAPACITY |
|---|---|---|
| **Storage:** | | |
| CONTAINER *(barrel, drum, etc.)* | S01 | GALLONS OR LITERS |
| TANK | S02 | GALLONS OR LITERS |
| WASTE PILE | S03 | CUBIC YARDS OR CUBIC METERS |
| SURFACE IMPOUNDMENT | S04 | GALLONS OR LITERS |
| **Disposal:** | | |
| INJECTION WELL | D79 | GALLONS OR LITERS |
| LANDFILL | D80 | ACRE-FEET *(the volume that would cover one acre to a depth of one foot)* OR HECTARE-METER |
| LAND APPLICATION | D81 | ACRES OR HECTARES |
| OCEAN DISPOSAL | D82 | GALLONS PER DAY OR LITERS PER DAY |
| SURFACE IMPOUNDMENT | D83 | GALLONS OR LITERS |
| **Treatment:** | | |
| TANK | T01 | GALLONS PER DAY OR LITERS PER DAY |
| SURFACE IMPOUNDMENT | T02 | GALLONS PER DAY OR LITERS PER DAY |
| INCINERATOR | T03 | TONS PER HOUR OR METRIC TONS PER HOUR; GALLONS PER HOUR OR LITERS PER HOUR |
| OTHER *(Use for physical, chemical, thermal or biological treatment processes not occurring in tanks, surface impoundments or incinerators. Describe the processes in the space provided; Item III-C.)* | T04 | GALLONS PER DAY OR LITERS PER DAY |

| UNIT OF MEASURE | UNIT OF MEASURE CODE | UNIT OF MEASURE | UNIT OF MEASURE CODE | UNIT OF MEASURE | UNIT OF MEASURE CODE |
|---|---|---|---|---|---|
| GALLONS | G | LITERS PER DAY | V | ACRE-FEET | A |
| LITERS | L | TONS PER HOUR | D | HECTARE-METER | F |
| CUBIC YARDS | Y | METRIC TONS PER HOUR | W | ACRES | B |
| CUBIC METERS | C | GALLONS PER HOUR | E | HECTARES | Q |
| GALLONS PER DAY | U | LITERS PER HOUR | H | | |

**EXAMPLE FOR COMPLETING ITEM III** *(shown in line numbers X-1 and X-2 below)*: A facility has two storage tanks, one tank can hold 200 gallons and the other can hold 400 gallons. The facility also has an incinerator that can burn up to 20 gallons per hour.

C DUP T/A C 1

| LINE NUMBER | A. PROCESS CODE (from list above) | B. PROCESS DESIGN CAPACITY 1. AMOUNT (specify) | 2. UNIT OF MEASURE (enter code) | FOR OFFICIAL USE ONLY | LINE NUMBER | A. PROCESS CODE (from list above) | B. PROCESS DESIGN CAPACITY 1. AMOUNT | 2. UNIT OF MEASURE (enter code) | FOR OFFICIAL USE ONLY |
|---|---|---|---|---|---|---|---|---|---|
| X-1 | S 0 2 | 600 | G | | 5 | | | | |
| X-2 | T 0 3 | 20 | E | | 6 | | | | |
| 1 | S 0 1 | 40,000 (Wastes) | G | | 7 | | This page submitted only | | |
| 2 | S 0 1 | 96,800 (Reclaim)* | G | | 8 | | to revise Item 2 from | | |
| 3 | S 0 2 | 29,000 (Reclaim)* | G | | 9 | | 99,000 G to 96,800 G. All else from Revision 3/19/85 | | |
| 4 | | *Recyclable Materials | | | 10 | | remains the same. Cherie D. Hicks 5/02/85 | | |

566-572

...om page 2.
...notocopy this page before completing if you have more than 26 wastes to list.

Form Approved OMB No. 158-S80004

EPA I.D. NUMBER (enter from page 1) W C T D 0 0 1 1 6 4 5 9 9 T/A 1 C

FOR OFFICIAL USE ONLY W DUP T/A 2 C DUP

## IV. DESCRIPTION OF HAZARDOUS WASTES (continued)

| LINE NO. | A. EPA HAZARD. WASTE NO. (enter code) | B. ESTIMATED ANNUAL QUANTITY OF WASTE | C. UNIT OF MEASURE (enter code) | D. PROCESSES 1. PROCESS CODES (enter) | | | | 2. PROCESS DESCRIPTION (If a code is not entered in D(1)) |
|---|---|---|---|---|---|---|---|---|
| 1 | | FOR WASTE MATERIAL | | | | | | |
| 2 | F 0 0 6 | 250,000 | P | S 0 1 | | | | These are in pounds |
| 3 | D 0 0 1 | 700,000 | P | S 0 1 | | | | |
| 4 | D 0 0 2 | 100,000 | P | S 0 1 | | | | |
| 5 | D 0 0 3 | 7000 | P | S 0 1 | | | | |
| 6 | D 0 0 7 | 2000 | P | S 0 1 | | | | |
| 7 | D 0 0 8 | 10,000 | P | S 0 1 | | | | |
| 8 | F 0 0 1 | 10,000 | P | S 0 1 | | | | |
| 9 | | | | | | | | |
| 10 | | FOR RECYCLED MATERIAL | | | | | | |
| 11 | D 0 0 2 | 17,551,600 | P | S 0 1 | S 0 2 | | | These are in pounds |
| 12 | D 0 0 4 | Included in the above | | | | | | |
| 13 | D 0 0 8 | Included in the above | | | | | | |
| 14 | D 0 0 8 | 900,000 | P | S01 | | | | |
| 15 | D 0 0 7 | 10,000 | P | S01 | | | | |
| 16 | | | | | | | | |
| 17 | | | | | | | | |
| 18 | | | | | | | | |
| 19 | | | | | | | | Revised November 5, 1987 |
| 20 | | | | | | | | Cherrie D. Gillis |
| 21 | | | | | | | | Compliance Administrator |
| 22 | | | | | | | | |
| 23 | | | | | | | | |
| 24 | | | | | | | | |
| 25 | | | | | | | | |
| 26 | | | | | | | | |

EPA Form 3510-3 (6-80)

CONTINUE ON REVERSE

.. the front.

## ..CRIPTION OF HAZARDOUS WASTES *(continued)*

..SE THIS SPACE TO LIST ADDITIONAL PROCESS CODES FROM ITEM D(1) ON PAGE 3.

EPA I.D. NO. *(enter from page 1)*

| S | | | | | | | | | | | | T/A | C |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| F | C | T | D | 0 | 0 | 1 | 1 | 6 | 4 | 5 | 9 | 9 | | 6 |

## V. FACILITY DRAWING

All existing facilities must include in the space provided on page 5 a scale drawing of the facility *(see instructions for more detail).*

## VI. PHOTOGRAPHS

All existing facilities must include photographs *(aerial or ground—level)* that clearly delineate all existing structures; existing storage, atment and disposal areas; and sites of future storage, treatment or disposal areas *(see instructions for more detail).*

## .. FACILITY GEOGRAPHIC LOCATION

| LATITUDE *(degrees, minutes, & seconds)* | LONGITUDE *(degrees, minutes, & seconds)* |
|---|---|
| 41 34 396 | 73 03 225 |

## VIII. FACILITY OWNER

XX A. If the facility owner is also the facility operator as listed in Section VIII on Form 1, "General Information", place an "X" in the box to the left and skip to Section IX below.

B. If the facility owner is not the facility operator as listed in Section VIII on Form 1, complete the following items:

| 1. NAME OF FACILITY'S LEGAL OWNER | 2. PHONE NO. *(area code & no.)* |
|---|---|
| E | |

| 3. STREET OR P.O. BOX | 4. CITY OR TOWN | 5. ST. | 6. ZIP CODE |
|---|---|---|---|
| F | G | | |

## IX. OWNER CERTIFICATION

*I certify under penalty of law that I have personally examined and am familiar with the information submitted in this and all attached documents, and that based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the submitted information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.*

| A. NAME *(print or type)* | B. SIGNATURE | C. DATE SIGNED |
|---|---|---|
| Reginald H. Post | Reginald H Post | 3-19-85 |

## X. OPERATOR CERTIFICATION

*I c[illegible]y under penalty of law that I have personally examined and am familiar with the information submitted in this and all attached d[illegible]ents, and that based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the submitted information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.*

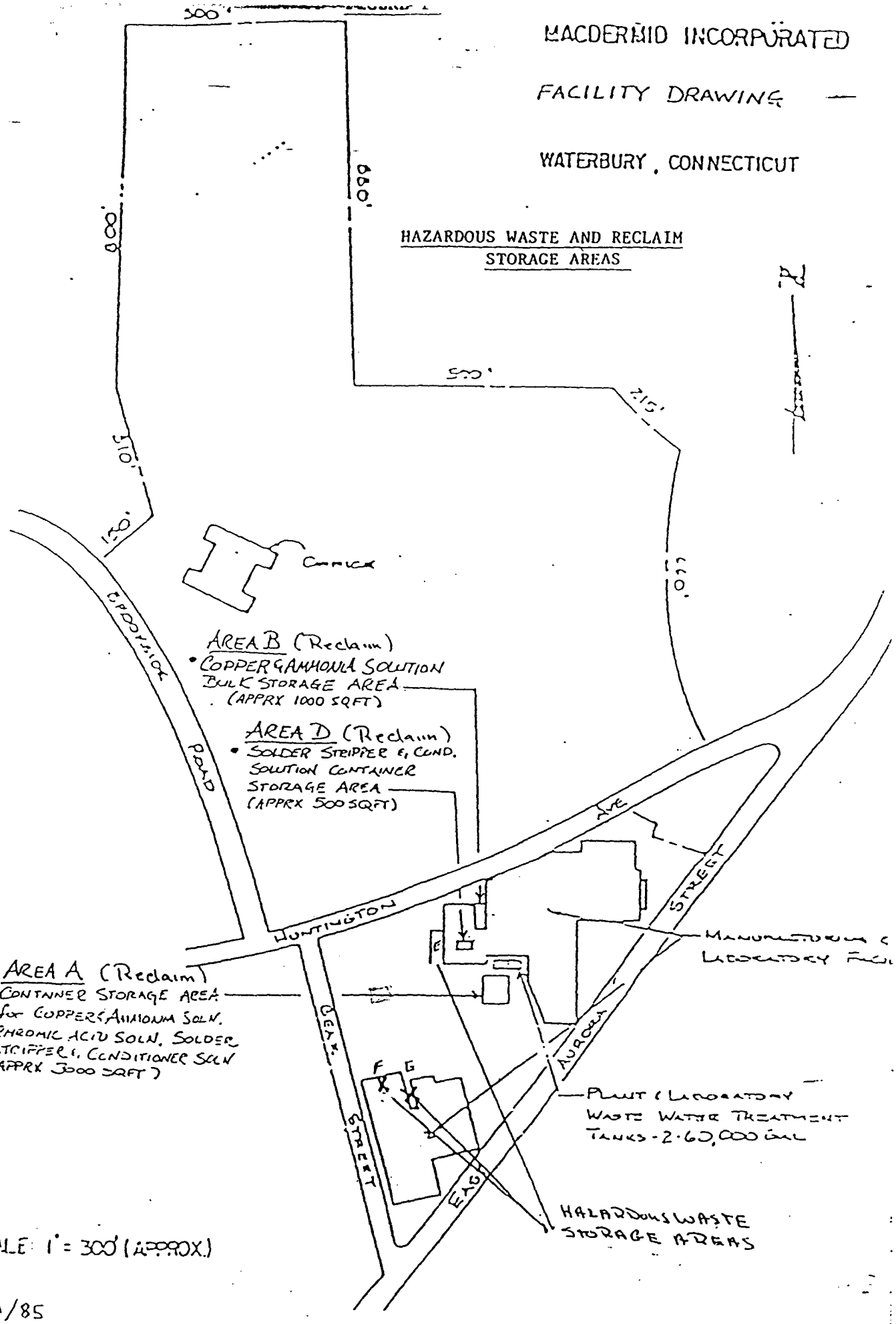
| A. NAME *(print or type)* | B. SIGNATURE | C. DATE SIGNED |
|---|---|---|
| Reginald H. Post | Reginald H Post | 3-19-85 |

MACDERMID INCORPORATED

FACILITY DRAWING

WATERBURY, CONNECTICUT

HAZARDOUS WASTE AND RECLAIM STORAGE AREAS




SCALE 1" = 300' (APPROX.)

1/1/85

# APPENDIX B

## NOVEMBER 8, 1988
## PART A APPLICATION

(fill–in areas are spaced for elite type, i.e., 12 characters/inch).

Form Approved OMB No. 158-R0175

FORM 1 GENERAL

EPA

U.S. ENVIRONMENTAL PROTECTION AGENCY

# GENERAL INFORMATION

*Consolidated Permits Program*

*(Read the "General Instructions" before starting.)*

**I. EPA I.D. NUMBER**

F C T D 0 0 1 1 6 4 5 9 9

LABEL ITEMS

I. EPA I.D. NUMBER

III. FACILITY NAME

V. FACILITY MAILING ADDRESS

VI. FACILITY LOCATION

PLEASE PLACE LABEL IN THIS SPACE

**GENERAL INSTRUCTIONS**

If a preprinted label has been provided, affix it in the designated space. Review the information carefully; if any of it is incorrect, cross through it and enter the correct data in the appropriate fill–in area below. Also, if any of the preprinted data is absent *(the area to the left of the label space lists the information that should appear)*, please provide it in the proper fill–in area*(s)* below. If the label is complete and correct, you need not complete Items I, III, V, and VI *(except VI-B which must be completed regardless)*. Complete all items if no label has been provided. Refer to the instructions for detailed item descriptions and for the legal authorizations under which this data is collected.

## II. POLLUTANT CHARACTERISTICS

INSTRUCTIONS: Complete A through J to determine whether you need to submit any permit application forms to the EPA. If you answer "yes" to any questions, you must submit this form and the supplemental form listed in the parenthesis following the question. Mark "X" in the box in the third column if the supplemental form is attached. If you answer "no" to each question, you need not submit any of these forms. You may answer "no" if your activity is excluded from permit requirements; see Section C of the instructions. See also, Section D of the instructions for definitions of bold–faced terms.

| SPECIFIC QUESTIONS | MARK 'X' YES | NO | FORM ATTACHED | SPECIFIC QUESTIONS | MARK 'X' YES | NO | FORM ATTACHED |
|---|---|---|---|---|---|---|---|
| A. Is this facility a **publicly owned treatment works** which results in a **discharge to waters of the U.S.**? (FORM 2A) | | X | | B. Does or will this facility *(either existing or proposed)* include a **concentrated animal feeding operation** or **aquatic animal production facility** which results in a **discharge to waters of the U.S.**? (FORM 2B) | | X | |
| C. Is this a facility which currently results in **discharges** to **waters of the U.S.** other than those described in A or B above? (FORM 2C) | | X | | D. Is this a proposed facility *(other than those described in A or B above)* which will result in a **discharge** to **waters of the U.S.**? (FORM 2D) | | X | |
| E. Does or will this facility treat, store, or dispose of **hazardous wastes**? (FORM 3) | X | | X | F. Do you or will you inject at this facility industrial or municipal effluent below the lowermost stratum containing, within one quarter mile of the well bore, underground sources of drinking water? (FORM 4) | | X | |
| G. Do you or will you inject at this facility any produced water or other fluids which are brought to the surface in connection with conventional oil or natural gas production, inject fluids used for enhanced recovery of oil or natural gas, or inject fluids for storage of liquid hydrocarbons? (FORM 4) | | X | | H. Do you or will you inject at this facility fluids for special processes such as mining of sulfur by the Frasch process, solution mining of minerals, in situ combustion of fossil fuel, or recovery of geothermal energy? (FORM 4) | | X | |
| I. Is this facility a proposed **stationary source** which is one of the 28 industrial categories listed in the instructions and which will potentially emit 100 tons per year of any air pollutant regulated under the Clean Air Act and may affect or be located in an **attainment area**? (FORM 5) | | X | | J. Is this facility a proposed **stationary source** which is NOT one of the 28 industrial categories listed in the instructions and which will potentially emit 250 tons per year of any air pollutant regulated under the Clean Air Act and may affect or be located in an **attainment area**? (FORM 5) | | X | |

## III. NAME OF FACILITY

1 SKIP M A C D E R M I D  I N C O R P O R A T E D

## IV. FACILITY CONTACT

| A. NAME & TITLE *(last, first, & title)* | B. PHONE *(area code & no.)* |
|---|---|
| 2 L A N D O N  C A R L  E.  V I C E  P R E S.  A M I D | 2 0 3 / 5 7 5 / 5 7 0 0 |

## V. FACILITY MAILING ADDRESS

A. STREET OR P.O. BOX

3 5 2 6  H U N T I N G D O N  A V E N U E

| B. CITY OR TOWN | C. STATE | D. ZIP CODE |
|---|---|---|
| 4 W A T E R B U R Y | C T | 0 6 7 0 8 |

## VI. FACILITY LOCATION

A. STREET, ROUTE NO. OR OTHER SPECIFIC IDENTIFIER

5 5 2 6  H U N T I N G D O N  A V E N U E

B. COUNTY NAME

N E W  H A V E N

| C. CITY OR TOWN | D. STATE | E. ZIP CODE | F. COUNTY CODE *(if known)* |
|---|---|---|---|
| 6 W A T E R B U R Y | C T | 0 6 7 0 8 | |

CONTINUED FROM THE FRONT

## VII. SIC CODES (4-digit, in order of priority)

| A. FIRST | B. SECOND |
|---|---|
| 7 28 99 (specify) Chemical Preparations | 7 (specify) |
| **C. THIRD** | **D. FOURTH** |
| 7 (specify) | 7 (specify) |

## VIII. OPERATOR INFORMATION

A. NAME: 8 MACDERMID INCORPORATED

B. Is the name listed in Item VIII-A also the owner? XXX YES ☐ NO

C. STATUS OF OPERATOR (Enter the appropriate letter into the answer box; if "Other", specify.)
F - FEDERAL, M - PUBLIC (other than federal or state), S - STATE, O - OTHER (specify), P - PRIVATE: P (specify)

D. PHONE (area code & no.): A 203 575 5700

E. STREET OR P.O. BOX: 526 HUNTINGDON AVENUE

F. CITY OR TOWN: 8 WATERBURY

G. STATE: CT

H. ZIP CODE: 06708

## IX. INDIAN LAND

Is the facility located on Indian lands? ☐ YES XX NO

## X. EXISTING ENVIRONMENTAL PERMITS

| | | |
|---|---|---|
| A. NPDES (Discharges to Surface Water) | 9 N CT0024988 | |
| D. PSD (Air Emissions from Proposed Sources) | 9 P | |
| B. UIC (Underground Injection of Fluids) | 9 U | |
| E. OTHER (specify) | 9 DEP / HWM 028 | (specify) CT Intermim Storage Permit |
| C. RCRA (Hazardous Wastes) | 9 R | |
| E. OTHER (specify) | 9 CTHW - 330 | (specify) CT Waste Hauler Permit |

## XI. MAP

Attach to this application a topographic map of the area extending to at least one mile beyond property bounderies. The map must show the outline of the facility, the location of each of its existing and proposed intake and discharge structures, each of its hazardous waste treatment, storage, or disposal facilities, and each well where it injects fluids underground. Include all springs, rivers and other surface water bodies in the map area. See instructions for precise requirements.

## XII. NATURE OF BUSINESS (provide a brief description)

The prinicple business of MacDermid, Inc. is the manufacture and sale of process chemicals to the metal finishing, plating on plastics, electronics, micro electronics and surface treatment industries. MacDermid also provides a recycling service for certain specialty chemical products returned by their customers . Through such manufacturing and recycling operations, hazardous wastes are generated and stored temporarily on-site. Ultimately, all wastes are either: recycled on-site for resale to customers; or shipped off-site by certified waste haulers and disposed of at permitted hazardous waste disposal facilities.

## XIII. CERTIFICATION (see instructions)

*I certify under penalty of law that I have personally examined and am familiar with the information submitted in this application and all attachments and that, based on my inquiry of those persons immediately responsible for obtaining the information contained in the application, I believe that the information is true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.*

| A. NAME & OFFICIAL TITLE (type or print) | B. SIGNATURE | C. DATE SIGNED |
|---|---|---|
| Carl E. Landon | Carl Landon | 11/8/88 |

COMMENTS FOR OFFICIAL USE ONLY

(Dot—in areas are spaced for elite type, i.e., 12 characters/inch).

FORM 3 RCRA

EPA

U.S. ENVIRONMENTAL PROTECTION AGENCY

# HAZARDOUS WASTE PERMIT APPLICATION

*Consolidated Permits Program*

*(This information is required under Section 3005 of RCRA.)*

I. EPA I.D. NUMBER: F C T D 0 0 1 1 6 4 5 9 9 (T/A) 1

**FOR OFFICIAL USE ONLY**

| APPLICATION APPROVED | DATE RECEIVED (yr., mo., & day) | COMMENTS |
|---|---|---|
| | | |

## II. FIRST OR REVISED APPLICATION

Place an "X" in the appropriate box in A or B below *(mark one box only)* to indicate whether this is the first application you are submitting for your facility or a revised application. If this is your first application and you already know your facility's EPA I.D. Number, or if this is a revised application, enter your facility's EPA I.D. Number in Item I above.

A. FIRST APPLICATION *(place an "X" below and provide the appropriate date)*

[X] 1. EXISTING FACILITY *(See instructions for definition of "existing" facility. Complete item below.)*

[ ] 2. NEW FACILITY *(Complete item below.)*

FOR EXISTING FACILITIES, PROVIDE THE DATE *(yr., mo., & day)* OPERATION BEGAN OR THE DATE CONSTRUCTION COMMENCED *(use the boxes to the left)*: C 8; YR 7 2; MO. 0 5; DAY 0 1

FOR NEW FACILITIES, PROVIDE THE DATE *(yr., mo., & day)* OPERATION BEGAN OR IS EXPECTED TO BEGIN: YR; MO.; DAY

B. REVISED APPLICATION *(place an "X" below and complete Item I above)*

[X] 1. FACILITY HAS INTERIM STATUS

[ ] 2. FACILITY HAS A RCRA PERMIT

## III. PROCESSES – CODES AND DESIGN CAPACITIES

A. PROCESS CODE – Enter the code from the list of process codes below that best describes each process to be used at the facility. Ten lines are provided for entering codes. If more lines are needed, enter the code(s) in the space provided. If a process will be used that is not included in the list of codes below, then describe the process *(including its design capacity)* in the space provided on the form *(Item III-C)*.

B. PROCESS DESIGN CAPACITY – For each code entered in column A enter the capacity of the process.
1. AMOUNT – Enter the amount.
2. UNIT OF MEASURE – For each amount entered in column B(1), enter the code from the list of unit measure codes below that describes the unit of measure used. Only the units of measure that are listed below should be used.

| PROCESS | PROCESS CODE | APPROPRIATE UNITS OF MEASURE FOR PROCESS DESIGN CAPACITY |
|---|---|---|
| **Storage:** | | |
| CONTAINER *(barrel, drum, etc.)* | S01 | GALLONS OR LITERS |
| TANK | S02 | GALLONS OR LITERS |
| WASTE PILE | S03 | CUBIC YARDS OR CUBIC METERS |
| SURFACE IMPOUNDMENT | S04 | GALLONS OR LITERS |
| **Disposal:** | | |
| INJECTION WELL | D79 | GALLONS OR LITERS |
| LANDFILL | D80 | ACRE-FEET *(the volume that would cover one acre to a depth of one foot)* OR HECTARE-METER |
| LAND APPLICATION | D81 | ACRES OR HECTARES |
| OCEAN DISPOSAL | D82 | GALLONS PER DAY OR LITERS PER DAY |
| SURFACE IMPOUNDMENT | D83 | GALLONS OR LITERS |

| PROCESS | PROCESS CODE | APPROPRIATE UNITS OF MEASURE FOR PROCESS DESIGN CAPACITY |
|---|---|---|
| **Treatment:** | | |
| TANK | T01 | GALLONS PER DAY OR LITERS PER DAY |
| SURFACE IMPOUNDMENT | T02 | GALLONS PER DAY OR LITERS PER DAY |
| INCINERATOR | T03 | TONS PER HOUR OR METRIC TONS PER HOUR; GALLONS PER HOUR OR LITERS PER HOUR |
| OTHER *(Use for physical, chemical, thermal or biological treatment processes not occurring in tanks, surface impoundments or incinerators. Describe the processes in the space provided; Item III-C.)* | T04 | GALLONS PER DAY OR LITERS PER DAY |

| UNIT OF MEASURE | UNIT OF MEASURE CODE | UNIT OF MEASURE | UNIT OF MEASURE CODE | UNIT OF MEASURE | UNIT OF MEASURE CODE |
|---|---|---|---|---|---|
| GALLONS | G | LITERS PER DAY | V | ACRE-FEET | A |
| LITERS | L | TONS PER HOUR | D | HECTARE-METER | F |
| CUBIC YARDS | Y | METRIC TONS PER HOUR | W | ACRES | B |
| CUBIC METERS | C | GALLONS PER HOUR | E | HECTARES | Q |
| GALLONS PER DAY | U | LITERS PER HOUR | H | | |

**EXAMPLE FOR COMPLETING ITEM III** *(shown in line numbers X-1 and X-2 below)*: A facility has two storage tanks, one tank can hold 200 gallons and the other can hold 400 gallons. The facility also has an incinerator that can burn up to 20 gallons per hour.

C DUP (T/A) 1

| LINE NUMBER | A. PROCESS CODE (from list above) | B. PROCESS DESIGN CAPACITY 1. AMOUNT (specify) | B. 2. UNIT OF MEASURE (enter code) | FOR OFFICIAL USE ONLY | LINE NUMBER | A. PROCESS CODE (from list above) | B. PROCESS DESIGN CAPACITY 1. AMOUNT | B. 2. UNIT OF MEASURE (enter code) | FOR OFFICIAL USE ONLY |
|---|---|---|---|---|---|---|---|---|---|
| X-1 | S 0 2 | 600 | G | | 5 | | | | |
| X-2 | T 0 3 | 20 | E | | 6 | | | | |
| 1 | S 0 1 | 84,590 | G | | 7 | | | | |
| | S 0 1 | 26 (Roll-Off) | Y | | 8 | | | | |
| 3 | S 0 2 | 29,000 | G | | 9 | | | | |
| 4 | | | | | 10 | | | | |



CONTINUE ON REVERSE

## III. PROCESSES (continued)

C. SPACE FOR ADDITIONAL PROCESS CODES OR FOR DESCRIBING OTHER PROCESSES *(code "T04")*. FOR EACH PROCESS ENTERED HERE INCLUDE DESIGN CAPACITY.

## IV. DESCRIPTION OF HAZARDOUS WASTES

A. EPA HAZARDOUS WASTE NUMBER — Enter the four—digit number from 40 CFR, Subpart D for each listed hazardous waste you will handle. If you handle hazardous wastes which are not listed in 40 CFR, Subpart D, enter the four—digit number*(s)* from 40 CFR, Subpart C that describes the characteristics and/or the toxic contaminants of those hazardous wastes.

B. ESTIMATED ANNUAL QUANTITY — For each listed waste entered in column A estimate the quantity of that waste that will be handled on an annual basis. For each characteristic or toxic contaminant entered in column A estimate the total annual quantity of all the non—listed waste*(s)* that will be handled which possess that characteristic or contaminant.

C. UNIT OF MEASURE — For each quantity entered in column B enter the unit of measure code. Units of measure which must be used and the appropriate codes are:

| ENGLISH UNIT OF MEASURE | CODE | METRIC UNIT OF MEASURE | CODE |
|---|---|---|---|
| POUNDS | P | KILOGRAMS | K |
| TONS | T | METRIC TONS | M |

If facility records use any other unit of measure for quantity, the units of measure must be converted into one of the required units of measure taking into account the appropriate density or specific gravity of the waste.

D. PROCESSES

1. PROCESS CODES:
   - For listed hazardous waste: For each listed hazardous waste entered in column A select the code*(s)* from the list of process codes contained in Item III to indicate how the waste will be stored, treated and/or disposed of at the facility.
   - For non—listed hazardous wastes: For each characteristic or toxic contaminant entered in column A, select the code*(s)* from the list of process codes contained in Item III to indicate all the processes that will be used to store, treat, and/or dispose of all the non—listed hazardous wastes that possess that characteristic or toxic contaminant.
   - *Note:* Four spaces are provided for entering process codes. If more are needed: (1) Enter the first three as described above; (2) Enter "000" in the extreme right box of Item IV-D(1); and (3) Enter in the space provided on page 4 the line number and the additional code*(s)*.

2. PROCESS DESCRIPTION: If a code is not listed for a process that will be used, describe the process in the space provided on the form.

**NOTE: HAZARDOUS WASTES DESCRIBED BY MORE THAN ONE EPA HAZARDOUS WASTE NUMBER** — Hazardous wastes that can be described by more than one EPA Hazardous Waste Number shall be described on the form as follows:

1. Select one of the EPA Hazardous Waste Numbers and enter it in column A. On the same line complete columns B, C, and D by estimating the total annual quantity of the waste and describing all the processes to be used to treat, store, and/or dispose of the waste.
2. In column A of the next line enter the other EPA Hazardous Waste Number that can be used to describe the waste. In column D(2) on that line enter "included with above" and make no other entries on that line.
3. Repeat step 2 for each other EPA Hazardous Waste Number that can be used to describe the hazardous waste.

**EXAMPLE FOR COMPLETING ITEM IV** *(shown in line numbers X-1, X-2, X-3 and X-4 below)* — A facility will treat and dispose of an estimated 900 pounds per year of chrome shavings from leather tanning and finishing operation. In addition the facility will treat and dispose of three non—listed wastes. Two wastes are corrosive only and there will be an estimated 200 pounds per year of each waste. The other waste is corrosive and ignitable and there will be an estimated 100 pounds per year of that waste. Treatment will be in an incinerator and disposal will be in a landfill.

| LINE NUMBER | A. EPA HAZARDOUS WASTE NO. (enter code) | B. ESTIMATED ANNUAL QUANTITY OF WASTE | C. UNIT OF MEASURE (enter code) | D. PROCESSES 1. PROCESS CODES (enter) | 2. PROCESS DESCRIPTION (if a code is not entered in D(1)) |
|---|---|---|---|---|---|
| X-1 | K 0 5 4 | 900 | P | T 0 3 D 8 0 | |
| X-2 | D 0 0 2 | 400 | P | T 0 3 D 8 0 | |
| X-3 | 0 0 1 | 100 | P | T 0 3 D 8 0 | |
| X-4 | D 0 0 2 | | | | *included with above* |



CONTINUE ON PAGE 3

Continued from page 2.

NOTE: Photocopy this page before completing if you have more than 26 wastes to list.

Form Approved OMB No. 158-S80004

| EPA I.D. NUMBER (enter from page 1) | FOR OFFICIAL USE ONLY |
|---|---|
| W C T D 0 0 1 1 6 4 5 9 9 T/A C 1 | W DUP T/A C 2 DUP |

## IV. DESCRIPTION OF HAZARDOUS WASTES (continued)

| | A. EPA HAZARD. WASTE NO. (enter code) | B. ESTIMATED ANNUAL QUANTITY OF WASTE | C. UNIT OF MEASURE (enter code) | D. PROCESSES 1. PROCESS CODES (enter) | | | | D. PROCESSES 2. PROCESS DESCRIPTION (if a code is not entered in D(1)) |
|---|---|---|---|---|---|---|---|---|
| 1 | | For Waste Material | | | | | | |
| 2 | D 0 0 1 | 700,000 | P | S 0 1 | | | | |
| 3 | D 0 0 2 | 100,000 | P | S 0 1 | S 0 2 | | | |
| 4 | D 0 0 3 | 7,000 | P | S 0 1 | | | | |
| 5 | D 0 0 7 | 2,000 | P | S 0 1 | | | | |
| 6 | D 0 0 8 | 10,000 | P | S 0 1 | | | | |
| 7 | F 0 0 1 | 10,000 | P | S 0 1 | | | | |
| 8 | F 0 0 3 | 10,000 | P | S 0 1 | | | | |
| 9 | F 0 0 5 | 10,000 | P | S 0 1 | | | | |
| 10 | F 0 0 6 | 250,000 | P | S 0 1 | | | | |
| 11 | F 0 0 7 | 10,000 | P | S 0 1 | | | | |
| 12 | U 1 5 4 | 2,000 | P | S 0 1 | | | | |
| 13 | U 2 1 9 | 2,000 | P | S 0 1 | | | | |
| 14 | U 0 7 0 | 2,000 | P | S 0 1 | | | | |
| 15 | | For Recycled | | | | | | |
| 16 | | Material | | | | | | |
| 17 | D 0 0 2 | 18,000,000 | P | S 0 1 | S 0 2 | | | |
| 18 | D 0 0 7 | 100,000 | P | S 0 1 | | | | |
| 19 | D 0 0 8 | 900,000 | P | S 0 1 | | | | |
| 20 | C R 0 4 | 10,000 | P | S 0 1 | | | | |
| 21 | | | | | | | | |
| 22 | | | | | | | | |
| 23 | | | | | | | | |
| 24 | | | | | | | | |
| 25 | | | | | | | | |
| 26 | | | | | | | | |

Continued from the front.

## IV. DESCRIPTION OF HAZARDOUS WASTES *(continued)*

E. USE THIS SPACE TO LIST ADDITIONAL PROCESS CODES FROM ITEM D(1) ON PAGE 3.

EPA I.D. NO. *(enter from page 1)*

| S | | | | | | | | | | | | | Y/A | C |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| F | C | T | D | 0 | 0 | 1 | 1 | 6 | 4 | 5 | 9 | 9 | | 6 |
| 1 | 2 | | | | | | | | | | | 13 | 14 | 15 |

## V. FACILITY DRAWING

All existing facilities must include in the space provided on page 5 a scale-drawing of the facility *(see instructions for more detail).*

## VI. PHOTOGRAPHS

All existing facilities must include photographs *(aerial or ground–level)* that clearly delineate all existing structures; existing storage, treatment and disposal areas; and sites of future storage, treatment or disposal areas *(see instructions for more detail).*

## VII. FACILITY GEOGRAPHIC LOCATION

| LATITUDE *(degrees, minutes, & seconds)* | LONGITUDE *(degrees, minutes, & seconds)* |
|---|---|
| 41 34 396 (65–66, 67–68, 69–71) | 73 03 225 (72–74, 75–76, 77–79) |

## VIII. FACILITY OWNER

☒ A. If the facility owner is also the facility operator as listed in Section VIII on Form 1, "General Information", place an "X" in the box to the left and skip to Section IX below.

B. If the facility owner is not the facility operator as listed in Section VIII on Form 1, complete the following items:

| 1. NAME OF FACILITY'S LEGAL OWNER | 2. PHONE NO. *(area code & no.)* |
|---|---|
| C E (15–16 … 55) | (56–58) – (59–61) – (62–65) |

| 3. STREET OR P.O. BOX | 4. CITY OR TOWN | 5. ST. | 6. ZIP CODE |
|---|---|---|---|
| C F (15–16 … 45) | C G (15–16 … 40) | (41–42) | (47 … 51) |

## IX. OWNER CERTIFICATION

*I certify under penalty of law that I have personally examined and am familiar with the information submitted in this and all attached documents, and that based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the submitted information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.*

| A. NAME *(print or type)* | B. SIGNATURE | C. DATE SIGNED |
|---|---|---|
| Carl E. Landon | Carl E. Landon | 11/8/88 |

## X. OPERATOR CERTIFICATION

*I certify under penalty of law that I have personally examined and am familiar with the information submitted in this and all attached documents, and that based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the submitted information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.*

| A. NAME *(print or type)* | B. SIGNATURE | C. DATE SIGNED |
|---|---|---|
| Carl E. Landon | Carl E. Landon | 11/8/88 |



CONTINUE ON PAGE 5

Continued from page 4.

## V. FACILITY DRAWING *(see page 4)*

See Figure 2.1 of this Permit Application.

# APPENDIX C

## MAY 8, 1990
## PART A APPLICATION

HRP
ASSOCIATES, INC.

FORM 1 GENERAL

EPA

U.S. ENVIRONMENTAL PROTECTION AGENCY

# GENERAL INFORMATION

*Consolidated Permits Program*

*(Read the "General Instructions" before starting.)*

I. EPA I.D. NUMBER: F C T D 0 0 1 1 6 4 5 9 9

LABEL ITEMS

I. EPA I.D. NUMBER

III. FACILITY NAME

V. FACILITY MAILING ADDRESS

VI. FACILITY LOCATION

PLEASE PLACE LABEL IN THIS SPACE

GENERAL INSTRUCTIONS

If a preprinted label has been provided, affix it in the designated space. Review the information carefully; if any of it is incorrect, cross through it and enter the correct data in the appropriate fill-in area below. Also, if any of the preprinted data is absent *(the area to the left of the label space lists the information that should appear)*, please provide it in the proper fill-in area(s) below. If the label is complete and correct, you need not complete Items I, III, V, and VI *(except VI-B which must be completed regardless)*. Complete all items if no label has been provided. Refer to the instructions for detailed item descriptions and for the legal authorizations under which this data is collected.

## II. POLLUTANT CHARACTERISTICS

INSTRUCTIONS: Complete A through J to determine whether you need to submit any permit application forms to the EPA. If you answer "yes" to any questions, you must submit this form and the supplemental form listed in the parenthesis following the question. Mark "X" in the box in the third column if the supplemental form is attached. If you answer "no" to each question, you need not submit any of these forms. You may answer "no" if your activity is excluded from permit requirements; see Section C of the instructions. See also, Section D of the instructions for definitions of bold-faced terms.

| SPECIFIC QUESTIONS | MARK 'X' YES | NO | FORM ATTACHED | SPECIFIC QUESTIONS | MARK 'X' YES | NO | FORM ATTACHED |
|---|---|---|---|---|---|---|---|
| A. Is this facility a publicly owned treatment works which results in a discharge to waters of the U.S.? (FORM 2A) | | X | | B. Does or will this facility *(either existing or proposed)* include a concentrated animal feeding operation or aquatic animal production facility which results in a discharge to waters of the U.S.? (FORM 2B) | | X | |
| C. Is this a facility which currently results in discharges to waters of the U.S. other than those described in A or B above? (FORM 2C) | | X | | D. Is this a proposed facility *(other than those described in A or B above)* which will result in a discharge to waters of the U.S.? (FORM 2D) | | X | |
| E. Does or will this facility treat, store, or dispose of hazardous wastes? (FORM 3) | X | | X | F. Do you or will you inject at this facility industrial or municipal effluent below the lowermost stratum containing, within one quarter mile of the well bore, underground sources of drinking water? (FORM 4) | | X | |
| G. Do you or will you inject at this facility any produced water or other fluids which are brought to the surface in connection with conventional oil or natural gas production, inject fluids used for enhanced recovery of oil or natural gas, or inject fluids for storage of liquid hydrocarbons? (FORM 4) | | X | | H. Do you or will you inject at this facility fluids for special processes such as mining of sulfur by the Frasch process, solution mining of minerals, in situ combustion of fossil fuel, or recovery of geothermal energy? (FORM 4) | | X | |
| I. Is this facility a proposed stationary source which is one of the 28 industrial categories listed in the instructions and which will potentially emit 100 tons per year of any air pollutant regulated under the Clean Air Act and may affect or be located in an attainment area? (FORM 5) | | X | | J. Is this facility a proposed stationary source which is NOT one of the 28 industrial categories listed in the instructions and which will potentially emit 250 tons per year of any air pollutant regulated under the Clean Air Act and may affect or be located in an attainment area? (FORM 5) | | X | |

## III. NAME OF FACILITY

1. SKIP: MACDERMID INCORPORATED

## IV. FACILITY CONTACT

| A. NAME & TITLE (last, first, & title) | B. PHONE (area code & no.) |
|---|---|
| 2. PFAFF MICHAEL VP MRKTG & SALES | 203 575 5700 |

## V. FACILITY MAILING ADDRESS

| A. STREET OR P.O. BOX | B. CITY OR TOWN | C. STATE | D. ZIP CODE |
|---|---|---|---|
| 3. 526 HUNTINGDON AVENUE | WATERBURY | CT | 06708 |

## VI. FACILITY LOCATION

| A. STREET, ROUTE NO. OR OTHER SPECIFIC IDENTIFIER | B. COUNTY NAME |
|---|---|
| 5. 526 HUNTINGDON AVENUE | NEW HAVEN |

| C. CITY OR TOWN | D. STATE | E. ZIP CODE | F. COUNTY CODE (if known) |
|---|---|---|---|
| 6. WATERBURY | CT | 06708 | |

**VII. SIC CODES (4-digit, in order of priority)**

| A. FIRST | B. SECOND |
|---|---|
| 2899 Chemical Preparations | (specify) |
| **C. THIRD** | **D. FOURTH** |
| (specify) | (specify) |

**VIII. OPERATOR INFORMATION**

| A. NAME | B. Is the name listed in Item VIII-A also the owner? |
|---|---|
| MACDERMID INCORPORATED | ☒ YES ☐ NO |

| C. STATUS OF OPERATOR (Enter the appropriate letter into the answer box; if "Other", specify.) | D. PHONE (area code & no.) |
|---|---|
| F = FEDERAL, S = STATE, P = PRIVATE, M = PUBLIC (other than federal or state), O = OTHER (specify) — P | A 203 575 5700 |

| E. STREET OR P.O. BOX | F. CITY OR TOWN | G. STATE | H. ZIP CODE |
|---|---|---|---|
| 526 HUNTINGDON AVENUE | WATERBURY | CT | 06708 |

**IX. INDIAN LAND**

Is the facility located on Indian lands? ☐ YES ☒ NO

**X. EXISTING ENVIRONMENTAL PERMITS**

| | |
|---|---|
| A. NPDES (Discharges to Surface Water): N CTD002498 8 | D. PSD (Air Emissions from Proposed Sources): P |
| B. UIC (Underground Injection of Fluids): U | E. OTHER (specify): DEP/HWM028 — (specify) CT Interim Storage Permit |
| C. RCRA (Hazardous Wastes): D | E. OTHER (specify): CTHW 330 — (specify) |

**XI. MAP**

Attach to this application a topographic map of the area extending to at least one mile beyond property boundaries. The map must show the outline of the facility, the location of each of its existing and proposed intake and discharge structures, each of its hazardous waste treatment, storage, or disposal facilities, and each well where it injects fluids underground. Include all springs, rivers and other surface water bodies in the map area. See instructions for precise requirements.

**XII. NATURE OF BUSINESS (provide a brief description)**

The principle business of MacDermid, Inc. is the manufacture and sale of process chemicals to the metal finishing, plating on plastics, electronics, micro electronics and surface treatment industries. MacDermid also provides a recycling service for certain specialty chemical products returned by their customers. Through such manufacturing and recycling operations, hazardous wastes are generated and stored temporarily on-site. Ultimately, all wastes are either: recycled on-site for resale to customers; or shipped off-site by certified waste haulers and disposed of at permitted hazardous waste disposal facilities.

**XIII. CERTIFICATION (see instructions)**

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this application and all attachments and that, based on my inquiry of those persons immediately responsible for obtaining the information contained in the application, I believe that the information is true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.

| A. NAME & OFFICIAL TITLE (type or print) | B. SIGNATURE | C. DATE SIGNED |
|---|---|---|
| Michael A. Pfaff<br>VP. Marketing & Sales | Michael A. Pfaff | 5/8/90 |

**XIV. FOR OFFICIAL USE ONLY**

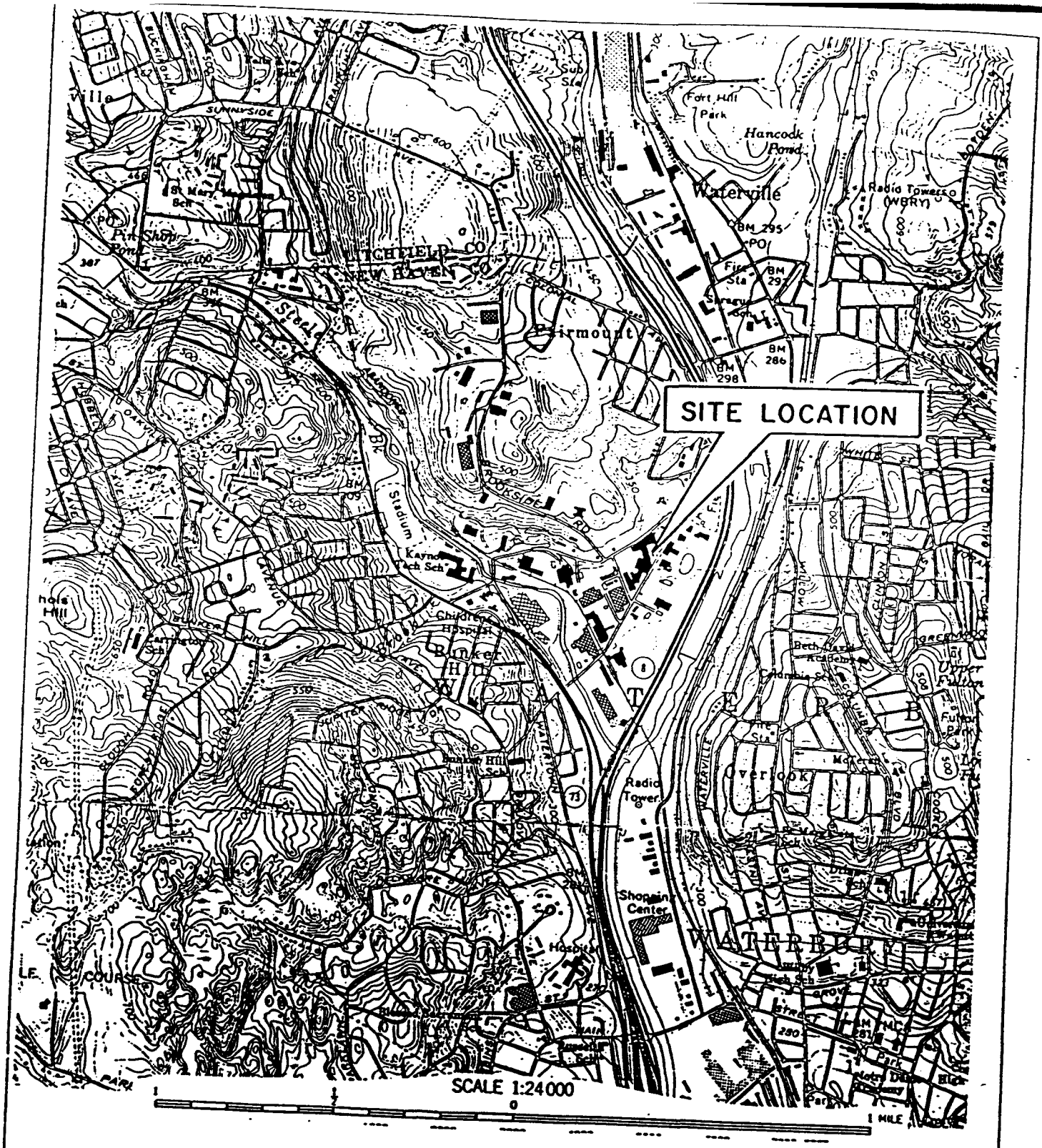
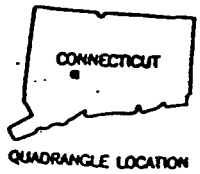



FIGURE 1.1
SITE LOCATION MAP
MAC DERMID, INC.
526 HUNTINGDON AVE.
WATERBURY, CT.



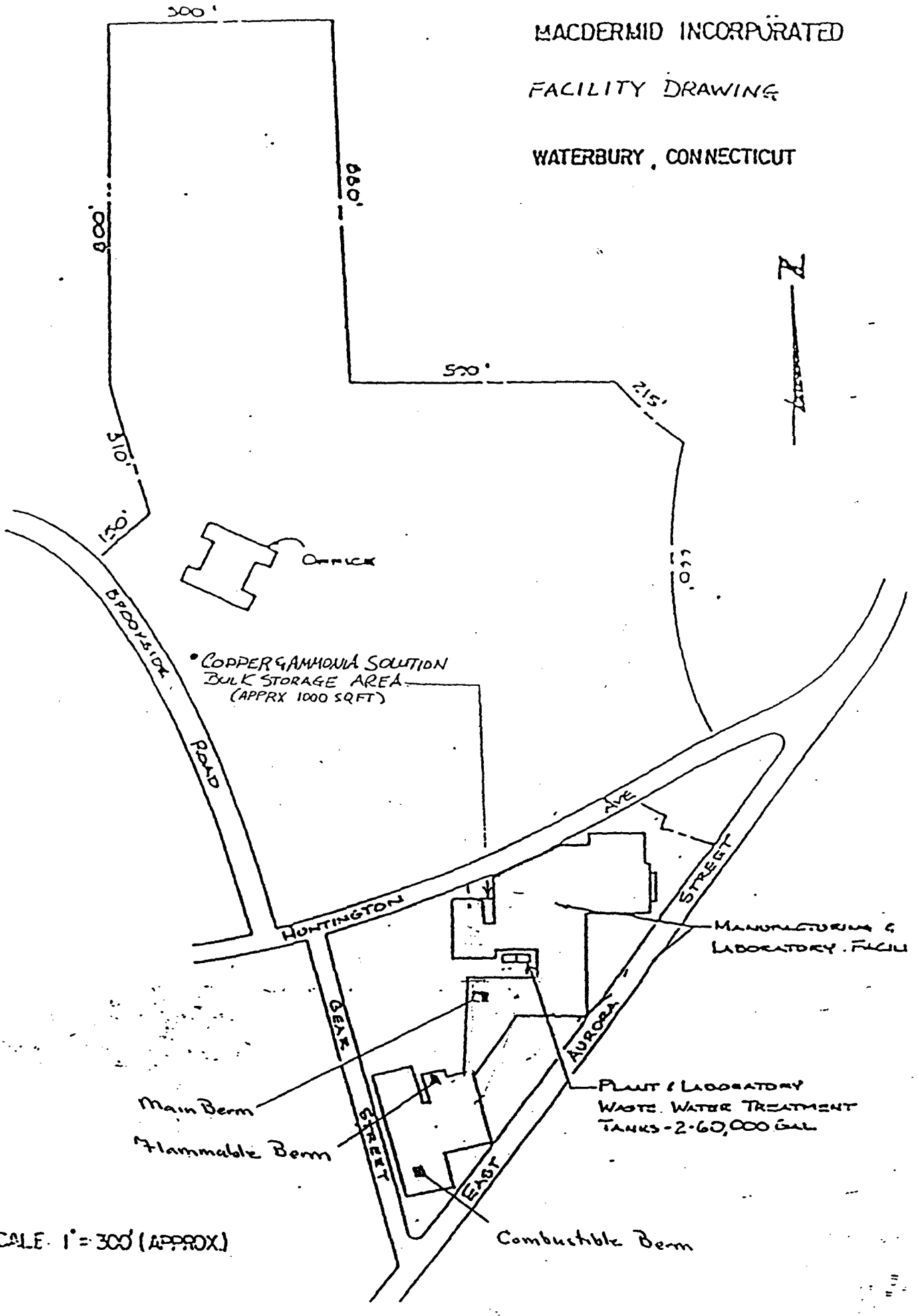

QUADRANGLE LOCATION

hrp associates inc.

MACDERMID INCORPORATED

FACILITY DRAWING

WATERBURY, CONNECTICUT




SCALE 1" = 300' (APPROX)

(fill-in areas are spaced for elite type, i.e., 12 characters/inch).

Form Approved OMB No. 158-S80004

FORM 3 RCRA

EPA

U.S. ENVIRONMENTAL PROTECTION AGENCY

# HAZARDOUS WASTE PERMIT APPLICATION

*Consolidated Permits Program*

*(This information is required under Section 3005 of RCRA.)*

I. EPA I.D. NUMBER: F C T D 0 0 1 1 6 4 5 9 9

FOR OFFICIAL USE ONLY

| APPLICATION APPROVED | DATE RECEIVED (yr., mo., & day) | COMMENTS |
|---|---|---|
| | | |

## II. FIRST OR REVISED APPLICATION

Place an "X" in the appropriate box in A or B below *(mark one box only)* to indicate whether this is the first application you are submitting for your facility or a revised application. If this is your first application and you already know your facility's EPA I.D. Number, or if this is a revised application, enter your facility's EPA I.D. Number in Item I above.

A. FIRST APPLICATION *(place an "X" below and provide the appropriate date)*

[X] 1. EXISTING FACILITY *(See instructions for definition of "existing" facility. Complete item below.)*

FOR EXISTING FACILITIES, PROVIDE THE DATE (yr., mo., & day) OPERATION BEGAN OR THE DATE CONSTRUCTION COMMENCED *(use the boxes to the left)*: C 8 — YR. 7 2 — MO. 0 5 — DAY 0 1

[ ] 2. NEW FACILITY *(Complete item below.)*

FOR NEW FACILITIES PROVIDE THE DATE (yr., mo., & day) OPERATION BEGAN OR IS EXPECTED TO BEGIN: YR. — MO. — DAY

B. REVISED APPLICATION *(place an "X" below and complete Item I above)*

[X] 1. FACILITY HAS INTERIM STATUS

[ ] 2. FACILITY HAS A RCRA PERMIT

## III. PROCESSES – CODES AND DESIGN CAPACITIES

A. PROCESS CODE – Enter the code from the list of process codes below that best describes each process to be used at the facility. Ten lines are provided for entering codes. If more lines are needed, enter the code(s) in the space provided. If a process will be used that is not included in the list of codes below, then describe the process *(including its design capacity)* in the space provided on the form *(Item III-C)*.

B. PROCESS DESIGN CAPACITY – For each code entered in column A enter the capacity of the process.

1. AMOUNT – Enter the amount.
2. UNIT OF MEASURE – For each amount entered in column B(1), enter the code from the list of unit measure codes below that describes the unit of measure used. Only the units of measure that are listed below should be used.

| PROCESS | PROCESS CODE | APPROPRIATE UNITS OF MEASURE FOR PROCESS DESIGN CAPACITY |
|---|---|---|
| **Storage:** | | |
| CONTAINER *(barrel, drum, etc.)* | S01 | GALLONS OR LITERS |
| TANK | S02 | GALLONS OR LITERS |
| WASTE PILE | S03 | CUBIC YARDS OR CUBIC METERS |
| SURFACE IMPOUNDMENT | S04 | GALLONS OR LITERS |
| **Disposal:** | | |
| INJECTION WELL | D79 | GALLONS OR LITERS |
| LANDFILL | D80 | ACRE-FEET *(the volume that would cover one acre to a depth of one foot)* OR HECTARE-METER |
| LAND APPLICATION | D81 | ACRES OR HECTARES |
| OCEAN DISPOSAL | D82 | GALLONS PER DAY OR LITERS PER DAY |
| SURFACE IMPOUNDMENT | D83 | GALLONS OR LITERS |

| PROCESS | PROCESS CODE | APPROPRIATE UNITS OF MEASURE FOR PROCESS DESIGN CAPACITY |
|---|---|---|
| **Treatment:** | | |
| TANK | T01 | GALLONS PER DAY OR LITERS PER DAY |
| SURFACE IMPOUNDMENT | T02 | GALLONS PER DAY OR LITERS PER DAY |
| INCINERATOR | T03 | TONS PER HOUR OR METRIC TONS PER HOUR; GALLONS PER HOUR OR LITERS PER HOUR |
| OTHER *(Use for physical, chemical, thermal or biological treatment processes not occurring in tanks, surface impoundments or incinerators. Describe the processes in the space provided; Item III-C.)* | T04 | GALLONS PER DAY OR LITERS PER DAY |

| UNIT OF MEASURE | UNIT OF MEASURE CODE | UNIT OF MEASURE | UNIT OF MEASURE CODE | UNIT OF MEASURE | UNIT OF MEASURE CODE |
|---|---|---|---|---|---|
| GALLONS | G | LITERS PER DAY | V | ACRE-FEET | A |
| LITERS | L | TONS PER HOUR | D | HECTARE-METER | F |
| CUBIC YARDS | Y | METRIC TONS PER HOUR | W | ACRES | B |
| CUBIC METERS | C | GALLONS PER HOUR | E | HECTARES | Q |
| GALLONS PER DAY | U | LITERS PER HOUR | H | | |

**EXAMPLE FOR COMPLETING ITEM III** *(shown in line numbers X-1 and X-2 below)*: A facility has two storage tanks, one tank can hold 200 gallons and the other can hold 400 gallons. The facility also has an incinerator that can burn up to 20 gallons per hour.

C DUP 1

| LINE NUMBER | A. PROCESS CODE (from list above) | B. PROCESS DESIGN CAPACITY 1. AMOUNT (specify) | B. 2. UNIT OF MEASURE (enter code) | FOR OFFICIAL USE ONLY | LINE NUMBER | A. PROCESS CODE (from list above) | B. PROCESS DESIGN CAPACITY 1. AMOUNT | B. 2. UNIT OF MEASURE (enter code) | FOR OFFICIAL USE ONLY |
|---|---|---|---|---|---|---|---|---|---|
| X-1 | S 0 2 | 600 | G | | 5 | | | | |
| X-2 | T 0 3 | 20 | E | | 6 | | | | |
| 1 | S 0 1 | 82,170 | G | | 7 | | | | |
| 2 | S 0 1 | 26 (Roll-Off) | Y | | 8 | | | | |
| 3 | S 0 2 | 29,000 | G | | 9 | | | | |
| 4 | | | | | 10 | | | | |

Continued from the front.

## III. PROCESSES *(continued)*

C. SPACE FOR ADDITIONAL PROCESS CODES OR FOR DESCRIBING OTHER PROCESSES *(code "T04")*. FOR EACH PROCESS ENTERED HERE INCLUDE DESIGN CAPACITY.

## IV. DESCRIPTION OF HAZARDOUS WASTES

A. EPA HAZARDOUS WASTE NUMBER – Enter the four–digit number from 40 CFR, Subpart D for each listed hazardous waste you will handle. If you handle hazardous wastes which are not listed in 40 CFR, Subpart D, enter the four–digit number*(s)* from 40 CFR, Subpart C that describes the characteristics and/or the toxic contaminants of those hazardous wastes.

B. ESTIMATED ANNUAL QUANTITY – For each listed waste entered in column A estimate the quantity of that waste that will be handled on an annual basis. For each characteristic or toxic contaminant entered in column A estimate the total annual quantity of all the non–listed waste*(s)* that will be handled which possess that characteristic or contaminant.

C. UNIT OF MEASURE – For each quantity entered in column B enter the unit of measure code. Units of measure which must be used and the appropriate codes are:

| ENGLISH UNIT OF MEASURE | CODE | METRIC UNIT OF MEASURE | CODE |
|---|---|---|---|
| POUNDS | P | KILOGRAMS | K |
| TONS | T | METRIC TONS | M |

If facility records use any other unit of measure for quantity, the units of measure must be converted into one of the required units of measure taking into account the appropriate density or specific gravity of the waste.

D. PROCESSES

1. PROCESS CODES:
   **For listed hazardous waste:** For each listed hazardous waste entered in column A select the code*(s)* from the list of process codes contained in Item III to indicate how the waste will be stored, treated, and/or disposed of at the facility.
   **For non–listed hazardous wastes:** For each characteristic or toxic contaminant entered in column A, select the code*(s)* from the list of process codes contained in Item III to indicate all the processes that will be used to store, treat, and/or dispose of all the non–listed hazardous wastes that possess that characteristic or toxic contaminant.
   Note: Four spaces are provided for entering process codes. If more are needed: (1) Enter the first three as described above; (2) Enter "000" in the extreme right box of Item IV-D(1); and (3) Enter in the space provided on page 4, the line number and the additional code*(s)*.

2. PROCESS DESCRIPTION: If a code is not listed for a process that will be used, describe the process in the space provided on the form.

**NOTE: HAZARDOUS WASTES DESCRIBED BY MORE THAN ONE EPA HAZARDOUS WASTE NUMBER** – Hazardous wastes that can be described by more than one EPA Hazardous Waste Number shall be described on the form as follows:

1. Select one of the EPA Hazardous Waste Numbers and enter it in column A. On the same line complete columns B,C, and D by estimating the total annual quantity of the waste and describing all the processes to be used to treat, store, and/or dispose of the waste.
2. In column A of the next line enter the other EPA Hazardous Waste Number that can be used to describe the waste. In column D(2) on that line enter "included with above" and make no other entries on that line.
3. Repeat step 2 for each other EPA Hazardous Waste Number that can be used to describe the hazardous waste.

**EXAMPLE FOR COMPLETING ITEM IV** ***(shown in line numbers X-1, X-2, X-3, and X-4 below)*** – A facility will treat and dispose of an estimated 900 pounds per year of chrome shavings from leather tanning and finishing operation. In addition, the facility will treat and dispose of three non–listed wastes. Two wastes are corrosive only and there will be an estimated 200 pounds per year of each waste. The other waste is corrosive and ignitable and there will be an estimated 100 pounds per year of that waste. Treatment will be in an incinerator and disposal will be in a landfill.

| LINE NO. | A. EPA HAZARD. WASTE NO. (enter code) | B. ESTIMATED ANNUAL QUANTITY OF WASTE | C. UNIT OF MEASURE (enter code) | D. PROCESSES 1. PROCESS CODES (enter) | D. PROCESSES 2. PROCESS DESCRIPTION (if a code is not entered in D(1)) |
|---|---|---|---|---|---|
| X-1 | K054 | 900 | P | T03 D80 | |
| | D002 | 400 | P | T03 D80 | |
| X-3 | D001 | 100 | P | T03 D80 | |
| X-4 | D002 | | | | included with above |



CONTINUE ON PAGE 3

Continued from page 2.
NOTE: Photocopy this page before completing if you have more than 26 wastes to list.

Form Approved OMB No. 158-S80004

EPA I.D. NUMBER (enter from page 1): CTD001164599

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## DESCRIPTION OF HAZARDOUS WASTES (continued)

| LINE NO. | A. EPA HAZARD. WASTE NO. (enter code) | B. ESTIMATED ANNUAL QUANTITY OF WASTE | C. UNIT OF MEASURE (enter code) | D. PROCESSES 1. PROCESS CODES (enter) | D. PROCESSES 2. PROCESS DESCRIPTION (if a code is not entered in D(1)) |
|---|---|---|---|---|---|
| 1 | | For Waste Material | | | |
| 2 | D001 | 700,000 | P | S01 | |
| 3 | D002 | 100,000 | P | S01 | |
| 4 | D006 | 2,000 | P | S01 | |
| 5 | D008 | 10,000 | P | S01 | |
| 6 | F002 | 10,000 | P | S01 | |
| 7 | F003 | 10,000 | P | S01 | |
| 8 | F005 | 5,000 | P | S01 | |
| 9 | F006 | 250,000 | P | S01 | |
| 10 | U154 | 2,000 | P | S01 | |
| 11 | U002 | 1,000 | P | S01 | |
| 12 | | For Recycled Material | | | |
| 13 | D002 | 20,000,000 | P | S01 S02 | |
| 14 | D008 | 100,000 | | S01 | |
| 15 | | | | | |
| 16 | | | | | |
| 17 | | | | | |
| 18 | | | | | |
| 19 | | | | | |
| 20 | | | | | |
| 21 | | | | | |
| 22 | | | | | |
| 23 | | | | | |
| 24 | | | | | |
| 25 | | | | | |
| 26 | | | | | |

Continued from the front.

## IV. DESCRIPTION OF HAZARDOUS WASTES *(continued)*

E. USE THIS SPACE TO LIST ADDITIONAL PROCESS CODES FROM ITEM D(1) ON PAGE 3.

EPA I.D. NO. *(enter from page 1)*

| S | | | | | | | | | | | | T/A | C |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| F | C | T | D | 0 | 0 | 1 | 1 | 6 | 4 | 5 | 9 | 9 | 6 |

## V. FACILITY DRAWING

All existing facilities must include in the space provided on page 5 a scale drawing of the facility *(see instructions for more detail).*

## VI. PHOTOGRAPHS

All existing facilities must include photographs *(aerial or ground–level)* that clearly delineate all existing structures; existing storage, treatment and disposal areas; and sites of future storage, treatment or disposal areas *(see instructions for more detail).*

## VII. FACILITY GEOGRAPHIC LOCATION

| LATITUDE *(degrees, minutes, & seconds)* | LONGITUDE *(degrees, minutes, & seconds)* |
|---|---|
| 41 34 396 | 73 03 225 |

## VIII. FACILITY OWNER

☒ A. If the facility owner is also the facility operator as listed in Section VIII on Form 1, "General Information", place an "X" in the box to the left and skip to Section IX below.

B. If the facility owner is not the facility operator as listed in Section VIII on Form 1, complete the following items:

| 1. NAME OF FACILITY'S LEGAL OWNER | 2. PHONE NO. *(area code & no.)* |
|---|---|
| E | |

| 3. STREET OR P.O. BOX | 4. CITY OR TOWN | 5. ST. | 6. ZIP CODE |
|---|---|---|---|
| F | G | | |

## IX. OWNER CERTIFICATION

*I certify under penalty of law that I have personally examined and am familiar with the information submitted in this and all attached documents, and that based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the submitted information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.*

| A. NAME *(print or type)* | B. SIGNATURE | C. DATE SIGNED |
|---|---|---|
| Michael A. Pfaff | Michael A. Pfaff | 5/8/90 |

## X. OPERATOR CERTIFICATION

*I certify under penalty of law that I have personally examined and am familiar with the information submitted in this and all attached documents, and that based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the submitted information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.*

| A. NAME *(print or type)* | B. SIGNATURE | C. DATE SIGNED |
|---|---|---|
| Michael A. Pfaff | Michael A. Pfaff | 5/8/90 |



CONTINUE ON PAGE 5

Continued from page 4.

## V. FACILITY DRAWING *(see page 4)*

See Figure 2.1 of this Permit Application.

# APPENDIX D

# INTERIM PERMIT FOR CONNECTICUT REGULATED WASTES

# STATE OF CONNECTICUT
## DEPARTMENT OF ENVIRONMENTAL PROTECTION

June 27, 1989

**INTERIM STATUS PERMIT EXTENSION**

MacDermid, Incorporated
526 Huntingdon Avenue
Waterbury, Connecticut 06702

Heartyden

DEP/HWM - 151-028 not 99
CTHW - 330
EPA ID# - CTD 001164599
City of Waterbury

Gentlemen:

The Connecticut Regulated Waste Facility Interim Status Permit issued to MacDermid, Incorporated in accordance with Section 22a-6 and 22a-454 of the Connecticut General Statutes on September 14, 1984 expires June 30, 1989 (attached).

The Department of Environmental Protection (DEP) hereby extends the expiration date of this permit until June 30, 1994 or until the Connecticut Regulated Waste Facility Permit is called whichever is sooner providing the following are met:

- compliance with conditions as stated in original permit;
- compliance with Subpart I & J of 40 CFR as amended;
- annual reports are submitted March 1st of each year;
- waste analysis plans must be revised to include PCB analyses on oils in order to detect PCBs prior to storage and if detected to locate the generator;
- PCBs found in oil fuels greater than 50ppm must be reported immediately by phone to DEP and in writing no later than 15 days after discovery.

Violations of any provisions of this permit extension as stated above is subject to enforcement action provided by Section 22a-6a of the Connecticut General Statutes.

S. W. Hitchcock

Stephen W. Hitchcock
Director
Hazardous Materials Management Unit

SWH:et
attachment

Phone:

165 Capitol Avenue • Hartford, Connecticut 06106

An Equal Opportunity Employer

# APPENDIX E

## NOTIFICATION OF HAZARDOUS WASTES AND CONNECTICUT REGULATED WASTE ACTIVITY (FORM ONE) TSDF'S APPLICATION FOR PERMIT (FORM THREE) AND HAZARDOUS WASTE RECYCLING REGISTRATION

# STATE OF CONNECTICUT
## DEPARTMENT OF ENVIRONMENTAL PROTECTION

FORM "ONE"

### NOTIFICATION OF HAZARDOUS WASTES
### and
### CONNECTICUT REGULATED WASTES ACTIVITY

I. Name of Installation MacDermid, Inc.

II. Installation Mailing Address 526 Huntingdon Avenue
Street Name and Number
Waterbury Connecticut 06708
Town State Zip

III. Location of Installation SAME
Street Name and Number
Town State Zip

IV. Installation Contact

Name Cherrie D. Gillis

Title Compliance Administrator

Phone (203) 575-5700

V. Installation Ownership

A. Type of Business ( ) Proprietorship ( ) Partnership
(x) Corporation ( ) Other

B. Name of Legal Owner MacDermid, Inc.

C. City, State and Date of Incorporation February 1922, Waterbury, CT

VI. Type of Waste Activity

A. Regulated Wastes
The following wastes are designated as Regulated Wastes in the State of Connecticut. For each regulated waste activity conducted on-site at your installation, enter the amount (gallons, lbs., etc.) of waste handled per year.

| Code | Regulated Waste Name | Regulated Waste Activities | | | | | |
|---|---|---|---|---|---|---|---|
| | | Generation | Transportation | Treatment | Storage | Disposal | Recovery |
| CR01 | Waste PCBs | | | | | | |
| CR02 | Waste Oil | 300G | | | 300G | | |
| CR03 | Wastewater Soluble Oil | | | | | | |
| CR04 | ~~Paint Waste~~ | 10,000G | 190,000G | | 200000G* | | 1,500G |
| ~~CR05~~ | ~~Grinding Waste~~ | 2,000P | | | 2000P | | |
| ~~CR06~~ | ~~Waste Sludges~~ | | | | | | |
| ~~CR07~~ | ~~Liquid Waste~~ | | | | | | |
| ~~CR08~~ | ~~Other~~ | | | | | | |

*Includes electroless copper & NMP

Phone:

165 Capitol Avenue • Hartford, Connecticut 06106

B. Hazardous Wastes

List all hazardous wastes and corresponding codes in the appropriate columns below which your installation manages. For each hazardous waste activity conducted on-site at your installation, enter the amount (gallons, lbs., etc.) of waste handled per year. Photocopy this page before completing if you have more than twelve (12) wastes to list.

| Code | Hazardous Waste Name | Hazardous Waste Activity * | | | | | |
|---|---|---|---|---|---|---|---|
| | | Generation | Transportation | Treatment | Storage | Disposal | Recovery |
| D002 | Copper Etchant | 10,000 | 19,990,000 | | 20,000,000 | | 20,000,000 |
| D008 | Solder Stripper | 10,000 | 90,000 | | 100,000 | | 100,000 |
| F006 | Wastewater Sludge | 250,000 | | | 250,000 | | |
| D002 | Solder Conditioner | 87,000 | 6,000 | | 93,000 | | |
| D002 | Acid Zinc Solution | 1,000 | 1,000 | | 2,000 | | |
| D002 | Acid Copper Solution | 1,000 | 1,000 | | 2,000 | | |
| D008 | Tin/Lead Plating Sol. | | 2,000 | | 2,000 | | |
| D006 | Cd Plating Solution | | 2,000 | | 2,000 | | |
| D002 | Palladium Solution | | 1,000 | | 1,000 | | |
| D002 | Waste Nickel Solution | 1,000 | 1,000 | | 2,000 | | |
| F003 | Waste Mixed Solvents | 9,000 | 1,000 | | 10,000 | | |
| F005 | Waste Mixed Solvents | 4,000 | 1,000 | | 5,000 | | |
| F002 | Waste Mixed Solvents | 9,000 | 1,000 | | 10,000 | | |

*lbs.

VII. Identification Codes

| A. Installations EPA I.D. Number | B. Installations State of CT. Transporter's ID Number | C. Installations S I C Code |
|---|---|---|
| CTD 001164599 | CT-HW- 330 | 2899 |

III. Certification

I certify under penalty of law that I have personally examined and am familiar with the information submitted in Form "ONE" and attached pertaining thereof, and that based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the submitted information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.

| A Signature | B Michael A. Pfaff, V.P., Sales & Marketing<br>Name & Official Title (type or print) | C 5/8/90<br>Date |
|---|---|---|

B. Hazardous Wastes

List all hazardous wastes and corresponding codes in the appropriate columns below which your installation manages. For each hazardous waste activity conducted on-site at your installation, enter the amount (gallons, lbs., etc.) of waste handled per year. Photocopy this page before completing if you have more than twelve (12) wastes to list.

| Code | Hazardous Waste Name | Hazardous Waste Activity | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | Generation | Transportation | Treatment | Storage | Disposal | Recovery | |
| U154 | Methanol | 2,000 lbs. | | | 2,000 lbs. | | | |
| U002 | Acetone | 1,000 lbs. | | | 1,000 lbs. | | | |
| D008 | Lead Fluoride Sludge | 8,000 lbs. | | | 8,000 lbs. | | | |
| D001 | Vacuum Pump Oil/inks | 700,000 lbs. | | | 700,000 lbs. | | | |
| | | | | | | | | |
| | | | | | | | | |
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| | | | | | | | | |

VII. Identification Codes

| A. Installations EPA I.D. Number | B. Installations State of CT. Transporter's ID Number | C. Installations S I C Code |
|---|---|---|
| CTD 001164599 | CT-HW- 330 | 2899 |

III. Certification

I certify under penalty of law that I have personally examined and am familiar with the information submitted in Form "ONE" and attached pertaining thereof, and that based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the submitted information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.

| A Signature | B Michael A. Pfaff, V.P., Sales & Marketing<br>Name & Official Title (type or print) | C 5/8/90<br>Date |
|---|---|---|

# STATE OF CONNECTICUT
## DEPARTMENT OF ENVIRONMENTAL PROTECTION

FORM "THREE"

TSDF'S APPLICATION FOR PERMIT

I. Installation EPA ID#: CTD 001164599

II. Name of Installation: MacDermid, Inc.

III. Installation Location: 526 Huntingdon Avenue
Street Name and Number

Waterbury, Connecticut 06708
City or Town State Zip

IV. Process Design Capacity:

A. Process Code - Enter the code from the list of process codes in the instructions that best describes each process to be used at the facility. Ten lines are provided for entering codes. If more lines are needed, enter the code(s) in the space provided (IV-C). If a process will be used that is not included in the list of codes in the instructions then describe the process (including its design capacity) in the space provided (Item IV-C).

B. Process Design Capacity - For each code entered in column A enter the capacity of the process.

1. Amount - Enter the amount
2. Unit of Measure - Enter the code from the list of unit measure codes in the instructions. Only the units of measure that are listed should be used.

| A. Process Code | B. Process Design Capacity | | A. Process Code | B. Process Design Capacity | |
|---|---|---|---|---|---|
| | 1. Amount | 2. Unit | | 1. Amount | 2. Unit |
| S01 | 82,170 | G | | | |
| S01 | 26 | Y | | | |
| S02 | 29,000 | G | | | |
| R01 | 1,000 | E | | | |
| R04 | 25 | E | | | |

C. Processes (continued)

Space for additional process codes or for describing other process (Code "T04" or "R04"). For each process entered here include design capacity.

V. Facility Map:

Attach to this application a U.S.G.S. topographic map (7 1/2 minute series) extending at least one mile beyond property boundaries. The map must show the following:

A. Outline of the facility (legal boundaries);

B. Location of existing and proposed intake and discharge structures (include serial numbers);

C. Each of its treatment, storage, recovery or disposal facilities;

D. Each underground injection well;

E. All drinking water wells within 1/4 mile of the facility; and

F. A meridian arrow showing north.

See instructions for an example of a facility map.

VI. Facility Geographic Location:

| 41° 34' 3.96" | 73° 03' 22.5" |
|---|---|
| Latitude | Longitude |

VII. Facility Drawing:

Attach to this application a facility drawing. This drawing should show the general layout of the facility and be approximately to scale. The drawing should show the following:

A. The property boundaries of the facility with approximate dimensions;

B. The areas occupied by all storage, treatment, recovery, or disposal operations, existing or proposed, with approximate dimensions;

C. The name of each operation (e.g. - multiple hearth incinerator, drum storage area, etc.)

D. Areas of past storage, treatment, recovery or disposal operations with approximate dimensions.

See instructions for an example of a facility drawing.

VIII. Facility Process Flow Diagram:

Attach to this application a facility process flow diagram. The diagram should show generally the route taken by general classes of hazardous waste or Connecticut regulated waste from delivery to ultimate disposal. The general waste classes used should be the ones you use to classify incoming wastes to insure proper handling. The diagram should show the following:

A. Route taken by each class of hazardous waste;

B. Process names and rates or capacities; and

C. Ultimate disposal of all materials shipped off-site including non-hazardous treatment residues.

See instructions for an example of facility process flow diagram.

IX. Owner Certification:

I certify under penalty of law that I have personally examined and am familiar with the information submitted in Form C and attached documents pertaining thereof and that based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the submitted information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.

| | | |
|---|---|---|
| Michael A. Pfaff<br>A. Signature | Michael A. Pfaff, V.P., Sales & Marketing<br>B. Name & Official Title (type or print) | 5/8/90<br>date signed |

X. Operator Certification:

I certify under penalty of law that I have personally examined and am faimiliar with the information submitted in Form C and attached documents pertaining thereof and that based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the submitted information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.

| | | |
|---|---|---|
| Michael A. Pfaff<br>A. Signature | Michael A. Pfaff, V.P., Sales & Marketing<br>B. Name & Official Title (type or print) | 5/8/90<br>date signed |

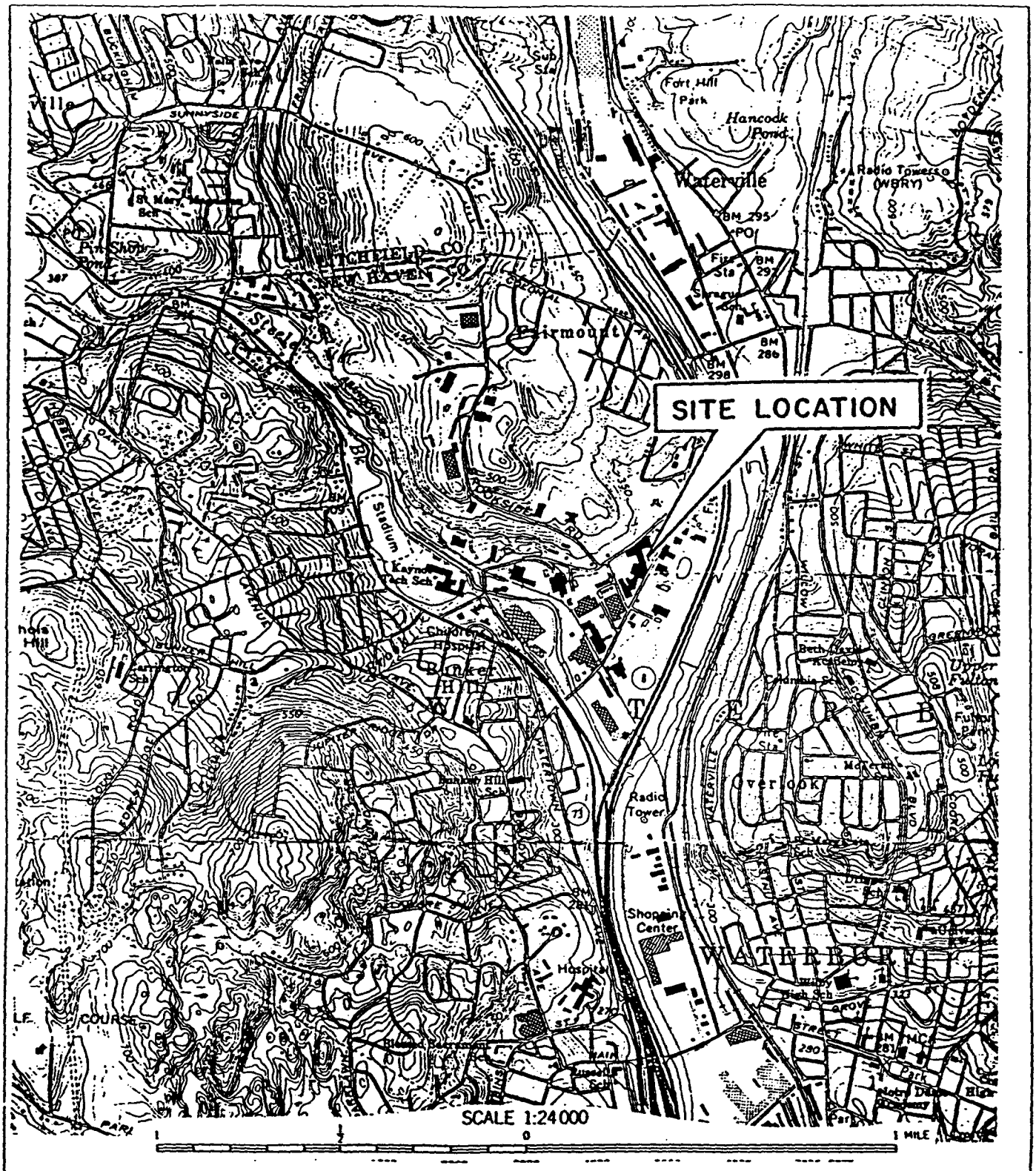
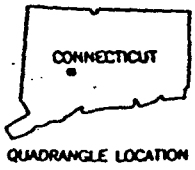



FIGURE 1.1
SITE LOCATION MAP
MAC DERMID, INC.
526 HUNTINGDON AVE.
WATERBURY, CT.



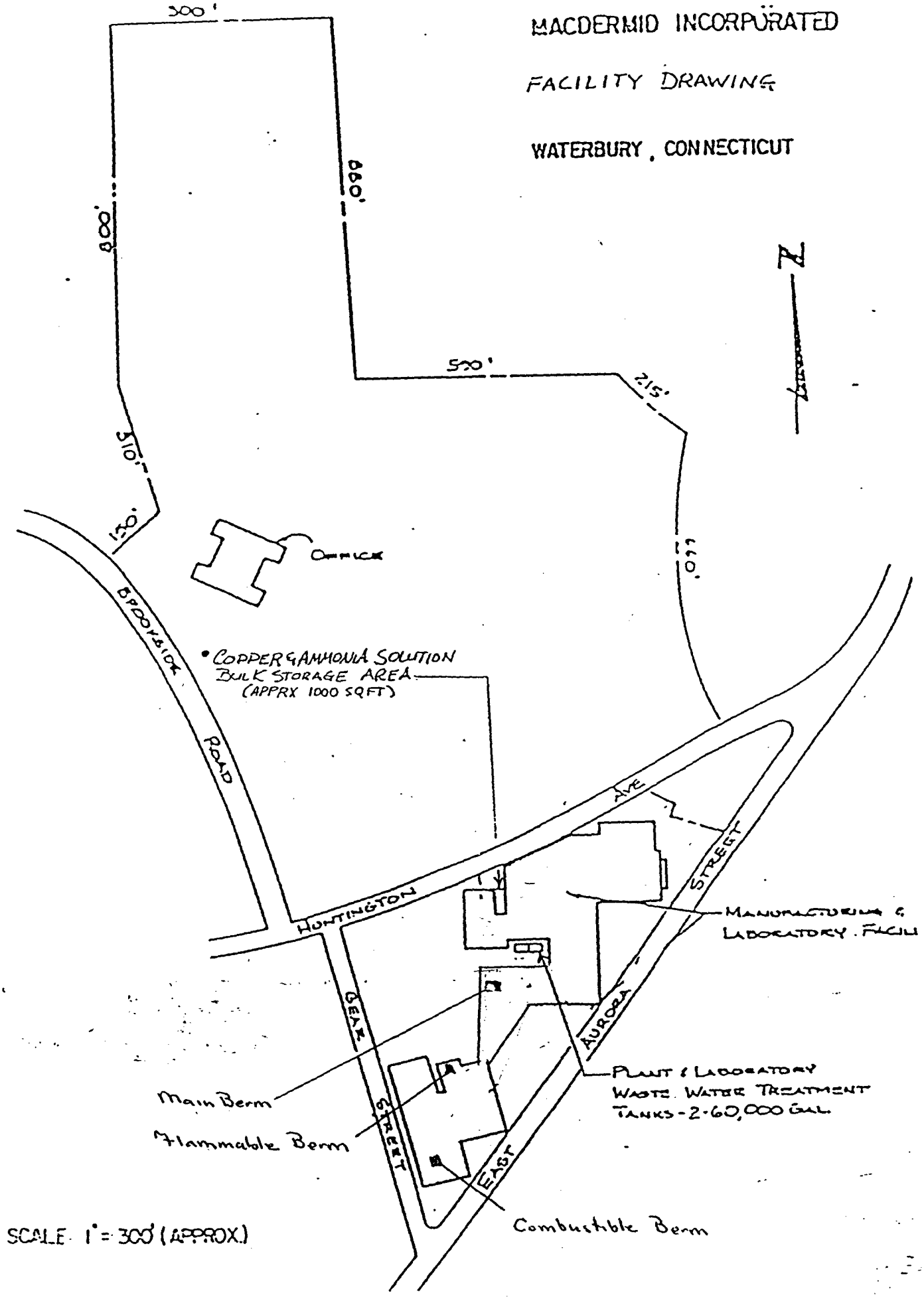

QUADRANGLE LOCATION

hrp associates inc.

MACDERMID INCORPORATED

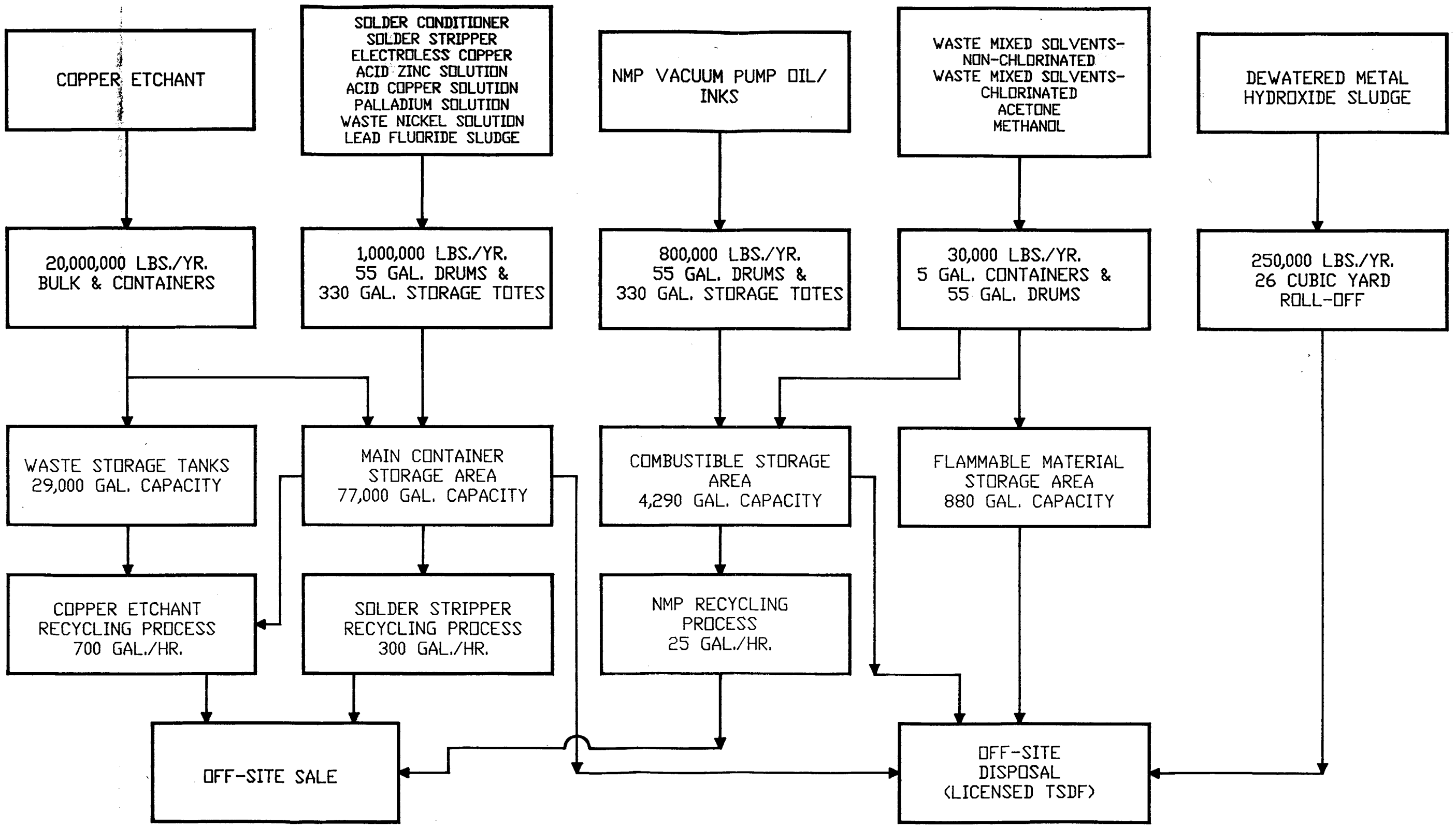
FACILITY DRAWING

WATERBURY, CONNECTICUT




SCALE 1" = 300' (APPROX.)

2190




PROCESS FLOW DIAGRAM
MACDERMID, INC.
526 HUNTINGDON AVE.
WATERBURY, CONN.
HRP# MAC0001.RC

GENERAL

# CT HAZARDOUS WASTE RECYCLING REGISTRATION

FICTD001164599 D

LABEL ITEMS

I. EPA I.D. NUMBER

III. FACILITY NAME

V. FACILITY MAILING ADDRESS

VI. FACILITY LOCATION

RECYCLE

GENERAL INSTRUCTIONS

If a preprinted label has been provided, affix it in the designated space. Review the information carefully; if any of it is incorrect, cross through it and enter the correct data in the appropriate fill-in area below. Also, if any of the preprinted data is absent *(the area to the left of the label space lists the information that should appear)*, please provide it in the proper fill-in area*(s)* below. If the label is complete and correct, you need not complete Items I, III, V, and VI *(except VI-B which must be completed regardless)*. Complete all items if no label has been provided. Refer to the instructions for detailed item descriptions and for the legal authorizations under which this data is collected.

## II. POLLUTANT CHARACTERISTICS

INSTRUCTIONS: Complete A through J to determine whether you need to submit any permit application forms to the EPA. If you answer "yes" to any questions, you must submit this form and the supplemental form listed in the parenthesis following the question. Mark "X" in the box in the third column if the supplemental form is attached. If you answer "no" to each question, you need not submit any of these forms. You may answer "no" if your activity is excluded from permit requirements; see Section C of the instructions. See also, Section D of the instructions for definitions of bold-faced terms.

| SPECIFIC QUESTIONS | MARK 'X' YES | MARK 'X' NO | MARK 'X' FORM ATTACHED |
|---|---|---|---|
| A. Is this facility a **publicly owned treatment works** which results in a **discharge to waters of the U.S.**? (FORM 2A) | | X | |
| B. Does or will this facility *(either existing or proposed)* include a **concentrated animal feeding operation** or **aquatic animal production facility** which results in a **discharge to waters of the U.S.**? (FORM 2B) | | X | |
| C. Is this a facility which currently results in **discharges to waters of the U.S.** other than those described in A or B above? (FORM 2C) | | X | |
| D. Is this a proposed facility *(other than those described in A or B above)* which will result in a **discharge to waters of the U.S.**? (FORM 2D) | | X | |
| E. Does or will this facility treat, store, or dispose of **hazardous wastes**? (FORM 3) | X | | X |
| F. Do you or will you inject at this facility industrial or municipal effluent below the lowermost stratum containing, within one quarter mile of the well bore, underground sources of drinking water? (FORM 4) | | X | |
| G. Do you or will you inject at this facility any produced water or other fluids which are brought to the surface in connection with conventional oil or natural gas production, inject fluids used for enhanced recovery of oil or natural gas, or inject fluids for storage of liquid hydrocarbons? (FORM 4) | | X | |
| H. Do you or will you inject at this facility fluids for special processes such as mining of sulfur by the Frasch process, solution mining of minerals, in situ combustion of fossil fuel, or recovery of geothermal energy? (FORM 4) | | X | |
| I. Is this facility a proposed **stationary source** which is one of the 28 industrial categories listed in the instructions and which will potentially emit 100 tons per year of any air pollutant regulated under the Clean Air Act and may affect or be located in an attainment area? (FORM 5) | | X | |
| J. Is this facility a proposed **stationary source** which is NOT one of the 28 industrial categories listed in the instructions and which will potentially emit 250 tons per year of any air pollutant regulated under the Clean Air Act and may affect or be located in an attainment area? (FORM 5) | | X | |

## III. NAME OF FACILITY

1 SKIP MACDERMID, INCORPORATED

## IV. FACILITY CONTACT

| A. NAME & TITLE *(last, first, & title)* | B. PHONE *(area code & no.)* |
|---|---|
| 2 PFAFF MICHAEL VP MRKTG & SALES | 203 575 5700 |

## V. FACILITY MAILING ADDRESS

A. STREET OR P.O. BOX

3 526 HUNTINGDON AVENUE

| B. CITY OR TOWN | C. STATE | D. ZIP CODE |
|---|---|---|
| 4 WATERBURY | CT | 06708 |

## VI. FACILITY LOCATION

A. STREET, ROUTE NO. OR OTHER SPECIFIC IDENTIFIER

5 526 HUNTINGDON AVENUE

B. COUNTY NAME

NEW HAVEN

| C. CITY OR TOWN | D. STATE | E. ZIP CODE | F. COUNTY CODE *(if known)* |
|---|---|---|---|
| 6 WATERBURY | CT | 06708 | |



CONTINUE ON REVERSE

·NTINUED FROM THE FRONT

## I. SIC CODES (4-digit, in order of priority)

| A. FIRST | B. SECOND |
|---|---|
| 8 9 9 (specify) Chemical Preparations | C 7 (specify) |
| **C. THIRD** | **D. FOURTH** |
| (specify) | C 7 (specify) |

## III. OPERATOR INFORMATION

A. NAME: MACDERMID INCORPORATED

B. Is the name listed in Item VIII-A also the owner? [X] YES [ ] NO

C. STATUS OF OPERATOR (Enter the appropriate letter into the answer box; if "Other", specify.)
F = FEDERAL
S = STATE
P = PRIVATE
M = PUBLIC (other than federal or state)
O = OTHER (specify)

P (specify)

D. PHONE (area code & no.): C A 203 575 5700

E. STREET OR P.O. BOX: 526 HUNTINGDON AVENUE

F. CITY OR TOWN: WATERBURY

G. STATE: CT

H. ZIP CODE: 06708

## IX. INDIAN LAND

Is the facility located on Indian lands? [ ] YES [X] NO

## EXISTING ENVIRONMENTAL PERMITS

| | | | |
|---|---|---|---|
| A. NPDES (Discharges to Surface Water) | N | CT0024988 | |
| B. UIC (Underground Injection of Fluids) | | | |
| C. RCRA (Hazardous Wastes) | R | | |
| D. PSD (Air Emissions from Proposed Sources) | | 9 P | |
| E. OTHER (specify) | | 9 DEP/HWM028 | (specify) CT Interim Storage Permit |
| E. OTHER (specify) | | 9 CTHW 330 | (specify) |

## . MAP

ttach to this application a topographic map of the area extending to at least one mile beyond property bounderies. The map must show ne outline of the facility, the location of each of its existing and proposed intake and discharge structures, each of its hazardous waste eatment, storage, or disposal facilities, and each well where it injects fluids underground. Include all springs, rivers and other surface vater bodies in the map area. See instructions for precise requirements.

## I. NATURE OF BUSINESS (provide a brief description)

The principle business of MacDermid, Inc. is the manufacture and sale of process chemicals to the metal finishing, plating on plastics, electronics, micro electronics and surface treatment industries. MacDermid also provides a recycling service for certain specialty chemical products returned by their customers. Through such manufacturing and recycling operations, hazardous wastes are generated and stored temporarily on-site. Ultimately, all wastes are either: recycled on-site for resale to customers; or shipped off-site by certified waste haulers and disposed of at permitted hazardous waste disposal facilities.

## II. CERTIFICATION (see instructions)

*certify under penalty of law that I have personally examined and am familiar with the information submitted in this application and all ttachments and that, based on my inquiry of those persons immediately responsible for obtaining the information contained in the pplication, I believe that the information is true, accurate and complete. I am aware that there are significant penalties for submitting lse information, including the possibility of fine and imprisonment.*

| NAME & OFFICIAL TITLE (type or print) | B. SIGNATURE | C. DATE SIGNED |
|---|---|---|
| Michael A. Pfaff, Vice President Marketing & Sales | Michael A. Pfaff | 5/8/90 |

IMMENTS FOR OFFICIAL USE ONLY

FORM 3 RCRA

# CT HAZARDOUS WASTE RECYCLING REGISTRATION

I. EPA I.D. NUMBER: CTD001164599 1

FOR OFFICIAL USE ONLY

| APPLICATION APPROVED | DATE RECEIVED (yr., mo., & day) |
|---|---|
| | |

COMMENTS

## II. FIRST OR REVISED APPLICATION

Place an "X" in the appropriate box in A or B below *(mark one box only)* to indicate whether this is the first application you are submitting for your facility or a revised application. If this is your first application and you already know your facility's EPA I.D. Number, or if this is a revised application, enter your facility's EPA I.D. Number in Item I above.

A. FIRST APPLICATION *(place an "X" below and provide the appropriate date)*

[X] 1. EXISTING FACILITY *(See instructions for definition of "existing" facility. Complete item below.)*

[ ] 2. NEW FACILITY *(Complete item below.)*

FOR EXISTING FACILITIES, PROVIDE THE DATE *(yr., mo., & day)* OPERATION BEGAN OR THE DATE CONSTRUCTION COMMENCED *(use the boxes to the left)*

| C | YR. | MO. | DAY |
|---|---|---|---|
| 8 | 72 | 05 | 01 |

FOR NEW FACILITIES, PROVIDE THE DATE *(yr., mo., & day)* OPERATION BEGAN OR IS EXPECTED TO BEGIN

| YR. | MO. | DAY |
|---|---|---|
| | | |

B. REVISED APPLICATION *(place an "X" below and complete Item I above)*

[X] 1. FACILITY HAS INTERIM STATUS

[ ] 2. FACILITY HAS A RCRA PERMIT

## III. PROCESSES – CODES AND DESIGN CAPACITIES

A. PROCESS CODE – Enter the code from the list of process codes below that best describes each process to be used at the facility. Ten lines are provided for entering codes. If more lines are needed, enter the code(s) in the space provided. If a process will be used that is not included in the list of codes below, then describe the process *(including its design capacity)* in the space provided on the form *(Item III-C)*.

B. PROCESS DESIGN CAPACITY – For each code entered in column A enter the capacity of the process.
1. AMOUNT – Enter the amount.
2. UNIT OF MEASURE – For each amount entered in column B(1), enter the code from the list of unit measure codes below that describes the unit of measure used. Only the units of measure that are listed below should be used.

| PROCESS | PROCESS CODE | APPROPRIATE UNITS OF MEASURE FOR PROCESS DESIGN CAPACITY |
|---|---|---|
| **Storage:** | | |
| CONTAINER *(barrel, drum, etc.)* | S01 | GALLONS OR LITERS |
| TANK | S02 | GALLONS OR LITERS |
| WASTE PILE | S03 | CUBIC YARDS OR CUBIC METERS |
| SURFACE IMPOUNDMENT | S04 | GALLONS OR LITERS |
| **Disposal:** | | |
| INJECTION WELL | D79 | GALLONS OR LITERS |
| LANDFILL | D80 | ACRE-FEET *(the volume that would cover one acre to a depth of one foot)* OR HECTARE-METER |
| LAND APPLICATION | D81 | ACRES OR HECTARES |
| OCEAN DISPOSAL | D82 | GALLONS PER DAY OR LITERS PER DAY |
| SURFACE IMPOUNDMENT | D83 | GALLONS OR LITERS |

| PROCESS | PROCESS CODE | APPROPRIATE UNITS OF MEASURE FOR PROCESS DESIGN CAPACITY |
|---|---|---|
| **Treatment:** | | |
| TANK | T01 | GALLONS PER DAY OR LITERS PER DAY |
| SURFACE IMPOUNDMENT | T02 | GALLONS PER DAY OR LITERS PER DAY |
| INCINERATOR | T03 | TONS PER HOUR OR METRIC TONS PER HOUR; GALLONS PER HOUR OR LITERS PER HOUR |
| OTHER *(Use for physical, chemical, thermal or biological treatment processes not occurring in tanks, surface impoundments or incinerators. Describe the processes in the space provided; Item III-C.)* | T04 | GALLONS PER DAY OR LITERS PER DAY |

| UNIT OF MEASURE | UNIT OF MEASURE CODE | UNIT OF MEASURE | UNIT OF MEASURE CODE | UNIT OF MEASURE | UNIT OF MEASURE CODE |
|---|---|---|---|---|---|
| GALLONS | G | LITERS PER DAY | V | ACRE-FEET | A |
| LITERS | L | TONS PER HOUR | D | HECTARE-METER | F |
| CUBIC YARDS | Y | METRIC TONS PER HOUR | W | ACRES | B |
| CUBIC METERS | C | GALLONS PER HOUR | E | HECTARES | Q |
| GALLONS PER DAY | U | LITERS PER HOUR | H | | |

EXAMPLE FOR COMPLETING ITEM III *(shown in line numbers X-1 and X-2 below)*: A facility has two storage tanks, one tank can hold 200 gallons and the other can hold 400 gallons. The facility also has an incinerator that can burn up to 20 gallons per hour.

C DUP T/A C 1

| LINE NUMBER | A. PROCESS CODE (from list above) | B. PROCESS DESIGN CAPACITY 1. AMOUNT (specify) | B. 2. UNIT OF MEASURE (enter code) | FOR OFFICIAL USE ONLY | LINE NUMBER | A. PROCESS CODE (from list above) | B. PROCESS DESIGN CAPACITY 1. AMOUNT | B. 2. UNIT OF MEASURE (enter code) | FOR OFFICIAL USE ONLY |
|---|---|---|---|---|---|---|---|---|---|
| X-1 | S02 | 600 | G | | 5 | | | | |
| X-2 | T03 | 20 | E | | 6 | | | | |
| 1 | S01 | 82, 170 | G | | 7 | | | | |
| 2 | S01 | 26 (roll-off) | Y | | 8 | | | | |
| 3 | S02 | 29,000 | G | | 9 | | | | |
| 4 | | | | | 10 | | | | |

Continued from the front.

## III. PROCESSES *(continued)*

C. SPACE FOR ADDITIONAL PROCESS CODES OR FOR DESCRIBING OTHER PROCESSES *(code "T04")*. FOR EACH PROCESS ENTERED HERE INCLUDE DESIGN CAPACITY.

## IV. DESCRIPTION OF HAZARDOUS WASTES

A. EPA HAZARDOUS WASTE NUMBER — Enter the four—digit number from 40 CFR, Subpart D for each listed hazardous waste you will handle. If you handle hazardous wastes which are not listed in 40 CFR, Subpart D, enter the four—digit number*(s)* from 40 CFR, Subpart C that describes the characteristics and/or the toxic contaminants of those hazardous wastes.

B. ESTIMATED ANNUAL QUANTITY — For each listed waste entered in column A estimate the quantity of that waste that will be handled on an annual basis. For each characteristic or toxic contaminant entered in column A estimate the total annual quantity of all the non—listed waste*(s)* that will be handled which possess that characteristic or contaminant.

C. UNIT OF MEASURE — For each quantity entered in column B enter the unit of measure code. Units of measure which must be used and the appropriate codes are:

| ENGLISH UNIT OF MEASURE | CODE | METRIC UNIT OF MEASURE | CODE |
|---|---|---|---|
| POUNDS | P | KILOGRAMS | K |
| TONS | T | METRIC TONS | M |

If facility records use any other unit of measure for quantity, the units of measure must be converted into one of the required units of measure taking into account the appropriate density or specific gravity of the waste.

D. PROCESSES

1. PROCESS CODES:
   For listed hazardous waste: For each listed hazardous waste entered in column A select the code*(s)* from the list of process codes contained in Item III to indicate how the waste will be stored, treated, and/or disposed of at the facility.
   For non—listed hazardous wastes: For each characteristic or toxic contaminant entered in column A, select the code*(s)* from the list of process codes contained in Item III to indicate all the processes that will be used to store, treat, and/or dispose of all the non—listed hazardous wastes that possess that characteristic or toxic contaminant.
   Note: Four spaces are provided for entering process codes. If more are needed: (1) Enter the first three as described above; (2) Enter "000" in the extreme right box of Item IV-D(1); and (3) Enter in the space provided on page 4, the line number and the additional code*(s)*.

2. PROCESS DESCRIPTION: If a code is not listed for a process that will be used, describe the process in the space provided on the form.

**NOTE: HAZARDOUS WASTES DESCRIBED BY MORE THAN ONE EPA HAZARDOUS WASTE NUMBER** — Hazardous wastes that can be described by more than one EPA Hazardous Waste Number shall be described on the form as follows:

1. Select one of the EPA Hazardous Waste Numbers and enter it in column A. On the same line complete columns B,C, and D by estimating the total annual quantity of the waste and describing all the processes to be used to treat, store, and/or dispose of the waste.
2. In column A of the next line enter the other EPA Hazardous Waste Number that can be used to describe the waste. In column D(2) on that line enter "included with above" and make no other entries on that line.
3. Repeat step 2 for each other EPA Hazardous Waste Number that can be used to describe the hazardous waste.

**EXAMPLE FOR COMPLETING ITEM IV** *(shown in line numbers X-1, X-2, X-3, and X-4 below)* — A facility will treat and dispose of an estimated 900 pounds per year of chrome shavings from leather tanning and finishing operation. In addition, the facility will treat and dispose of three non—listed wastes. Two wastes are corrosive only and there will be an estimated 200 pounds per year of each waste. The other waste is corrosive and ignitable and there will be an estimated 100 pounds per year of that waste. Treatment will be in an incinerator and disposal will be in a landfill.

| LINE NO. | A. EPA HAZARD. WASTE NO (enter code) | B. ESTIMATED ANNUAL QUANTITY OF WASTE | C. UNIT OF MEASURE (enter code) | D. PROCESSES 1. PROCESS CODES (enter) | D. PROCESSES 2. PROCESS DESCRIPTION (if a code is not entered in D(1)) |
|---|---|---|---|---|---|
| X-1 | K 0 5 4 | 900 | P | T 0 3 D 8 0 | |
| X-2 | D 0 0 2 | 400 | P | T 0 3 D 8 0 | |
| X-3 | D 0 0 1 | 100 | P | T 0 3 D 8 0 | |
| X-4 | D 0 0 2 | | | | included with above |



CONTINUE ON P/

ontinued from page 2.
NOTE: Photocopy this page before completing if you have more than 26 wastes to list.

Form Approved OMB No. 158-S80004

| EPA I.D. NUMBER (enter from page 1) | | | | | | | | | | | | | | FOR OFFICIAL USE ONLY | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| W | C | T | D | 0 | 0 | 1 | 1 | 6 | 4 | 5 | 9 | 9 | 1 | W | DUP | | 2 | DUP | |

## IV DESCRIPTION OF HAZARDOUS WASTES (continued)

| LINE NO. | A. EPA HAZARD. WASTE NO. (enter code) | B. ESTIMATED ANNUAL QUANTITY OF WASTE | C. UNIT OF MEASURE (enter code) | D. PROCESSES 1. PROCESS CODES (enter) | | | | D. PROCESSES 2. PROCESS DESCRIPTION (if a code is not entered in D(1)) |
|---|---|---|---|---|---|---|---|---|
| 1 | | For Waste Material | | | | | | |
| 2 | D001 | 700,000 | P | S01 | | | | |
| 3 | D002 | 100,000 | P | S01 | | | | |
| 4 | D006 | 2,000 | P | S01 | | | | |
| 5 | D008 | 10,000 | P | S01 | | | | |
| 6 | F002 | 10,000 | P | S01 | | | | |
| 7 | F003 | 5,000 | P | S01 | | | | |
| 8 | F005 | 250,000 | P | S01 | | | | |
| 9 | U154 | 2,000 | P | S01 | | | | |
| 10 | U002 | 1,000 | P | S01 | | | | |
| 11 | | | | | | | | |
| 12 | | For Recycled Material | | | | | | |
| 13 | D002 | 20,000,000 | P | S01 | S02 | | | |
| 14 | D008 | 100,000 | P | S01 | | | | |
| 15 | | | | | | | | |
| 16 | | | | | | | | |
| 17 | | | | | | | | |
| 18 | | | | | | | | |
| 19 | | | | | | | | |
| 20 | | | | | | | | |
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| 23 | | | | | | | | |
| 24 | | | | | | | | |
| 25 | | | | | | | | |
| 26 | | | | | | | | |

Continued from the front.

## IV. DESCRIPTION OF HAZARDOUS WASTES *(continued)*

E. USE THIS SPACE TO LIST ADDITIONAL PROCESS CODES FROM ITEM D(1) ON PAGE 3.

EPA I.D. NO. *(enter from page 1)*

| S | | | | | | | | | | | | T/A | C |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| F | C | T | D | 0 | 0 | 1 | 1 | 6 | 4 | 5 | 9 | 9 | 6 |

## V. FACILITY DRAWING

All existing facilities must include in the space provided on page 5 a scale drawing of the facility *(see instructions for more detail)*.

## VI. PHOTOGRAPHS

All existing facilities must include photographs *(aerial or ground—level)* that clearly delineate all existing structures; existing storage, treatment and disposal areas; and sites of future storage, treatment or disposal areas *(see instructions for more detail)*.

## VII. FACILITY GEOGRAPHIC LOCATION

| LATITUDE *(degrees, minutes, & seconds)* | LONGITUDE *(degrees, minutes, & seconds)* |
|---|---|
| 41 34 396 | 73 03 225 |

## VIII. FACILITY OWNER

☐ A. If the facility owner is also the facility operator as listed in Section VIII on Form 1, "General Information", place an "X" in the box to the left and skip to Section IX below.

B. If the facility owner is not the facility operator as listed in Section VIII on Form 1, complete the following items:

| 1. NAME OF FACILITY'S LEGAL OWNER | 2. PHONE NO. *(area code & no.)* |
|---|---|
| E | |

| 3. STREET OR P.O. BOX | 4. CITY OR TOWN | 5. ST. | 6. ZIP CODE |
|---|---|---|---|
| F | G | | |

## IX. OWNER CERTIFICATION

*I certify under penalty of law that I have personally examined and am familiar with the information submitted in this and all attached documents, and that based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the submitted information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.*

| A. NAME *(print or type)* | B. SIGNATURE | C. DATE SIGNED |
|---|---|---|
| Michael A. Pfaff | Michael A. Pfaff | 5/8/90 |

## X. OPERATOR CERTIFICATION

*I certify under penalty of law that I have personally examined and am familiar with the information submitted in this and all attached documents, and that based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the submitted information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.*

| A. NAME *(print or type)* | B. SIGNATURE | C. DATE SIGNED |
|---|---|---|
| Michael A. Pfaff | Michael A. Pfaff | 5/8/90 |



CONTINUE ON PA

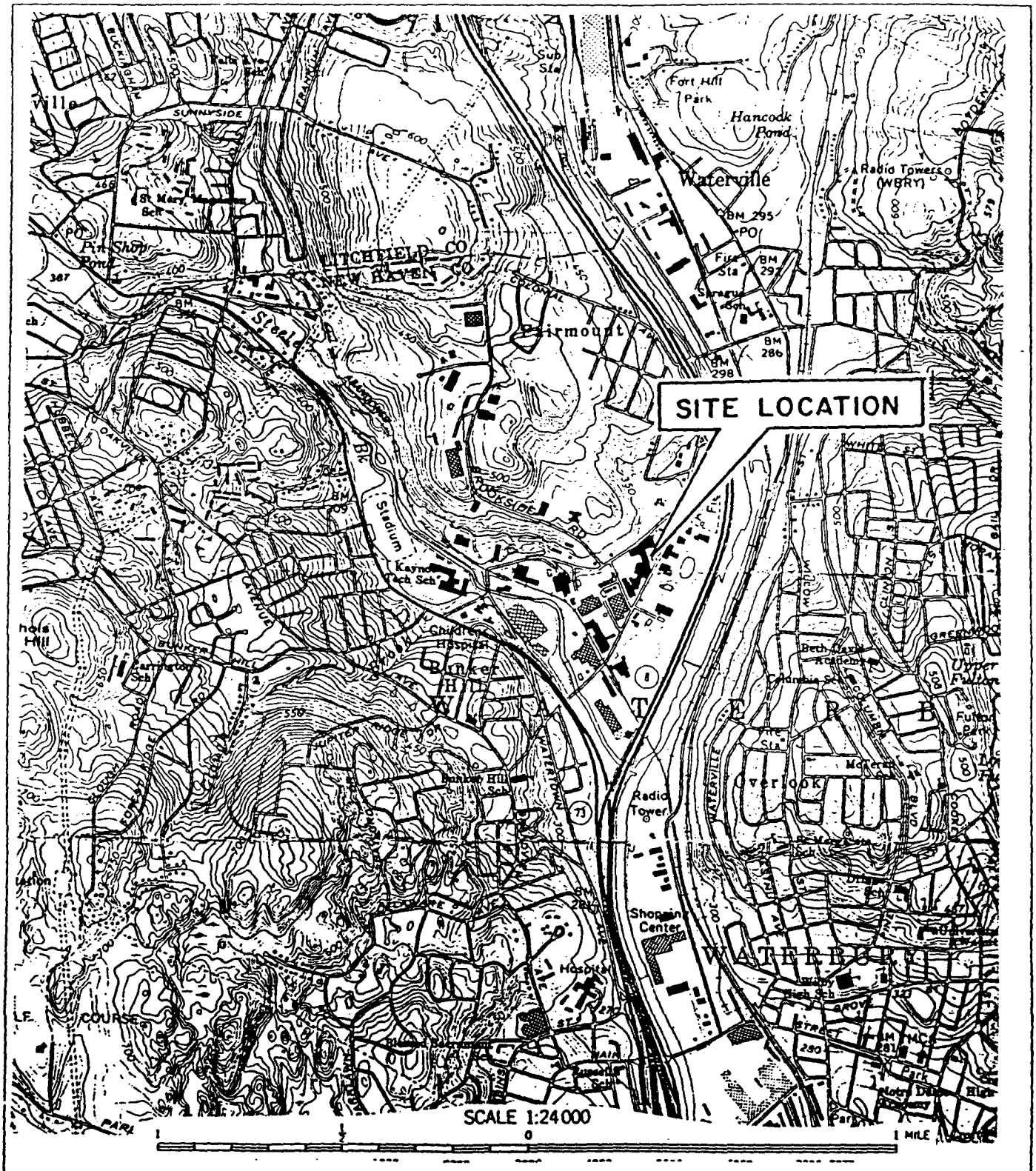
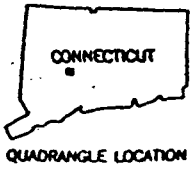



FIGURE 1.1
SITE LOCATION MAP
MAC DERMID, INC.
526 HUNTINGDON AVE.
WATERBURY, CT.




hrp associates inc.

Continued from page 4.



## V. FACILITY DRAWING (see page 4)

See Figure 2.1 of this Permit Application.

# APPENDIX F

## CHEMICAL RESISTANCE GUIDE FOR THE EPOXY COATING - STON CLAD HT

# STONCLAD HT

# CHEMICAL RESISTANCE GUIDE

STONHARD

The purpose of this guide is to aid in determining the potential value of STONCLAD HT surfacer when exposed to the damaging effects of corrosive chemical spillages.

The test procedure used was to totally immerse cured samples of STONCLAD HT in the chemicals listed for a period of 90 days at normal room temperatures. (This is an exceptionally severe test, since most floors subjected to chemical spillages such as these are "flushed down" periodically with water as part of the normal floor maintenance operation.)

The resultant resistance of STONCLAD HT to the various chemicals is rated using the symbols listed below. (It is recommended that normal "good housekeeping procedures" are used, including a daily flushing with clean water.)

***RATING CODE***

E—Excellent
G—Good
F—Fair
NR—Not Recommended
OS—Suitable for use where "occasional spillages" occur, when followed by immediate water flushing

The data contained herein is based on laboratory tests performed under carefully controlled conditions. No warranty can be expressed nor implied regarding the accuracy of this information as it will apply to actual plant operational use. Plant operations vary widely, and the individual results obtained are affected by the specific conditions encountered, which are beyond our control.

## *ACIDS*

| | RATING |
|---|---|
| Acetic—5% | E |
| Acetic—10% | G |
| Acetic—30% | OS |
| Acetic—Glacial | NR |
| Benzoic—Sat. | E |
| Boric—Sat. | E |
| Butyric—10% | F |
| Chromic—10% | G |
| Chromic—15% | G |
| Chromic—30% | F |
| Citric—Sat. | E |
| Cresylic | OS |
| Diglycolic | G |
| Fatty | E |
| Formic—up to 10% | F |
| Formic—over 10% | NR |
| Fluoboric | G |
| Heptanoic | OS |
| Hydrochloric—15% | E |
| Hydrochloric—37% | G |
| Hydrofluoric—5% | E |
| Hydrofluoric—10% | G |
| Hydrofluoric—15% | OS |
| Hypochlorous—5% | E |
| Lactic—up to 20% | F |
| Lactic—over 25% | OS |
| Maleic—over 10% | E |
| Maleic—30% | G |
| Maleic—40% | F |
| Maleic—Sat. | OS |
| Malic—30% | E |
| Malic—50% | E |
| Monochloroacetic—5% | G |
| Monochloroacetic—10% | F |
| Monochloroacetic—20% | OS |
| Nitric—20% | E |
| Nitric—30% | G |
| Nitric—over 40% | NR |
| Oleic | E |
| Oxalic—Sat. | E |
| Pelargonic | OS |
| Perchloric—35% | F |
| Phosphoric—up to 50% | F |
| Phosphoric—70% | OS |
| Phosphoric—Conc. 85% | NR |
| Picric—Sat. | E |
| Phthalic | F |
| Succinic—Sat. | E |
| Sulfuric—50% | E |
| Sulfuric—70% | F |
| Sulfuric—98% | NR |
| Tannic—Sat. | E |
| Tartaric—Sat. | E |
| Trichloroacetic—5% | G |
| Trichloroacetic—10% | F |
| Trichloroacetic—20% | OS |

## ALKALIES AND SALTS

| | RATING |
|---|---|
| Aluminum Chloride—50% | E |
| Ammonium Chloride—Sat. | E |
| Ammonium Hydroxide—up to 20% | E |
| Ammonium Hydroxide—up to 40% | G |
| Ammonium Nitrate | E |
| Ammonium Sulfate—Sat. | E |
| Calcium Chloride—Sat. | E |
| Calcium Hypochlorite—up to 15% | G |
| Copper Fluoroborate | E |
| Ferric Chloride—Sat. | G |
| Ferrous Sulfate | G |
| Potassium Hydroxide—up to 40% | E |
| Sodium Carbonate (Soda Ash)—Sat. | E |
| Sodium Bicarbonate—Sat. | E |
| Sodium Bisulfate—Sat. | E |
| Sodium Bisulfite—Sat. | E |
| Sodium Chloride (Salt) | E |
| Sodium Hydroxide—up to 50% | E |
| Sodium Hypochlorite—up to 10% | G |
| Sodium Sulfate—Sat. | E |
| Sodium Sulfide—Sat. | E |
| Trisodium Phosphate—Sat. | E |
| Zinc Nitrate | G |

## SOLVENTS AND OTHER CHEMICALS

| | RATING |
|---|---|
| Acetone | OS |
| Acrylonitrile | OS |
| Aniline | NR |
| Alcohol (Methyl) | OS |
| Alcohol (Ethyl, Propyl, Isopropyl, Butyl) | G |
| Amyl Acetate | E |
| Beer | E |
| Benzene | F |
| Butyl Acetate | G |
| Butyl Lactate | G |
| Bromine | NR |
| Carbon Disulfide | NR |
| Carbon Tetrachloride | E |
| Chlorobenzene | E |
| Corn Oil | E |
| Cyclohexane | E |
| Cyclohexanol | E |
| Cyclohexanone | OS |
| Chloroform | NR |
| Diacetone Alcohol | E |
| Diethyl Phthalate | E |
| Dimethyl Phthalate | E |
| Ethyl Acetate | OS |
| Ethylene Glycol | E |
| Ether | OS |
| Ethylene Dichloride | NR |
| Formaldehyde | E |
| Gasoline | E |
| Glycerine | E |
| Glyoxal | E |
| Hydrogen Peroxide—10% | E |
| JP5 Jet Fuel | E |
| Juices—Fruit | E |
| Juices—Vegetable | E |
| Kerosene | G |
| Lanoline | E |
| Lard | F |
| Linseed Oil | E |
| Methanol | OS |
| Mayonnaise | G |
| Methyl Ethyl Ketone | OS |
| Methyl Isobutyl Ketone | OS |
| Methyl Salicylate—50% in Toluene | NR |
| Methylene Chloride | NR |
| Milk | E |
| Mineral Spirits | E |
| Muriatic Acid (See Hydrochloric Acid) | |
| Mustard | E |
| Naphtha | E |
| Naphthalene | G |
| Oils—Cutting | E |
| Oils—Mineral | E |
| Oils—Vegetable | G |
| Peanut Butter | E |
| Perchloroethylene | E |
| Phenol—5% | NR |
| Pyridine | NR |
| Sucrose—Sat. (Sugar) | E |
| Toluene | G |
| Triacetin | E |
| Trichloroethane | G |
| Trichloroethylene | G |
| Triethanolamine | E |
| Triethylene Glycol | E |
| Urea | E |
| Vinegar (Household) | E |
| Water | E |
| Wine | E |
| Xylene | E |

Rev-11/85

**STONHARD**

Call Toll Free • In U.S.A.
**800/257-7953**

In Canada — 1-800/263-3112
In New Jersey — 1-800-624-0753
Worldwide-TWX710-892-0769-Stonhard MASE

Stonhard, Inc., Maple Shade, NJ 08052
Stonhard Limited, Ajax, Ontario L1S 3W7

# APPENDIX G

# CONTAINER HANDLING EQUIPMENT

## APPENDIX H

## CHEMICAL RESISTANCE CHART
## PUBLISHED BY INDUSTRIAL PLASTICS, INC.

Industrial Plastics Inc.

# ENGINEERING

Industrial Plastics Inc.

# CHEMICAL RESISTANCE CHART

| CHEMICALS | PLASTICS | | | | | | | | | ELASTOMERS | | | | | | | | | ALLOYS | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | CPVC | PVC | KYNAR | POLYESTER | EPOXY FRP | TEFLON | POLYETHYLENE | POLYPROPYLENE | RYTON (PENTON) | HYPALON | NITRILE | BUTYL | NATURAL | VITON | NEOPRENE | ETHYLENE/PRO | BUNA "N" | 304 S.S. | HASTELLOY C | HASTELLOY B | TITANIUM | ALUMINUM | 316 S.S. |
| AMMONIA, AQUEUS 25% | A | A | A | | | | A | | A | | | | | | | | | | | A | | A | B | A |
| AMMONIA, CONCENTRATED | C | C | | | | | | | A | | | | | | | | | | | | | | | |
| AMMONIA, DRY GAS | | | | | | | | A | A | | | | | | | | | A | | A | | A | | A |
| AMMONIA, GAS | A | A | | | | | | | A | A | | | | | | | C | | | | | | | |
| AMMONIA, NITRATE | | | | | | | | | | | | | | | | | | A | C | | | | | A |
| AMMONIUM, ACETATE | A | A | | | | | | | A | A | | | | A | A | A | C | A | | | | | | |
| AMMONIUM, BICARBONATE | | | | | A | A | | | | | | | | | | | | | | | | | | |
| AMMONIUM, BIFLUORIDE | A | A | | | | | | | A | | | | | | | | A | A | | A | | B | | A |
| AMMONIUM, BISUFIDE | | A | | | | | | | | | | | | | | | | | | | | | | |
| AMMONIUM, CARBONATE | A | A | | | A | A | | A | A | A | | | A | A | A | A | A | A | A | C | | B | B | A | B |
| AMMONIUM, CASENITE | | | | | | | | | | | | | | | | | | A | | | | | | | A |
| AMMONIUM, CHLORIDE | A | A | | | A | A | | A | A | | | | A | A | A | A | A | A | A | B | | A | B | A | B |
| AMMONIUM, DICHROMATE | | A | | | | | | | | | | | | | | A | | A | | | | | | | |
| AMMONIUM, FLUORIDE 10% | A | A | | | | | | A | A | A | | | | | | | | | | | | A | | B | |
| AMMONIUM, FLUORIDE 25% | A | A | | | | | | A | A | A | | | | | | | | | | | | A | | B | |
| AMMONIUM, HYDROXIDE | A | A | A | | | | | | A | | | | | | | | A | A | A | A | B | A | A | A | A |
| AMMONIUM, METAPHOSPATE | A | A | | | | | | A | A | | | | | | | | A | | | A | | | | | |
| AMMONIUM, NITRATE | A | A | | | A | A | | A | A | A | | | A | A | A | A | B | A | A | A | | A | C | | A |
| AMMONIUM, OXALATE | | | | | | | | | | | | | | | | | | A | | A | | A | | | A |
| AMMONIUM, PERSULPHATE | A | A | | | A | | | | A | A | | | | | | C | A | C | A | C | | A | C | A | A |
| AMMONIUM, PHOSPHATE | A | A | | | A | A | | | A | A | | | A | | | A | A | A | | A | | | | | |
| AMMONIUM, PHOSPHATE DIBAIC | A | | | | | | | | A | | | | | | | | A | A | A | A | | A | | A | C |
| AMMONIUM, PHOSPHATE MONOBASIC | A | | | | | | | | A | | | | | | | | A | A | A | A | | A | | A | C |
| AMMONIUM, PHOSPHATE TRIBASIC | A | | | | | | | | A | | | | | | | | A | C | A | A | | A | | A | A |
| AMMONIUM, SULFATE | A | A | | | A | A | | A | A | A | | | A | | A | A | C | A | A | A | | A | | A | B |
| AMMONIUM, SULFIDE | A | A | | | | | | A | A | A | | | | | | | C | | | A | | | | | A |
| AMMONIUM, THIOCYANATE | A | A | | | A | A | | A | B | A | | | | | | | | | | | | | | | |
| AMMONIUM, THIOSULFATE | | | | | A | A | | | | | | | | | | | | A | | A | | | | A | |
| AMYL ACETATE | C | C | B | | C | A | A | B | C | A | | | D | D | D | D | D | A | | A | B | B | | D | B | A |
| AMYL ALCOHOL | C | C | | | | | | A | A | A | | | | | | | A | A | A | A | | B | | C | | A |
| AMYL CHLORIDE | C | C | | | C | A | | | C | A | | | | | | D | B | C | C | C | | A | | C | |
| ANILINE | C | C | B | | C | C | A | A | A | A | | | D | D | | A | C | C | B | C | A | B | | B | B | A |
| ANILINE CHLOROHYDRATE | | C | | | | | | | | | | | | | | | | | | | | | | | |
| ANILINE HYDROCHLORIDE | | C | | | | | | | | A | | | | | | | A | | | C | | | | | |
| ANISOLE | | | | | | | | | B | A | | | | | | | | | | | | | | | |
| ANTHRAQUINONE | | A | | | | | | | | A | | | | | | | A | | | | | | | | |
| ANTHRAQUINONE SULFONIC ACID | A | A | | | | | | | | A | | | | | | | A | | | | | | | | |
| ANTI-FREEZE | | | | | | | | | | | | | | | | | | C | | A | | | | | |
| ANTIMONY CHLORIDE | | | | | | | | A | A | | | | | | | | | | | | | | | | |
| ANTIMONY PENTACHLORIDE | | | | | A | | | | | | | | | | | | | | | | | | | | |
| ANTIMONY TRICHLORIDE | A | A | | | A | A | | | | A | | | | | | | A | | | | | | | | |
| AQUA REGIA | A | | | | C | C | | B | | A | | | D | D | D | D | C | C | C | C | | C | | B | D |
| AROCHLOR 1248 | | | | | | | | | | | | | | | | | A | C | B | C | | | | | |
| ARSENIC ACID | A | A | | | A | A | | A | | A | | | | | | A | A | A | A | A | | | | | B |
| ARSENOUS ACID | | | | | A | A | | | | | | | | | | | | | | | | | | | |
| ARYL SULFONIC ACID | B | | | | | | | | | A | | | | | | | A | | | | | | | | |
| ASPHALT | | | | | | | A | | | | | | C | | | D | A | C | C | B | A | | | | A |
| AVIATION FUEL (115-145 oct) | | | | | | | | | B | B | | | | | | | | | | | | | | | |
| AVIATION TURBINE FUEL | | | | | | | | | B | B | | | | | | | | | | | | | | | |

A – No Effect – Excellent  B – Minor Effect – Good  C – Moderate Effect – Fair  D – Severe Effect – Not Recommended

Industrial Plastics Inc.

# ENGINEERING

Industrial Plastics Inc.

# CHEMICAL RESISTANCE CHART

| CHEMICALS | PLASTICS | | | | | | | | | | | ELASTOMERS | | | | | | | | | ALLOYS | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | CPVC | PVC | KYNAR | POLYESTER | EPOXY | TEFLON | FRP | POLYETHYLENE | POLYPROPYLENE | RYTON (PENTON) | HYPALON | NITRILE | BUTYL | NATURAL | VITON | NEOPRENE | ETHYLENE/PRO | BUNA "N" | 304 S.S. | HASTELLOY C | HASTELLOY B | TITANIUM | ALUMINUM | 316 S.S. |
| ACETALDEHYDE | | C | | | | | | A | B | A | A | | D | D | D | D | A | C | B | C | | A | A | | A | B | A |
| ACETAMIDE | | | | | | | | | | A | A | | | | | | C | C | A | A | | | | | | | A |
| ACETATE SOLV. | C | C | | | | | | | | C | | | | D | D | D | | C | | C | | | | | | | A |
| ACETIC ACID, 10% | A | A | | A | A | A | | A | A | A | A | | | | | | B | | A | A | | A | A | A | A | A | A |
| ACETIC ACID, 20% | A | A | | A | A | C | | A | A | A | A | | A | | C | A | | A | A | A | | A | A | A | A | | A |
| ACETIC ACID, 50% | C | A | | A | A | C | | | A | A | A | | C | | C | A | A | C | A | A | | A | A | A | A | | A |
| ACETIC ACID, 80% | C | A | | A | C | C | | A | A | | A | | | | | | A | C | A | A | | A | A | A | A | | A |
| ACETIC ACID GLACIAL | B | | | | | | | | | A | | | | | | | | C | B | | | | A | A | B | | A |
| ACETIC ANHYDRIDE | C | C | | C | C | | | A | | | A | | A | D | | A | | C | | A | | A | A | B | B | C | A |
| ACETONE | C | C | | C | C | A | | A | B | A | C | | | | | | C | C | A | C | | A | A | A | A | A | A |
| ACETONITRILE | | | | | C | A | | A | | | C | | | | | | B | C | C | C | | A | B | | | A | A |
| ACETOPHENONE | | | | | | | | | | A | | | | | | | C | | | C | | A | | | | | A |
| ACETYL CHLORIDE | C | C | | | | | | A | | | C | | | | | | A | | | C | | A | | | | | A |
| ACETYLENE | C | A | | | | | | A | | A | | | C | C | C | D | A | C | | A | | A | | | | A | A |
| ACETYL NITRILE | | C | | | | | | | | | | | | | | | C | | | C | | | | | | | |
| ACID MINE WATER | | | | | | | | A | | | | | | | | A | | | | | | | | | | C | |
| ACRIFLAUINE | | | | | | | | | | A | A | | | | | | | | | | | | | | | | |
| ACRYLIC ACID | | | | | C | C | | | | | | | | | | | | | | | | | | | | | |
| ACRYLIC EMULSIONS | | | | | | | | | A | A | | | | | | | | | | | | | | | | | |
| ACRYLONITRILE | C | C | | | C | A | | | | | A | | | | | | C | | | C | | | B | | | | |
| ADIPIC ACID | A | A | | | | | | | | | A | | | | | | | | A | | | | | | | | |
| AIR | A | B | | | A | A | | | | A | | | | | | | | | | | | | | | | | |
| ALCOHOL, ALLYL | | A | | | | | | | | | A | | | | | | A | | | A | | | | | | | |
| ALCOHOL, AMYL | A | A | | | A | A | A | A | A | A | A | | A | | | A | A | A | A | A | | | A | A | A | | A |
| ALCOHOL, BENZYL | | | | | | | | | | A | | | | | | | A | | B | C | | | A | A | A | | A |
| ALCOHOL, BUYTL | B | A | | A | A | A | A | A | A | A | A | | A | A | A | A | A | A | A | A | | A | A | A | A | | A |
| ALCOHOL, DIACETONE | | | | | | | | | | A | | | A | | | C | C | A | | C | | | A | A | A | | A |
| ALCOHOL, ETHYL | A | A | | | A | A | | | | A | A | | A | A | A | A | C | A | | A | | | A | A | | | A |
| ALCOHOL, HEXYL | | A | | | | | | | | | A | | | | | | A | A | A | A | | | A | A | A | | A |
| ALCOHOL, ISOBUTYL | | | | | A | A | | | | | | | | | | A | A | | A | B | | | A | A | | | A |
| ALCOHOL, ISOPROPYL | | A | | | A | A | | | | A | | | | | | | A | A | A | B | | | A | A | A | | A |
| ALCOHOL, METHYL | A | A | | | A | A | | | | A | A | | A | A | A | A | C | A | A | A | | | A | A | A | | A |
| ALCOHOL, COTYL | | | | | | | | | | | | | | | | | A | A | A | B | | | A | A | A | | A |
| ALCOHOL, POLYVINYL | | | | | A | A | | | | | | | | | | | | | | | | | | | | | |
| ALCOHOL, PROPARGYL | | A | | | | | | | | | | | | | | | | | | | | | | | | | |
| ALCOHOL, PROPYL | A | A | | | | | | | | A | A | | A | A | A | A | A | A | A | A | | | A | A | A | | A |
| ALLYL, CHLORIDE | | C | | | | A | | | | | A | | | | | | A | | | | | | | | | | |
| ALUM | A | A | | | A | A | | | A | A | A | | | | | | A | A | A | A | | | B | | A | | A |
| ALUM, AMMONIUM | | A | | | | | | | | A | A | | A | A | A | A | A | A | | A | | | | | | | |
| ALUM, CHROME | A | A | | | | | | | | A | A | | A | A | A | A | A | A | | A | | | | | | | |
| ALUM, POTASSIUM | A | A | | | | | | | | A | A | | A | A | A | A | A | A | | A | | | | | | | |
| ALUMINUM, CHLORIDE | A | A | | | A | A | A | A | A | A | A | | A | A | A | A | A | A | A | A | | C | A | A | A | A | C |
| ALUMINUM, CHLOROHYDROXIDE | | | | | | A | A | | | | | | | | | | | | | | | | | | | | |
| ALUMINUM CITRATE | | | | | A | A | | | | | | | | | | | | | | | | | | | | | |
| ALUMINUM, FLUORIDE | A | A | | | | | | | A | A | A | | A | A | A | A | A | A | | A | | | C | | A | | B |
| ALUMINUM, HYDROXIDE | A | A | | | A | A | | | A | A | A | | | | | | A | | | A | | | | | A | | A |
| ALUMINUM, NITRATE | A | A | | | A | A | | | | A | A | | | A | A | A | A | A | | A | | | | | | | |
| ALUMINUM, OXYCHLORIDE | A | A | | | | | | | | A | A | | | | | | C | | | | | | | | | | |
| ALUMINUM, POTASSIUM SULFATE | | | | | A | A | | | | | | | | | | | | | | | | | | | | | |
| ALUMINUM, SULFATE | A | A | | A | A | A | | | A | A | A | | A | A | A | A | A | A | A | A | | A | A | B | A | C | |
| AMINES | | | | | | | | | | | | | | | | | C | C | B | C | | | | | B | | A |
| AMMONIA, ANHYDROUS | | | | A | | | | A | | | | | A | A | A | A | C | A | A | C | | A | A | B | B | | A |
| AMMONIA, AQUA 10% | A | A | | | | | | | | A | A | | | | | | C | | | A | | | | | | | |

A – No effect – Excellent  B – Minor Effect – Good  C – Moderate Effect – Fair  D – Severe Effect – Not Recommended

Industrial Plastics Inc

# ENGINEERING

Industrial Plastics Inc.

# CHEMICAL RESISTANCE CHART

| CHEMICALS | PLASTICS | | | | | | | | | | | ELASTOMERS | | | | | | | | | | | | | ALLOYS | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | CPVC | PVC | KYNAR | POLYESTER | EPOXY | FRP | TEFLON | FRP | POLYETHYLENE | POLYPROPYLENE | RYTON (PENTON) | HYPALON | NITRILE | BUTYL | NATURAL | VITON | NEOPRENE | ETHYLENE/PRO | BUNA "N" | 304 S.S. | HASTELLOY C | HASTELLOY B | TITANIUM | ALUMINUM | 316 S.S. |
| BARIUM ACETATE | | | | | | | A | A | | | | | | | | | | | | | | | | | |
| BARIUM CARBONATE | A | A | | | | | A | A | | | A | A | A | | | | | | A | | | A | | | A | | | | | B |
| BARIUM CHLORIDE | A | A | | | | A | | | | A | A | A | A | | | A | A | A | A | A | A | A | | B | A | A | A | | | B |
| BARIUM CYANIDE | | | | | | | | | | | | | | | | | | | A | A | A | C | | | | | | | | A |
| BARIUM HYDROXIDE | A | A | | | A | A | A | | | A | A | A | A | | | A | A | A | A | A | A | A | | A | B | B | A | B | | A |
| BARIUM NITRATE | | A | | | | | | | | | | | | | | | | A | A | A | A | A | | | | | A | | | A |
| BARIUM SULFATE | A | A | | | A | A | A | | | A | A | A | A | | | | | | A | A | A | A | | A | | | | A | | A |
| BARIUM SULFIDE | A | A | | | | A | A | | | | A | | A | | | A | A | A | A | A | A | A | | | | | | | | A |
| BEER | A | A | | | | | A | | | | A | | A | | | A | A | A | A | A | A | A | | | | | | | | A |
| BEET SUGAR LIQ. | A | | | | | | | | | | | | | | | A | | | A | A | A | A | | | | | | | | A |
| BENZALDEHYDE | C | C | | | | | A | | | | C | A | A | | | D | D | D | D | C | C | A | C | | | | | | | A |
| BENZALKONIUM CHLORIDE | | A | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BENZENE | C | C | | | B | | C | | A | A | B | A | A | | | D | D | D | D | A | C | C | C | A | B | B | A | A | | B |
| BENZENE SULFONIC ACID | A | A | | | B | | A | | A | A | A | A | A | | | | | | A | A | | | C | A | | | | C | | |
| BENZOIC ACID | A | A | | | | | A | | A | | A | A | A | | | | | | | A | C | C | C | | A | | A | | | B |
| BENZOL | | C | | | | | | | | | | B | A | | | | | | | A | C | | C | | A | | | | | |
| BENZYL ALCOHOL | | | | | | | | | | | | A | A | | | | | | | A | | | C | | | | | | | |
| BENZYL CHLORIDE | | | | | | A | | | | A | | | C | | | D | D | D | D | | D | | | | | | | | | |
| BISMUTH CARBONATE | A | A | | | | | | | | | A | A | A | | | | | | | | | | | | | | | | | |
| BLACK LIQUOR | A | A | | | | | B | B | | | | A | A | | | A | | | A | A | A | | A | | | | | | | |
| BLEACH 12.5% ACTIVE $CL_2$ | A | A | | | | | | | | | | | | | | | | | | A | | | C | | | | | | | |
| BLEACH 5.5% ACTIVE $CL_2$ | | A | | | | | | | | | | C | A | | | | | | | A | | | C | | | | | | | |
| BORAX | A | A | | | A | | | | | A | | A | | | | | | | | A | C | A | A | | A | A | A | A | | A |
| BORIC ACID | A | A | | | | | A | A | | | A | A | A | | | A | | A | A | A | C | C | C | | | A | A | A | | B |
| BREEDER PELLETS DERIV. FISH | A | A | | | | | | | | | | A | | | | | | | | | | | | | | | | | | |
| BREWERY SLOP. | | | | | | | | | | | | | | | | | | | | A | | A | A | | | | | | | A |
| BRINE ACID | A | A | | | | | | | | | | A | A | | | | | | | A | | | A | | | A | | | | |
| BROMIC ACID | A | A | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BROMINE GAS | | A | | | | | C | C | | | C | | C | | | | | | | A | | | C | | | | | | | |
| BROMINE LIQUID | | C | | | | | C | C | | | C | | | | | D | | D | D | A | D | | C | | | | | | | |
| BROMINE WATER | | A | | A | | | C | C | | A | B | C | C | | | D | | D | D | A | D | | C | | C | | | | C | C |
| BROMOBENZENE | | C | | | | | | | | | | | | | | | | | | A | | | C | | | | | | | |
| BROMOTOLUENE | | C | | | | | | | | | | C | | | | | | | | | | | | | | | | | | |
| BUTADIENE | A | A | | | A | | | A | | A | | | A | | | D | | | D | A | D | A | A | | A | | | | A | A |
| BUTANE | A | A | | | A | | | A | | A | | B | A | | | A | A | | D | A | A | D | A | | A | | B | | A | A |
| BUTANEDIOL | | | | | | | | | | | A | | | | | | | | | | | | | | | | | | | |
| BUTANOL, PRIMARY | A | A | | | | | | | | | | A | | | | | | | | | | | | | | | | | | |
| BUTANOL, SECONDARY | A | A | | | | | | | | | | A | | | | | | | | | | | | | | | | | | |
| BUTTER | | | | | | | | | | | | | | | | | | | | A | C | A | A | | | | | | | A |
| BUTTERMILK | | | | | | | | | | | | | | | | | | | | A | A | | A | | | | | | | A |
| BUTYLENE | A | A | | | B | | | | | A | | | A | | | | | | | A | | C | A | | A | | | | A | A |
| BUTYL ACETATE | C | A | | | C | | C | A | | | A | C | A | | | D | D | D | D | C | C | B | C | | A | | | | A | |
| BUTYL ALCOHOL | A | A | | | | | | | | | A | A | A | | | | | | | C | | | C | | | | | | | |
| BUTYL AMINE | | | | | C | | | | | A | | | A | | | | | | | | | | | | A | | | | A | A |
| BUTYL CELLOSOLVE | | A | | | | | C | A | | | | | | | | | | | | C | | | C | | | | | | | |
| BUTYL ETHER | | | | | | B | | | | A | | | A | | | | | | | | | | | | A | | | | A | A |
| BUTYL PHENOL | A | A | | | | | | | | | | | A | | | | | | | | | | | | | | | | | |
| BUTYL PHTHALATE | | | | | | | | | | | | A | | | | | | | | A | | | C | | | | | | | |
| BUTYL SEARATE | | A | | | | | | | | | | | | | | | | | | A | | | A | | | | | | | |
| BUTYNEDIOL | A | A | | | | | | | | | | | A | | | | | | | | | | | | | | | | | |
| BUTYRALDEHYDE | | | | | | | | | A | | | | | | | D | | D | D | | D | | | | | | | | | |
| BUTYRIC ACID | A | A | | | | | A | A | | | B | A | A | | | | | | | C | C | B | C | | | A | B | A | | B |

A – No Effect – Excellent  B – Minor Effect – Good  C – Moderate Effect – Fair  D – Severe Effect – Not Recommended

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| CHEMICALS | PLASTICS | | | | | | | | | | | ELASTOMERS | | | | | | | | | ALLOYS | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | CPVC | PVC | KYNAR | POLYESTER | EPOXY FRP | TEFLON | FRP | POLYETHYLENE | POLYPROPYLENE | RYTON (PENTON) | HYPALON | NITRILE | BUTYL | NATURAL | VITON | NEOPRENE | ETHYLENE/PRO | BUNA "N" | 304 S.S. | HASTELLOY C | HASTELLOY B | TITANIUM | ALUMINUM | 316 S.S. |
| CADMIUM CYANIDE | | A | | A | | | | | | | | | | | | | | | | | | | | | |
| CADMIUM SALT | | | | | | | | | | A | A | | | | | | | | | | | | | | |
| CAFFEINE CITRATE | | | | A | | | | | | | | | | | | | | | | | | | | | |
| CALCIUM BISULFIDE | | | | A | | | | | | | A | | A | C | A | A | A | A | C | A | | | | A | | B |
| CALCIUM BISULFITE | | A | | A | | A | | A | | | A | | A | C | A | A | A | A | | A | | | | | | |
| CALCIUM CARBONATE | | A | | A | | A | | A | | A | A | | | | | | A | A | | A | | A | A | A | | A |
| CALCIUM CHLORATE | | A | | A | | A | | | | A | A | | | C | A | D | A | C | | A | | | | | | |
| CALCIUM CHLORIDE | | A | | A | A | A | A | A | A | A | A | | A | A | A | A | A | A | A | B | B | A | B | A | C | B |
| CALCIUM HYDROXIDE | | A | | A | | A | A | | | A | A | | A | A | A | A | A | C | A | B | | A | A | A | | A |
| CALCIUM HYPOCHLORITE | | A | | A | | A | C | | | A | A | | A | A | A | A | A | D | A | B | | A | | A | | C |
| CALCIUM NITRATE | | A | | A | | A | A | | | A | A | | A | A | A | A | A | A | | A | | | | | | |
| CALCIUM OXIDE | | | | A | | | | | | | A | | | | | | | | | | | | | | | |
| CALCIUM PHOSPHATE | | | | | | | | | | | A | | | | | | | | | | | | | | | |
| CALCIUM SULFATE | | A | | A | A | A | A | A | A | A | A | | A | A | A | A | A | C | | A | A | B | B | | B | A |
| CALCIUM SULFITE | | | | | | | | | | | A | | | | | | | | | | | | | | | |
| CALGON | | | | | | | | | | | | | | | | | | A | | A | | | | | | A |
| CAMPHOR CRYSTALS | | | | A | | | | | | | | | | | | | | | | | | | | | | |
| CAMPHOR OIL | | | | | | | | | | B | C | | | | | | | | | | | | | | | |
| CANE SUGAR LIQUORS | | A | | A | | | | | | | A | A | | A | A | A | A | A | | A | | | | | | |
| CAPRYLIC ACID | | | | | | A | A | | | | | A | | | | | | | | | | | | | | |
| CARBITOL | | | | A | | | | | | | | | | | | | A | | | A | | | | | | |
| CARBOLIC ACID | | A | | | | | | | | | A | | D | D | D | D | A | C | C | C | | A | A | B | | A |
| CARBON BISULFIDE | | | | C | | | | | | | C | | | | | | A | C | C | A | | | | | | |
| CARBON DIOXIDE | | A | | A | A | A | A | A | A | A | A | | A | A | A | A | A | A | B | A | A | A | A | A | A | A |
| CARBON DISULFIDE | | C | | C | B | C | | | A | C | C | C | | | D | D | A | C | C | C | A | | | | A | |
| CARBON MONOXIDE | | A | | A | | A | A | | | A | | | | | | | A | A | A | | | | A | | | A |
| CARBON TETRACHLORIDE | | A | | A | A | C | A | | A | C | A | A | | D | D | D | D | A | C | C | C | C | A | B | A | C | A |
| CARBONATER WATER | | A | | | | | | | | | A | | | | | | A | A | | A | A | | | | | |
| CARBONIC ACID | | A | | A | | A | A | | | A | A | A | | A | A | A | A | A | A | B | | A | A | | | B |
| CASTOR OIL | | A | | A | | A | A | | | A | A | A | | A | A | A | A | | A | | | | | | | |
| CATSUP | | A | | | | | | | | | A | | | | | | A | C | | A | | | | | | A |
| CAUSTIC POTASH | | A | | A | | | | | | | | A | | | | | C | | | A | | | | | | |
| CAUSTIC SODA | | A | | A | | | | | | | | A | | A | A | A | A | A | | | | | | | | |
| CELLOSOLVE | | A | | A | A | | | | A | | | A | | | | | C | | | C | A | | | | A | |
| CELLOSOLVE ACETATE | | | | A | | | | | | | | | | | | | C | | | C | | | | | | |
| CETYL ALCOHOL | | | | | | | | | | | A | A | | | | | | | | | | | | | | A |
| CHLORAL HYDRATE | | A | | A | | | | | | | | A | | | | | C | | | C | | | | | | |
| CHLORAMINE | | | | A | | | | | | | | | | | | | | | | | | | | | | |
| CHLORIC ACID | | A | | A | | | | | | | | | | | | | | | | | | | | | | |
| CHLORINATED GLUE | | | | | | | | | | | | | | | | | | | B | C | | | | | | A |
| CHLORINE GAS | | C | | C | | A | C | | | C | C | C | | | | | A | | | B | | | | A | B | |
| CHLORINE LIQUID | | C | | C | | A | C | | | C | C | C | | | | | A | | B | C | | | | | | C |
| CHLORINE WATER | | A | | A | | A | C | | | A | A | A | | | | | A | | | C | | | | | | |
| CHLOROACETIC ACID | | A | | A | | B | | | | B | B | A | | | C | A | D | C | C | B | C | | A | A | A | | C |
| CHLOROACETIC CETYL CHLORINE | | | | A | | | | | | | | | | | | | | | | | | | | | | |
| CHLOROACETIC BENZENE | | C | | C | A | C | A | A | C | C | A | | | | D | D | D | A | C | C | C | A | A | B | A | A | A |
| CHLOROACETIC BENZYL CHLORINE | | C | | C | | | | | | | A | | | | | | A | | | | | | | | | |
| CHLOROACETIC FORM | | C | | C | A | C | C | A | B | C | A | | | D | D | D | D | A | C | C | C | A | B | | A | A | A |
| CHLOROACETIC PICRIN | | | | C | | | | | | | | | | | | | | | | | | | | | | |
| CHLOROACETIC SULFONIC ACID | | | | A | C | C | | A | C | C | C | | | | A | A | D | C | C | C | C | C | B | | C | C |
| CHLOROX BLEACH | | A | | A | | | | | | | C | | | | | | A | A | | B | B | | A | | | A |
| CHOCOLATE SYRUP | | | | | | | | | | | | | | | | | | A | | | A | | | | | A |
| CHROME ALUM | | A | | A | | A | A | | | A | A | A | | | | | | A | | | A | | | | | |

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# CHEMICAL RESISTANCE CHART

| CHEMICALS | PLASTICS | | | | | | | | | | | ELASTOMERS | | | | | | | | ALLOYS | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | CPVC | PVC | KYNAR | POLYESTER | EPOXY | FRP | TEFLON | POLYETHYLENE | POLYPROPYLENE | RYTON (PENTON) | HYPALON | NITRILE | BUTYL | NATURAL | VITON | NEOPRENE | ETHYLENE/PRO | BUNA "N" | 304 S.S. | HASTELLOY C | HASTELLOY B | TITANIUM | ALUMINUM | 316 S.S. |
| CHROMIC ACID 20% | A | A | A | C | C | A | A | A | A | | A | D | D | D | A | C | A | C | | C | A | A | A | C | A |
| CHROMIC ACID 50% | A | A | A | C | C | A | A | A | | | A | D | D | D | A | C | A | C | | C | A | C | A | C | C |
| CHROMIC SULFURIC | | | | | | | A | C | B | | | | | | A | | | | | | | | | | |
| CIDER | | | | | | | A | | | | | | | | A | A | | A | | | | | | | A |
| CITRIC ACID | A | A | | A | A | | A | A | A | | A | A | A | A | A | A | A | A | | | A | A | A | | A |
| CITRIC OILS | | | | | | | | | | | | | | | A | C | | A | | | | | | | A |
| COCONUT OIL | | A | | A | A | | A | A | A | | | | | | A | D | | A | | | | | | | |
| COD LIVER OIL | | | | | | | | | | | | | | | | A | | | | | | | | | |
| COFFEE | A | | | | | | | | A | | | | | | A | A | | A | | | | | | | A |
| COKE OVEN GAS | | A | | | | | | | A | | | | | | A | | | D | | | | | | | |
| COLA CONCENTRATES | | | | | | | A | A | | | | | | | | | | | | | | | | | |
| COPPER ACETATE | | | | | | A | A | | | | | | | | | | | | | | | | | | |
| COPPER CARBONATE | A | A | | | | | | | A | | | | | | A | | | D | | | | | | | |
| COPPER CHLORIDE | A | A | | B | B | A | | A | A | | A | A | A | A | A | D | A | A | | | | | A | | C |
| COPPER CYANIDE | A | A | | A | A | | | A | A | | A | A | A | A | A | A | A | A | | | A | B | A | | A |
| COPPER FLUOBORATE | | | | | | | | | | | | | | | A | A | | B | | | B | B | | | D |
| COPPER FLUORIDE | A | A | | | | A | | A | A | | | | | | A | | | | | | | | | | |
| COPPER NITRATE | A | A | | A | A | A | | A | A | | | | | | A | A | | A | | | A | D | A | | A |
| COPPER SALTS | A | A | | | | | | A | | | | | | | | | | | | | | | | | |
| COPPER SULFATE | A | A | A | A | A | A | | A | A | | A | A | C | A | A | A | A | A | | C | A | | A | | A |
| CORN OIL | | | | A | A | | | | | | | | | | | A | | | | | | | | | |
| CORN SYRUP | | A | | A | A | | | A | | | | | | | A | | | A | | | | | | | |
| COTTON SEED OIL | A | A | | A | A | A | A | A | A | | | | | | A | A | | A | | A | | | | | A |
| CREAM | A | | | | A | | | A | | | | | | | A | C | | A | | | | | | | A |
| CREOSOTE | | D | | | | | | | | | | | | | | D | | | | | | | | | |
| CREOSOLS | D | B | A | | A | A | C | C | A | | | | | | A | D | D | D | | A | | | | | A |
| CRESYLIC ACID 50% | A | A | | D | D | | | | A | | | | | | A | D | D | D | | | B | B | | | A |
| CROTON ALDEHYDE | D | D | | | | | | | D | | | | | | | | | | | | | | | | |
| CRUDE OIL | A | A | A | A | A | A | | B | B | | | C | D | D | A | B | | D | | A | | | | | A |
| CUPRIC FLOURIDE | | A | | | A | | A | A | A | | | | | | | | | | | | | | | | |
| CUPRIC CHLORIDE | | | | | | | A | A | | | | | | | | | | | | | | | | | |
| CUPRIC CYANIDE | | | | | | | A | A | | | | | | | | | | | | | | | | | |
| CUPRIC NITRATE | | | | | | | A | A | | | | | | | | | | | | | | | | | |
| CUPRIC SULFATE | | A | | | | | A | A | A | | | | | | A | | | A | | | | | | | |
| CUPROUS CHLORIDE | | A | | | | A | A | A | A | | | | | | A | | | A | | | A | | B | | |
| CYANIC ACID | | | | | | | | | | | | | | | | D | | C | | | | | | | |
| CYCLOHEXANE | | | | A | B | A | A | C | D | A | | | | | A | D | D | B | | A | | | A | A | A |
| CYCLOHEXANOL | D | D | | A | | A | A | | A | A | | | | | A | | | B | | A | | | | C | A |
| CYCLOHEXANONE | D | D | | D | | | A | | C | B | | | | | C | | | C | | A | | | | A | A |
| DECALAN | D | D | | | | | | | D | A | | | | | A | | | D | | | | | | | |
| DESOCYEPHEDRINE HYDROCHLORIDE | | B | | | | | | | | | | | | | | | | | | | | | | | |
| DETERGENTS | A | A | | A | A | A | | A | A | | | | | | A | A | A | A | | A | | | | C | A |
| DETERGENTS, HEAVY DUTY | A | A | | | | | | A | | | | | | | A | | | A | | | | | | | |
| DETERGENTS, SYNTHETIC | | | | | | | A | A | | | | | | | | | | | | | | | | | |
| DEVELOPERS | | A | | A | A | A | A | A | | | | | | | A | A | | A | | | A | | A | | A |
| DEXTRIN | A | A | | | | | A | A | | | | | | | | | | | | | | | | | |
| DEXTROSE | A | A | | A | A | | A | A | | | | | | | A | A | | A | | | | | | | |
| DIALLYL PHTHALATE | | | | A | A | | | | | | | | | | | | | | | | | | | | |
| DIAMMONIUM PHOSPHATE | | | | | | | | | | | | A | A | A | | A | | | | | | | | | |
| DIAZO SALTS | A | A | | | | | A | A | | | | | | | | | | | | | | | | | |
| DIBENZYL | | | | | | | | | | | | | | | | D | | | | | | | | | |
| DIBUTOXY ETHYL PHTHALATE | | D | | | | | | | | | | | | | | | | | | | | | | | |
| DIBUTYL ETHER | | | | | | | | | | | | | | | | D | | | | | | | | | |

A – No Effect – Excellent  B - Minor Effect – Good  C – Moderate Effect – Fair  D – Severe Effect – Not Recommended

Industrial Plastics Inc.

# ENGINEERING

Industrial Plastics Inc.

## CHEMICAL RESISTANCE CHART

| CHEMICALS | PLASTICS | | | | | | | | | | ELASTOMERS | | | | | | | | | | ALLOYS | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | CPVC | PVC | KYNAR | POLYESTER | EPOXY | FRP | TEFLON | FRP | POLYETHYLENE | POLYPROPYLENE | RYTON (PENTON) | HYPALON | NITRILE | BUTYL | NATURAL | VITON | NEOPRENE | ETHYLENE/PRO | BUNA "N" | 304 S.S. | HASTELLOY C | HASTELLOY B | TITANIUM | ALUMINUM | 316 S.S. |
| DIBUTYL PHTHALATE | | D | | D | | | A | | A | A | | B | A | | | | | | D | | | D | | | |
| DIBUTYL SEBACATE | | | | B | | | | | | | | | | | | | | | | | | | | | |
| DICALCIUM PHOSPHATE | | | | | | | A | | A | | | | | | | | | | | | | | | | |
| DICHLOROACETALDEHYDE | | | | | | | D | | | | | | | | | | | | | | | | | | |
| DICHLORO BENZENE | | | | D | | | D | | A | | | | | | | | | | A | | | D | | | |
| DICHLOROETHYLENE | | | | | | | | | | A | | A | | | | | | | A | | | D | | | |
| DICHLOROMETHANE | | | | | | | D | | D | | | | | | | | | | | D | | | | | |
| DIEMETHYL PHTHALATE | | | | | | | B | | B | | | | | | | | | | | | | | | | |
| DIESEL FUEL | | B | | B | | A | B | | A | A | | | A | | | | | | A | D | D | A | | A | | | A | A |
| DIETHANOLAMINE | | | | | | | D | | D | A | | A | A | | | | | | | | | | | | |
| DIETHYL CELLOSOLVE | | | | | | | | | | | | | A | | | | | | | | | | | | |
| DIETHYL ETHER | | D | | D | | | D | | B | | | C | A | | | | | | D | | | D | | | |
| DIETHYL KEYTONE | | | | | | | D | | | | | | | | | | | | | | | | | | |
| DIETHYL SEBECATE | | | | | | | | | | | | | | | | | | | | D | | | | | |
| DIETHYLAMINE | | | | | | | | | | | | | A | | | | | | B | | B | B | | | | | A |
| DIETHYLENE GLYCOL | | | | | | | A | | A | | A | A | | | | | | | A | A | A | A | | | | | A |
| DIETHYLENE TRIAMINE | | | | | | | D | | D | | | | | | | | | | | | | | | | |
| DIGLYCOLIC ACID | | A | | A | | | | | | | | A | A | | | | | | | | | | | | |
| DIISOBUTYLENE | | | | | | A | | | | A | | | | | | | | | | | | | A | | | A | A |
| DIISOOCTYL PHTHALATE | | | | | | | | | | A | | A | | | | | | | | | | | | | |
| DIMETHYL FORMAMIDE | | D | | D | | | D | | D | A | | A | D | | | | | | D | | | C | | A | | A | A |
| DIMETHYL HYDRAZONE | | | | D | | | | | | | | | | | | | | | D | | | C | | | |
| DIMETHYL PHATHALATE | | | | | | D | | | | A | | | | | | | | | | | | | | A | | A | A |
| DIMETHYL SULFOXIDE | | | | | | | | | | | | | A | | | | | | | | | | | | |
| DIMETHYLAMINE | | | | A | | | D | | D | | | B | A | | | | | | D | | | | | | |
| DIMETHYL AQUEOUS | | D | | D | | | | | | | | B | | | | | | | | | | | | | |
| DIOCTYL PHTHALATE | | D | | D | | | | | | A | B | D | A | | | | | | C | | | D | | A | | A | A |
| DIOXANE | | | | | | D | | | | A | | D | D | | | | | | D | | | D | | C | | C | C |
| DIOXANE 1 & 4 | | | | | | | | | | | | | C | | | | | | D | | | D | | | |
| DIPHNOL ETHER | | | | | | | | | | A | | | | | | | | | | | | | | A | | A | A |
| DIPHENYL ETHER | | | | | | | B | | B | | | | | | | | | | | | | | | | |
| DIPHENYL OXIDE | | | | | | | | | | | | | | | | | | | A | D | D | D | | | | | A |
| DIPROPYLENE GLYCOL | | | | | | | A | | A | | | | | | | | | | | | | | | | |
| DISODIUM METHYL ARSENATE | | | | | | | | | A | | | | | | | | | | | | | | | | |
| DISODIUM PHOSPHATE | | A | | A | | | | | | | A | A | A | | | | | | | | | | | | |
| DISTILLED WATER | | A | | A | | | | | | | | A | | | | | | | | | | | | | |
| DIVINYLBENZENE | | D | | D | | | | | | | | | A | | | | | | | | | | | | |
| DOWTHERM | | | | | | | | | | | | | A | | | | | | | D | | | | | |
| EMULSIONS, PHOTOGRAPHIC | | | | | | | | | | | A | A | | | | | | | | | | | | | |
| EPICHLOROHYDRIN | | | | | | D | | | | A | | A | | | | | | | | | | | | A | | A | A |
| EPSOM SALTS | | | | A | | | | | | | | A | | | | | | | A | A | A | A | | | B | A | A | A |
| ESTERS | | D | | D | | | | | | | | | | | | | | | | | | | | | | | |
| ETHANE | | | | | | | | | | | | | | | | | | | A | D | D | A | | | | A | | A |
| ETHANOL | | A | | A | | | | | | | | A | | | | | | | | | | | | | | | |
| ETHANOLAMINE | | | | | | D | | | | A | | A | A | | | | | | D | | | B | | A | | | | A |
| ETHERS | | D | | D | | C | | | | A | | C | | | | | | | C | D | C | D | | A | B | | A | A |
| ETHYL ACETATE | | D | | D | | C | | D | B | A | B | A | C | | | | | | D | D | B | D | | A | B | | A | A |
| ETHYL ACETOACETATE | | D | | D | | | | | | | | | | | | | | | D | | | D | | | | | |
| ETHYL ALCOHOL | | A | | A | | | | | | | | A | A | | | | | | | | | | | | | | |
| ETHYL ACRYLATE | | D | | D | | | | | | | | | B | | | | | | D | | | D | | | | | |
| ETHYL BENZENE | | | | | | | | | | | | | | | | | | | | D | | | | | | | |
| ETHYL BROMIDE | | | | | | | | | | | D | D | | | | | | | | | | | | | | | |

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# CHEMICAL RESISTANCE CHART

| CHEMICALS | PLASTICS | | | | | | | | | | | ELASTOMERS | | | | | | | | ALLOYS | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | CPVC | PVC | KYNAR | POLYESTER | EPOXY | FRP | TEFLON | POLYETHYLENE | POLYPROPYLENE | RYTON (PENTON) | HYPALON | NITRILE | BUTYL | NATURAL | VITON | NEOPRENE | ETHYLENE/PRO | GUNA "N" | 304 S.S. | HASTELLOY | HASTELLOY C | TITANIUM | ALUMINUM | 316 S.S. | | |
| ETHYL BUTYRATE | | | | | | | | | | D | D | | | | | | | | | | | | | | | |
| ETHYL CHLORIDE | D | D | | | D | D | | | C | C | A | | D | D | D | D | A | C | A | A | | | B | B | | A |
| ETHYL CHLORIDE (WET) | | | | | | | A | | | A | C | | | | | | | | | | | D | | | D | D |
| ETHYL CELLOSOLVE | | | | | D | B | | | | | | | | | | | | | | | | | | | | |
| ETHYL CELLULOSE | | | | | | | | | | | | | A | | | A | | A | | | | | | | | |
| ETHYL ETHER | D | D | | | D | C | | | D | D | | | | | | | D | | | D | | | | | | |
| ETHYL CHLORDACETATE | | D | | | | | | | | | | | | | | | | | | | | | | | | |
| ETHYL SULFATE | | | | | | | | | | | | | | | | | A | | | A | | | | | | D |
| ETHYLENE BROMIDE | D | D | | | | | | | | | C | | | | | | | | | | | | | | | |
| ETHYLENE CHLORIDE | D | D | | A | | | | A | | D | C | | | | | | A | D | C | D | | C | B | B | B | C | A |
| ETHYLENE DIAMINE | | | | C | D | D | | A | | | D | | | | | | D | | | A | | A | | | | D | A |
| ETHYLENE DICHLORIDE | D | D | | | D | C | | A | C | A | D | | D | D | D | D | A | D | C | D | | C | B | A | | C | C |
| ETHYLENE GLYCOL | A | A | | A | A | A | A | A | A | A | A | | A | A | A | A | A | A | A | A | | A | | | | D | A |
| ETHYLENE OXIDE | D | D | | | | | | | | | D | | | | | | D | D | C | D | | | | | | | |
| ETHYLENE TRICHLORIDE | | | | | | | | | | | | | | | | D | | | | | | | | | | |
| ETHYLENE CHLOROHYDRIN | | D | | | A | B | | | | | | | | | | | A | | | D | | | | | | |
| FATTY ACIDS | A | A | | | A | A | | | A | A | | | A | A | D | D | A | D | C | B | | | A | A | | | A |
| FERRIC ACETATE | | C | | | B | A | | | | | | | | | | | | | | | | | | | | |
| FERRIC CHLORIDE | A | A | | A | A | A | A | A | A | A | A | | A | A | A | A | A | A | A | A | | D | A | D | A | D | D |
| FERRIC HYDROXIDE | | A | | | | | | | | | | | | | | | | | | | | | | | | | |
| FERRIC NITRATE | A | A | | | A | A | | | A | A | A | | A | A | A | A | A | A | A | A | | | A | | | | B |
| FERRIC SULFATE | A | A | | | A | A | | | A | A | A | | A | A | A | A | A | A | | B | | | A | | | | A |
| FERROUS CHLORIDE | A | A | | A | A | A | A | A | A | A | A | | | A | A | A | A | A | | | | D | B | D | | D | D |
| FERROUS HYDROXIDE | | A | | | | | | | | | | | | | | | | | | | | | | | | | |
| FERROUS NITRATE | A | A | | | A | A | | | | A | A | | | | | | | | | | | | | | | | |
| FERROUS SULFATE | A | A | | | A | A | | | A | A | A | | | A | A | A | A | A | | A | | | B | B | A | | B |
| FISH SOLUBLES | A | A | | | | | | | A | A | | | | | | | | | | | | | | | | | |
| FLUORIDE SALTS | | | | | | | | | | | | | A | A | A | A | | A | | | | | | | | | |
| FLUORINE GAS (WET) | C | A | | | | | | | | D | D | | D | C | C | D | D | D | | D | | | | | | | |
| FLUORINE GAS (DRY) | | | | | | | | | | | | | | D | D | D | | D | | | | | | | | | |
| FLUOBORIC ACID | C | A | | | A | A | | | A | B | | | A | A | A | A | A | A | | | | | A | | D | | B |
| FLUOSILICIC ACID | A | A | | | C | C | | | A | A | A | | A | A | A | A | C | A | | A | | | | | | | B |
| FLOURINE | | | | | D | D | | | | | | | | | | | | | | | | | | | | | |
| FORMALDEHYDE | A | A | | A | A | B | A | A | A | A | A | | A | A | A | A | A | D | B | C | | B | B | B | B | B | A |
| FORMIC ACID | C | C | | | C | D | | | A | A | A | | A | A | A | A | B | D | A | D | | | A | B | B | | A |
| FREON II | A | A | | A | | | | A | | | A | | | | | | A | D | D | A | | A | | | | A | A |
| FREON 12 | B | B | | A | | | | A | A | A | A | | | | | | A | D | B | B | | A | | | | A | A |
| FREON 21 | | D | | A | | | | A | | | A | | | | | | D | | | D | | A | | | | A | A |
| FREON 22 | | D | | A | | | | A | | | A | | | | | | D | D | A | D | | A | | | | A | A |
| FREON 113 | | B | | A | | | | A | | | A | | | | | | B | D | D | C | | A | | | | A | A |
| FREON 114 | | | | A | | | | A | | | | | | | | | A | | | A | | A | | | | A | A |
| FREON TF | | | | A | | | | A | | | | | | | | | B | D | D | C | | A | | | | A | A |
| FREON E-3 | | | | A | | | | A | | | | | | | | | | | | | | A | | | | A | A |
| FRUCTOSE | A | A | | | | | | | A | A | A | | | | | | A | | | A | | | | | | | |
| FRUIT JUICE | A | A | | | | | | | | A | A | | | A | A | A | A | A | | A | | | | | | | A |
| FRUIT PULP | A | A | | | | | | | A | A | A | | | | | | | | | | | | | | | | |
| FUEL OIL | | | | A | A | A | A | | C | C | A | | A | A | D | D | A | D | D | A | | A | | | | A | A |
| FUMARIC ACID | | | | | | | | | | | | | | | | A | | | | | | | | | | | |
| FURAN | | | | D | | | | A | | | | | | | | | | A | | | | A | | | | A | A |
| FURFURAL | D | D | | D | D | D | A | | D | D | | | C | D | C | B | D | C | B | D | | A | B | B | | A | A |
| FURFURYL ALCOHOL | | | | | | | | | D | D | | | | | | | | | | | | | | | | | |

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# CHEMICAL RESISTANCE CHART

| CHEMICALS | PLASTICS | | | | | | | | | | | ELASTOMERS | | | | | | | | | ALLOYS | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | CPVC | PVC | KYNAR | POLYESTER | EPOXY FRP | TEFLON | POLYETHYLENE | POLYPROPYLENE | RYTON (PENTON) | HYPALON | NITRILE | BUTYL | NATURAL | VITON | NEOPRENE | ETHYLENE/PRO | BUNA "N" | 304 S.S. | HASTELLOY C | HASTELLOY B | TITANIUM | ALUMINUM | 316 S.S. | | | | |
| GALUC ACID | | C | A | | | | | | A | A | B | | | A | A | A | A | A | | C | | | | | | | |
| GAS, MANUFACTURED | | | A | | A | B | A | A | C | C | C | | | | | | A | D | D | | | A | A | A | | A | A |
| GAS, NATURAL | | A | A | | | | | | | A | A | | | | | | A | | | A | | | | | | | |
| GASOLINE, BENZENE | | | | | | | | | D | D | | | | | | | | | | | | | | | | | |
| GASOLINE, LEADED | | D | A | | | | | | | D | A | | | | | | A | | | A | | | | | | | |
| GASOLINE, UNLEADED | | | A | | | | | | | D | A | | | | | | A | | | A | | | | | | | |
| GASOLINE, SOUR | | D | A | | | | | | | D | | | | | | | A | | | A | | | | | | | |
| GASOLINE, REFINED | | D | A | | | | | | | D | | | D | A | D | D | | C | | | | | | | | | |
| GELATIN | | A | A | | | | | | | A | | | A | A | A | A | A | A | A | A | | | B | | | | A |
| GIN | | A | A | | | | | | A | A | A | | | | | | | | | | | | | | | | |
| GLAUBERS SALTS | | | A | | | | | | | | | | | | | A | | | | | | | | | | | |
| GLUCONIC ACID | | | | | | C | C | | | | | | | | | | | | | | | | | | | | |
| GLUCOSE | | A | A | | | A | A | | A | A | A | | A | A | A | A | A | A | A | A | | | | | | | A |
| GLUE | | A | A | | | | | | | A | | | A | | | A | A | A | | A | | | | | | | A |
| GLYCERIN | | A | A | | | A | A | | | A | A | | A | A | A | A | A | A | A | A | | | A | A | A | A | |
| GLYCEROL | | | | | | | | | A | A | | | | | | | | | | | | | | | | | |
| GLYCOLIC ACID | | A | A | | D | | | A | | A | A | | | | | | A | A | | A | | A | | | | D | A |
| GLYCOLS | | A | A | | | | | | A | A | | | | | | | A | | | A | | | | | | | |
| GLYOXAL | | | | | | | | C | | | | | | | | | | | | | | | | | | | |
| GOLD MONOCYANIDE | | | | | | | | | | | | | | | | | A | A | | A | | | | | | | A |
| GRAPE JUICE | | A | | | | | | | | | | | | | | | A | A | | A | | | | | | | |
| GRAPE SUGAR | | | A | | | | | | A | A | | | | | | | A | | | A | | | | | | | |
| GREASE | | | | | | | | | | | | | C | A | D | D | A | D | | | | | | | | | A |
| GREEN LIQUOR | | A | A | | | | D | | | | | | | A | A | A | | A | | | | | | | | | |
| HEPTANE | | A | A | A | A | A | A | C | C | A | | | A | | | D | A | D | D | A | | A | | | | A | A |
| HEXANE | | B | B | A | B | B | A | | D | A | | | A | A | D | D | A | D | D | A | | A | | | | A | A |
| HEXANOL | | A | A | | | | | | | | | | | | | | | | | | | | | | | | |
| HONEY | | | | | | | | | | | | | | | | | A | A | A | A | | | | | | | A |
| HYDRAULIC FLUID | | | | | | B | A | | | | | | | | | | | | | | | | | | | | |
| HYDRAULIC OIL (PETROLEUM) | | | | | | A | A | | | | | | | | | | D | A | D | A | | | | | | | A |
| HYDRAULIC OIL (SYNTHETIC) | | | | | | A | A | | | | | | | | | | A | C | | C | | | | | | | A |
| HYDRAZINE | | D | | | | | | | | | | | | | | | A | A | A | A | | | | | | | A |
| HYDROBROMIC ACID 20% | | A | A | | | | | | | A | | | | | | | A | | | D | | | | | | | |
| HYDROBROMIC ACID 50% | | | | | | | | | A | A | | | | | | | A | | | D | | | | | | | |
| HYDROBROMIC ACID DILUTE | | A | A | | | | | | | A | | | | | | | A | | | D | | | | | | | |
| HYDROCHLORIC ACID 10% | | A | A | | | C | C | | | A | | | A | | A | A | A | A | A | C | | A | | B | C | | D |
| HYDROCHLORIC ACID 20% | | A | A | | A | C | C | A | | A | A | | A | | A | A | A | C | C | C | | D | A | A | C | D | D |
| HYDROCHLORIC ACID 40% | | A | A | | | C | C | | | A | A | | A | | A | A | A | | | D | | | | | | | |
| HYDROCHLORIC ACID 50% | | A | A | | | | | | | A | | | | | | | | | | | | | | | | | |
| HYDROCHLORIC ACID DILUTE | | A | A | | | | | | | A | | | | | | | | | | | | | A | A | A | | A |
| HYDROCYANIC ACID | | A | A | | | | | | A | A | A | | A | A | A | A | A | A | A | B | | | A | A | A | | A |
| HYDROCYANIC ACID 10% | | A | A | | | | | | A | A | A | | A | A | A | A | A | A | A | B | | | | | | | |
| HYDROFLUORIC ACID 20% | | A | A | | | D | D | | C | C | A | | A | C | A | A | A | C | A | C | | | B | B | D | | C |
| HYDROFLUORIC ACID 50% | | A | A | | A | | | A | | C | A | | A | | C | A | A | C | A | C | | D | B | B | D | D | C |
| HYDROFLUORIC ACID 75% | | A | A | | | | | | | C | A | | | | | | A | D | C | D | | | | B | D | | D |
| HYDROFLUORIC ACID 100% | | | | | | | | | | | A | | | | | | B | | | D | | | | | | | |
| HYDROFLUORIC ACID DILUTE | | A | A | | | | | | | C | A | | | | | | B | | | D | | | | | | | |
| HYDROFLUORSILICIC ACID | | D | D | | | | | | | | | | A | A | A | A | A | C | A | A | | | | B | | | D |
| HYDROGEN | | B | A | | | | | | | A | A | | | A | A | | A | A | | A | | | | | | | |
| HYDROGENCHLORIDE | | | | | | | | | A | A | | | | | | | | | | | | | | | | | |
| HYDROGENCYANIDE | | | A | | | | | | | B | | | | A | A | A | | A | | | | | | | | | |
| HYDROGEN PEROXIDE 30% | | A | A | | A | C | D | A | A | C | | | A | A | A | D | A | D | C | D | | C | | | | A | C |

A – No Effect – Excellent  B – Minor Effect – Good  C – Moderate Effect – Fair  D – Severe Effect – Not Recommended

Industrial Plastics Inc

# ENGINEERING

Industrial Plastics Inc

## CHEMICAL RESISTANCE CHART

| CHEMICALS | PLASTICS | | | | | | | | | | ELASTOMERS | | | | | | | | | | ALLOYS | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | CPVC | PVC | KYNAR | POLYESTER | EPOXY FRP | TEFLON | FRP | POLYETHYLENE | POLYPROPYLENE | RYTON (PENTON) | HYPALON | NITRILE | BUTYL | NATURAL | VITON | NEOPRENE | ETHYLENE/PRO | BUNA "N" | 304 S.S. | HASTELLOY C | HASTELLOY B | TITANIUM | ALUMINUM | 316 S.S. |
| HYDROGEN PEROXIDE 50% | | A | | A | | | | | | D | A | | A | A | A | D | A | D | C | D | | | | |
| HYDROGEN PEROXIDE 90 % | | A | | A | | | | | | D | A | | A | A | A | D | A | D | C | D | | | | |
| HYDROGENPHOSPHIDE | | A | | A | | | | | A | A | | | | C | A | A | | C | | | | | | |
| HYDROGEN SULFIDE (DRY) | | A | | A | | | A | A | | A | A | | A | A | A | A | D | A | | D | | | | |
| HYDROGEN SULFIDE (AQ. SOL.) | | A | | A | | | A | A | | A | A | | A | A | A | A | D | A | A | D | | | A | | A |
| HYDROGEN SULFIDE (WET) | | | | | | A | A | A | A | A | A | C | A | A | A | A | | A | | | A | | | A | A |
| HYDROQUINONE | | A | | A | | | | | | A | A | | A | A | A | A | A | A | | D | | | | |
| HYDROXYACETIC ACID | | | | A | | | | | | | | | | | | | A | A | A | A | | | A | | |
| HYPD SOLUTIONS | | | | C | | | | | | | | | A | A | A | A | | A | | | | | | | |
| HYPOCHLOROS ACID | | A | | A | | | A | | | A | A | | | C | A | C | A | D | | D | | | | | |
| HYDROGEN FLUORIDE | | D | | D | | | | | | | | D | | | | | D | | | D | | | | | |
| HYDROGEN GAS | | | | | | A | | | A | | | A | | | | | | | | | A | | | A | A |
| HYDROXYLAMINE SULFATE | | A | | A | | | | | | | | | | | | | | | | | | | | | |
| HYPO. SODIUM THIOSULFATE | | A | | A | | | | | | | A | | | | | | | | | | | | | | |
| INK | | | | | | | | | A | A | | | | A | A | A | | A | | A | | | | | A |
| IODINE | | D | | D | | | C | | B | A | | | A | A | A | D | A | A | B | A | | B | | A | D |
| IODINE SOLUTION | | | | B | | | | | | | | B | | | | | A | | | C | | | | | |
| ISOTANE | | | | | | | | | | | | | | | | | | | | A | | | | | |
| ISODODECANE | | | | | | | | | | | | | A | | | D | | A | | | | | | | |
| ISOPROPYL ACETATE | | | | | | | | | | | | | | | | | D | D | B | D | | | | | B |
| ISOPROPYL ETHER | | | | | | | | | | | C | | | D | | D | D | D | D | A | | | | | A |
| ISOPROPYL ALCOHOL | | A | | A | | | | | | | A | | | | | | | | | | | | | | |
| ISO OCTANE | | | | | | | | | | | D | | | A | | D | A | A | | A | | | | | |
| JP-3 | | A | | A | | A | A | A | A | | | C | | | | | A | D | D | B | | A | | A | A |
| JP-4 | | A | | A | | A | A | A | A | | D | C | | | | | A | D | D | B | | A | | A | A |
| JP-5 | | A | | A | | A | A | A | A | | D | C | | | | | A | D | D | B | | A | | A | A |
| KEROSENE | | A | | A | | A | A | A | A | B | A | C | | C | A | D | A | D | D | A | | A | | A | A |
| KEYTONES | | D | | | | D | | | A | | A | D | | | | | D | D | A | D | | A | | A | A |
| KRAFT LIQUOR | | A | | A | | | | | | | | | | | | | | | | | | | | | |
| LACQUERS | | | | | | | | | | | | | | D | D | D | D | D | D | D | | | | | A |
| LACTIC ACID | | B | | B | | D | A | A | A | A | A | C | | A | A | A | A | C | A | A | | A | | B | B | C | A |
| LARD | | A | | A | | | | | | | | A | | C | A | D | D | A | A | B | A | | | | | | A |
| LAYTEX | | | | | | | B | B | | A | A | | | | | | | A | C | | A | | | | | | A |
| LPG | | | | | | A | | | A | | | | | | | | | | | | | A | | | A | A |
| LAURIC ACID | | A | | A | | | A | A | | | A | A | | | | | | | | | | | | | | | |
| LAURYL CHLORIDE | | A | | A | | | | | | | | | | | | | | | | | | | | | | | |
| LEAD ACETATE | | A | | A | | | A | A | | A | A | A | | | A | A | A | D | A | A | A | | | A | | B |
| LEAD CHLORIDE | | | | A | | | | | | | | | | | | | | | | | | | | | | | |
| LEAD NITRATE | | | | A | | | A | A | | | | | | | | | A | A | | | A | | | | | |
| LEAD SULFAMATE | | | | | | | | | | | A | | | | | | | A | A | A | B | | | | | |
| LEAD SULFATE | | | | A | | | | | | | | | | | | | | | | | | | | | | |
| LEMON OIL | | | | | | | | | | | D | A | | | | | | | | | | | | | | |
| LEVULINIC ACID | | | | | | | A | A | | | | | | | | | | | | | | | | | | |
| LIGROINE | | | | | | | | | | | A | | | | | | | A | | D | A | | | | | A |
| LIME | | A | | | | | | | | | | | | | | | | A | A | A | A | | | A | | |
| LIME BLEACH | | A | | | | | | | | | | | | | A | A | A | | A | | | | | | | |
| LIME SLURRY | | | | | | | B | A | | | | | | | | | | | | | | | | | | |
| LIME SULFUR | | A | | A | | | | | | | A | | | | | | | A | | | D | | | | | |
| LINOLEIC ACID | | A | | A | | | | | | | A | A | | | | | | B | | | B | | | | | |
| LINOLEIC OIL | | | | A | | | | | | | | | | | | | | C | | | C | | | | | |

A – No Effect – Excellent  B – Minor Effect – Good  C – Moderate Effect – Fair  D – Severe Effect – Not Recommended

Industrial Plastics Inc

# ENGINEERING

Industrial Plastics Inc.

## CHEMICAL RESISTANCE CHART

| CHEMICALS | PLASTICS | | | | | | | | | | | ELASTOMERS | | | | | | | | | ALLOYS | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | CPVC | PVC | KYNAR | POLYESTER | EPOXY | TEFLON | FRP | POLYETHYLENE | POLYPROPYLENE | RYTON (PENTON) | HYPALON | NITRILE | BUTYL | NATURAL | VITON | NEOPRENE | ETHYLENE/PRO | BUNA "N" | 304 S.S. | HASTELLOY C | HASTELLOY B | TITANIUM | ALUMINUM | 316 S.S. |
| LINSEED OIL | | A | | A | | | A | A | | C | A | A | | A | A | D | D | A | A | | A | | | | | | |
| LIQUERS | | | | A | | | | | | | | | | | | | | | | | | | | | | | |
| LITHIUM BROMODE | | | | A | | | | | | | | | | | | | | A | | | A | | | | | | |
| LITHIUM CHLORIDE | | | | | | | A | A | | | | | | | | | | | | | | | | | | | |
| LUB OIL | | A | | A | | A | A | A | | A | D | B | A | | C | A | D | D | A | D | D | A | | A | | | A | A |
| LYE SOLUTION | | A | | A | | | | | | | | A | | | | | | A | | A | | | | | | | |
| MALIC ACID | | | | A | | | A | A | | | | | A | | | A | A | A | A | A | | D | | | | | |
| MACHINE OIL | | A | | A | | | | | | | | B | | | | | | | | | | | | | | | |
| MAGNESIUM BISULFITE | | | | | | | | | | | | | | | | C | A | A | | C | | | | | | | |
| MAGNESIUM CARBONATE | | A | | A | | | B | A | | A | A | A | | | | | | | | A | | A | | | B | B | A |
| MAGNESIUM CITRATE | | | | A | | | | | | | | | | | | | | | | | | | | | | | |
| MAGNESIUM CHLORIDE | | A | | A | | | A | A | | A | A | A | | A | A | A | A | A | A | A | A | A | | | A | A | A |
| MAGNESIUM HYDROXIDE | | A | | A | | A | B | A | A | A | A | C | | | | | | A | A | A | A | | | A | | A | C | A |
| MAGNESIUM NITRATE | | A | | A | | | A | A | | A | A | A | | | | | | | A | | A | | | | | | A |
| MAGNESIUM OXIDE | | | | | | | | | | | | | | | | | | | A | | A | | | | | | A |
| MAGNESIUM SULFATE | | A | | A | | | A | A | | A | A | A | | A | A | A | A | A | A | A | A | A | | | B | A | A | A |
| MANGANESE CHLORIDE | | | | | | | | | | | | | | | A | A | A | | A | | | | | | | | |
| MANGANESE SALTS | | A | | A | | | | | | | | A | | | | | | | | | | | | | | | |
| MANGANESE SULFATE | | | | A | | | | | | | | A | | | A | A | A | | A | | | | | | | | |
| MALEIC ACID | | A | | A | | | A | A | | B | B | A | | | A | D | A | A | A | D | A | | | | | B | A | A |
| MALEIC ANHYDRIDE | | | | | | | | | | | | | | | | | | A | D | D | D | | | | A | A | | |
| MASH | | | | | | | | | | | | | | | | | | | A | | A | | | | | | | A |
| MAYONAISE | | | | | | | | | | | | | | | | | | A | | | A | | | | | | | A |
| MELAMINE | | | | | | | | | | | | | | | | | | | | | C | | | | | | | D |
| MERCURIC CHLORIDE | | A | | A | | | A | A | | A | A | A | | A | A | A | A | A | A | A | A | | | | B | | A | D |
| MERCURIC CYANIDE | | A | | A | | | | | | A | A | A | | A | A | A | A | | A | | A | | | | | | A | A |
| MERCURIC NITRATE | | | | A | | | | | | | | | | A | A | A | A | | A | | | | | | | | | |
| MERCURIC SULFATE | | | | A | | | | | | | | | | | | | | A | | | A | | | | | | | |
| MERCUROUS CHLORIDE | | | | | | | A | A | | | | | | | | | | | | | | | | | | | | |
| MERCUROUS NITRATE | | | | A | | | | | | A | A | A | | | | | | | | | | | | | | | | |
| MERCURY | | A | | A | | | A | A | | A | A | A | | A | A | A | A | A | A | A | A | | | | | B | B | A |
| METHANE | | A | | A | | | | | | | | C | | | | | | A | | | A | | | | | | | |
| METHACRYLIC ACID GLACIAL | | | | | | | D | D | | | | | | | | | | | | | | | | | | | | |
| METHOXYETHYL OLEATE | | | | A | | | | | | | | | | | | | | | | | | | | | | | | |
| METHELENE CHLOROBROMIDE | | | | D | | | | | | | | | | | | | | | | | | | | | | | | |
| METHY ALCOHOL | | A | | A | | | | | | A | A | | | | | | | | | | | | | | | | | |
| METHYLAMINE | | | | D | | | | | | | | | | | | | | | | | B | | | | | | | A |
| METHYL ACETATE | | | | | | | | | | | | | | | | | | D | D | B | D | | | | A | B | | A |
| METHYL ACRYLATE | | | | | | | | | | | | | | | | | | D | D | B | D | | | | | | | |
| METHYL ACETONE | | | | | | | | | | | | | | | | | | | D | | D | | | | | | | A |
| METHYL BROMIDE | | D | | D | | | | | | D | D | A | | | | | | A | D | D | D | | | | | | | |
| METHYL BUTYL KEYTONE | | | | | | | | | | | | | | | | | | D | D | A | | | | | | B | | A |
| METHYL CELLOSOLVE | | | | A | | | | | | | A | A | | | | | | D | D | B | D | | | | | | | |
| METHYL CHLORIDE | | D | | D | | | D | D | | C | D | A | | D | D | D | D | A | D | C | C | | | | | B | | A |
| METHYL CHLOROFORM | | D | | D | | | | | | | | | | | | | | | | | | | | | | | | |
| METHYL DICHLORIDE | | | | | | | | | | | | | | | | | | A | D | D | D | | | | | | | |
| METHYL ETHYL KETONE | | D | | D | | D | D | C | A | C | A | D | | | D | D | D | D | C | A | D | | | A | | B | | A | A |
| METHYL ISOBUTYL ALCOHOL | | | | | | | C | B | | | D | | | | | | | D | D | C | D | | | | | | | A |
| METHYL ISOBUTYL CARBITOL | | | | | | | | C | | | | | | | | | | | | | | | | | | | | |
| METHYL ISOBUTYL KEYTONE | | D | | D | | D | D | B | A | | D | D | | | | | | D | | | D | | | A | | | A | A |
| METHYL ISOPROPYL KEYTONE | | | | | | | | | | | | | | | | | | D | D | B | D | | | | | | | A |
| METHYL METHACRYLATE | | | | | | | D | C | | | | | | | | | | D | C | D | D | | | | | | | |

A – No Effect – Excellent  B – Minor Effect – Good  C – Moderate Effect – Fair  D – Severe Effect – Not Recommended

Industrial Plastics Inc.

# ENGINEERING

Industrial Plastics Inc.

# CHEMICAL RESISTANCE CHART

| CHEMICALS | PLASTICS | | | | | | | | | | | ELASTOMERS | | | | | | | | | | | | ALLOYS | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | CPVC | PVC | KYNAR | POLYESTER | EPOXY FRP | TEFLON FRP | POLYETHYLENE | POLYPROPYLENE | RYTON (PENTON) | HYPALON | NITRILE | BUTYL | NATURAL | VITON | NEOPRENE | ETHYLENE/PRO | BUNA "N" | 304 S.S. | HASTELLOY C | HASTELLOY B | TITANIUM | ALUMINUM | 316 S.S. |
| METHYL SULFATE | C | C | | | | | | | | | | | A | A | A | | C | | | | | | |
| METHYL SULFURIC ACID | A | A | | | | | | A | B | | | | | | | | | | | | | | |
| METHYL SULFONIC | | | | | D | D | | | | | | | | | | | | | | | | | |
| METHYLENE BROMIDE | | B | | | | | | | | | | | | | | | | | | | | | |
| METHYLENE CHLORIDE | D | D | | | D | D | | C | D | A | | D | D | D | D | B | D | D | D | | | A | A | | | | | A |
| METHYLENE IODINE | | A | | | | | | | | | | | | | | | | | | | | | |
| METHYLISOBUTYL CARBINOL | | | | | | | | | A | | | | | | | | | | | | | | |
| MILK | A | A | | | | | | A | A | | | | | | | A | A | A | A | | | | | | | | | A |
| MINE WATER | | | | | | | | | | | | A | A | A | A | | A | | | | | | |
| MINERAL OIL | A | A | A | A | A | A | A | C | C | C | | D | A | D | D | A | D | | A | | A | | | | | | A | A |
| MOLASSES | A | A | | | | | | A | A | A | | | A | A | A | A | A | | A | | | | | | | | | A |
| MONOETHANOLAMINE | | | | | | | | | | A | | | | | | A | | | A | | | | | | | | | |
| MOTOR OIL | A | A | | | | | | | C | | | | | | | A | | | A | | | | | | | | | |
| MORPHOLINE | | | | D | | | A | | | | | | | | | | | | | | A | | | | | | A | A |
| MUSTARD | A | | | | | | | | A | | | | | | | A | A | C | | B | | | | | | | | A |
| NAPHTHA | A | A | A | A | A | A | A | C | A | A | | D | A | D | D | A | D | D | A | | A | B | B | | | | A | A |
| NAPHTHALENE | D | A | A | A | A | A | A | C | A | C | | D | D | D | D | A | D | D | D | | A | | | | | | A | B |
| N–HEPTANE | | | | | | | | | C | | | | | | | | | | | | | | | | | | | |
| NATURAL GAS | A | A | | | | | | | A | | | | | | | A | | | A | | | | | | | | | |
| NICKEL ACETATE | | A | | | | | | | | | | A | A | A | A | D | A | | D | | | | | | | | | |
| NICKEL CHLORIDE | A | A | | | A | A | | A | A | A | | A | A | A | A | A | A | A | A | | | | A | | | | | C |
| NICKEL NITRATE | A | A | | | A | A | | A | A | A | | A | A | A | A | A | A | | A | | | | | | | | | |
| NICKEL SALT | A | A | | | | | | | A | | | | | | | | | | | | | | | | | | | |
| NICKEL SULFATE | A | A | | | A | A | | A | A | A | | A | A | A | A | A | A | A | A | | | B | | | | | | B |
| NICOTINE | A | A | | | | | | A | A | | | | C | D | D | | C | | | | | | | | | | | |
| NICOTINE ACID | A | A | | | | | | A | A | A | | | | | | | | | | | | | | | | | | |
| NITRIC ACID 10% | A | A | | A | C | D | A | A | A | C | | A | D | A | A | A | A | B | D | | A | A | D | A | | | C | A |
| NITRIC ACID 20% | | | | | C | D | | A | A | | | | | | | A | D | D | D | | | A | D | A | | | | A |
| NITRIC ACID 30% | A | A | | A | | | A | A | A | D | | D | D | A | D | A | D | | D | | A | | | | | | D | A |
| NITRIC ACID 40% | A | A | | | | | | C | C | D | | | | | | A | | | D | | | | | | | | | |
| NITRIC ACID 50% | A | A | | | | | | C | D | D | | | | | | A | D | D | D | | | A | D | A | | | | A |
| NITRIC ACID 70% | C | A | | | | | | C | D | D | | D | D | D | D | A | D | | D | | | | | | | | | |
| NITRIC ACID CONCENTRATE | D | D | | A | | | A | D | | D | | | | | | A | D | D | D | | A | B | | | A | | C | A |
| NITROBENZENE | D | D | | B | D | | A | D | D | D | | D | D | C | D | A | D | D | C | | A | B | D | | | | A | B |
| NITROGEN | | | | A | | | A | | | A | | | | | | | | | | | A | | | | | | A | A |
| NITROGEN SOL. | | | | | C | B | | | | | | A | A | A | A | | A | | | | | | | | | | | |
| NITROGLYCERINE | | D | | | | | | | | A | | | A | A | A | | A | | | | | | | | | | | |
| NITROUS ACID | A | A | | | | | | | D | A | | | | | | | | | | | | | | | | | | |
| NITROUS OXIDE | A | A | | | | | | | A | A | | | | | | A | | | D | | | | | | | | | |
| NITROGLYCOL | | D | | | | | | | | | | | | | | | | | | | | | | | | | | |
| OCENOL | A | A | | | | | | | | | | | | | | | | | | | | | | | | | | |
| –OILS– | A | A | | | A | A | | C | B | | | | | | | | | | | | | | | | | | | |
| ANIUNE | | | | | | | | | | | | | | | | A | D | B | D | | | B | | | | | | A |
| ANISE | | | | | | | | | | | | | | | | | D | | | | | | | | | | | A |
| BAY | | | | | | | | | | | | | | | | A | D | | | | | | | | | | | A |
| BONE | | | | | | | | | | | | | | | | A | D | | A | | | | | | | | | A |
| CASTOR | A | | | | | | | | | | | | | | | A | D | B | A | | | | | | | | | A |
| CINNAMON | | | | | | | | | | | | | | | | | D | | | | | | | | | | | A |
| CITRIC | | | | | | | | | | | | | | | | A | D | | | | | | | | | | | A |
| CLOVE | | | | | | | | | | | | | | | | | | | A | | | | | | | | | A |
| COCONUT | | | | | | | | | | | | | | | | A | A | A | A | | | | | | | | | A |
| COD LIVER | | | | | | | | | | | | | | | | A | A | A | A | | | | | | | | | A |

A – No Effect – Excellent  B – Minor Effect – Good  C – Moderate Effect – Fair  D – Severe Effect – Not Recommended

Industrial Plastics Inc.

# ENGINEERING

Industrial Plastics Inc.

# CHEMICAL RESISTANCE CHART

| CHEMICALS | PLASTICS | | | | | | | | | | ELASTOMERS | | | | | | | | | ALLOYS | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | CPVC | PVC | KYNAR | POLYESTER | EPOXY | FRP | TEFLON | FRP | POLYETHYLENE | POLYPROPYLENE | RYTON (PENTON) | HYPALON | NITRILE | BUTYL | NATURAL | VITON | NEOPRENE | ETHYLENE/PRO | BUNA "N" | 304 S.S. | HASTELLOY | HASTELLOY C | TITANIUM | ALUMINUM | 316 S.S. | | |
| –OILS– (CONT.) | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| CORN | | | | | | | | | | | | A | | | | | | | A | D | C | A | | | | | A |
| COTTONSEED | | | A | | | | | | | | | A | | | | | | | A | D | C | A | | | | | A |
| CREOSOTE | | | | | | | | | | | | | | | | | | | A | D | D | B | | | | | A |
| DIESEL FUEL | | | | | | | | A | | A | | A | | | | | | | A | D | D | | | | | | A |
| FUEL | | | | | | | | | | | | | | | | | | | A | D | D | B | | | | | A |
| GINGER | | | | | | | | | | | | | | | | | | | A | A | | A | | | | | A |
| LEMON | | | | | | | | | | | | | | | | | | | A | D | | | | | | | A |
| LINSEED | | | A | | | | | | | | | A | | | | | | | A | D | D | A | | | | | A |
| MINERAL | | | A | | | | | | | | | A | | | | | | | | A | D | | | | | | A |
| OLIVE | | | A | | | | | A | | A | | | | | A | A | | D | A | D | | A | | | | | A |
| ORANGE | | | | | | | | | | | A | A | | | | | | | A | D | | A | | | | | A |
| PALM | | | A | | | | | | | | | | | | | | | | A | D | | A | | | | | A |
| PEANUT | | | A | | | | | | | | | | | | | | | | A | D | | A | | | | | A |
| PEPPERMINT | | | | | | | | | | | | | | | | | | | A | D | | D | | | | | A |
| PINE | | | A | | | | | | | | | | | | | | | | A | D | | D | | | | | A |
| RAPE SEED | | | A | | | | | | | | | | | | | | | | A | D | | D | | | | | A |
| ROSIN | | | | | | | | | | | | | | | | | | | A | | | A | | | | | A |
| SESAME SEED | | | A | | | | | | | | | | | | | | | | A | D | | A | | | | | A |
| SILICONE | | | | | | | | | | | | A | | | | | | | A | A | | A | | | | | A |
| SOYBEAN | | | A | | | | | | | | | | | | | | | | A | D | | A | | | | | A |
| SPERM | | | A | | | | | | | | | | | | | | | | A | D | | A | | | | | A |
| TANNING | | | | | | | | | | | | | | | | | | | A | D | | A | | | | | A |
| TURBINE | | | A | | | | | | | | | | | | | | | | A | A | | A | | | | | A |
| VEGETABLE | | | A | A | | | | | | | | A | A | | | | | | A | | | A | | | | | |
| OLEIC ACID | | | A | A | | | | A | | A | C | A | A | | C | A | A | D | A | D | D | A | | | B | | A |
| OLEUM | | | D | D | | | | D | | D | | D | D | | D | D | D | D | A | D | D | D | | | A | | A |
| OXALIC ACID | | | A | A | | | | A | | A | A | A | A | | A | A | A | A | A | A | A | A | | B | B | B | A |
| OXALIC ACID 50% | | | A | A | | A | A | | | | | A | A | | | | | | A | | | C | | | | | |
| OXYGEN GAS | | | A | A | | | | | | | | D | A | | A | A | A | A | A | A | | D | | | | | |
| OZONE | | | | A | | | | | | | C | C | A | | | | | | A | | | D | | | | | |
| PAINT | | | | | | | | | | | | | | | A | A | A | A | | A | | | | | | | |
| PALMITIC ACID 10% | | | B | A | | | | A | | A | | B | A | A | | C | A | C | C | A | C | | A | | | | |
| PALMITIC ACID 70% | | | B | B | | | | A | | A | | B | A | A | | C | A | C | C | A | C | | A | | | | |
| PARAFFIN | | | | A | | | | | | | | | | | | | | | A | | | A | | | | | A |
| PENTANE | | | | | | | | | | | | | | | | | | | A | | D | A | | B | B | | |
| PERACETIC ACID | | | D | C | | | | | | | | | | | | | | | | | | | | | | | |
| PERCHLORIC ACID 10% | | | A | A | | | | | | D | | A | A | A | | D | D | D | D | A | D | | D | | | | |
| PERCHLORIC ACID 70% | | | D | D | | | | | | D | | | A | D | | D | D | D | D | A | D | | D | | | | |
| PERCHLOROETHYLENE | | | | | | A | | D | | B | A | | | | | D | D | D | D | A | D | D | D | A | | | A | A |
| PERMANGANIC ACID | | | | | | | | | | | | | | | | | C | A | D | | C | | | | | | |
| PERPHOSPHATE | | | | A | | | | | | | | | | | | | | | | | | | | | | | |
| PETROLATUM | | | A | A | | | | | | | | | | | | | | | A | A | A | A | | | | | A |
| PETROLATUM ETHER | | | | | | | | D | | C | | C | C | | | | | | | | | | | | | | |
| PETROLEUM OILS | | | | | | | | | | | | | | | C | A | D | D | | C | | | | | | | |
| PETROLEUM (SOUR) | | | A | A | | | | | | | | | A | | | | | | A | | | A | | | | | |
| PETROLEUM (REFINED) | | | A | A | | | | | | | | | A | | | | | | A | | | A | | | | | |
| PHENOL | | | A | C | A | | D | | D | A | B | A | A | | | | | | A | D | D | D | | C | A | A | B | A | A |
| PHENYHYLDRAZINE | | | D | D | | | | | | | | | A | | | | | | A | | | D | | | | | |
| PHENYHYLDRAZINE HYDROCHLORIC | | | B | C | | | | | | | | | | | | A | A | A | | C | | | | | | | |
| PHOSGENE LIQUID | | | D | D | | | | | | | | D | A | | | C | C | C | D | C | | D | | | | | |
| PHOSGENE GAS | | | B | B | | | | | | | | D | A | | | C | C | C | D | C | | D | | | | | |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | CPVC | PVC | KYNAR | POLYESTER | EPOXY | TEFLON | FRP | POLYETHYLENE | POLYPROPYLENE | RYTON (PENTON) | HYPALON | NITRILE | BUTYL | NATURAL | VITON | NEOPRENE | ETHYLENE/PRO | BUNA "N" | 304 S.S. | HASTELLOY C | TITANIUM | HASTELLOY B | ALUMINUM | 316 S.S. |
| PHOSPHORIC ACID 10% | A | | A | A | | A | C | A | | A | A | | A | A | A | A | A | A | B | C | D | A | D | B | D | A |
| PHOSPHORIC ACID 50% | A | | A | A | | A | C | A | A | A | A | | A | A | A | A | A | A | B | C | D | A | D | B | D | A |
| PHOSPHORIC ACID 85% | A | | A | A | | A | C | A | B | A | A | | A | A | A | A | A | A | B | C | D | A | D | C | D | B |
| PHOSPHORIC ACID CRUDE | A | | A | A | | A | C | A | | A | A | | A | A | A | A | A | A | B | C | D | A | D | C | D | C |
| PHOSPHORUS YELLOW | | | | A | | | | | | | A | | | | | C | D | | C | | | | | | | |
| PHOSPHORUS RED | | | | | | | | | | | A | | | | | | | | | | | | | | | |
| PHOSPHORUS PENTOXIDE | | | | A | | | | | A | B | A | | | | | A | C | | A | | | | | | | |
| PHOSPHORUS TRICHLORIDE | D | | D | | A | | | A | A | | D | | | | D | C | D | A | D | | D | A | | | D | A |
| PHOSPHORUS OXYCHLORIDE | | | | | | | D | | | | | | | | | | | | | | | | | | | |
| PHOTOGRAPHIC DEVELOPER | A | | | | | | | | | A | | | | | | | | A | A | | A | | A | A | A | |
| PHOTOGRAPHIC SOLUTIONS | A | | A | | | | | | A | A | A | | | | | | | A | | | A | | | | | |
| PHTHALIC ANHYDRIDE | | | | | | | A | A | | | | | | | | | | | | | | | | | | |
| PICKLE BRINE | | | | | | | | | | | | | A | A | A | A | | | A | | | | | | | |
| –PICKLING BATHS– | | | | | | | | | | | | | | | | | | | | | | | | | | |
| HYDROCHLORIC ACID | | | | | | | | | A | A | | | | | | | | | | | | | | | | |
| SULFURIC ACID | | | | | | | | | A | A | | | | | | | | | | | | | | | | |
| SULFURIC NITRIC | | | | | | | | | B | B | | | | | | | | | | | | | | | | |
| PICRIC ACID | D | | D | | | | C | | B | B | A | | A | A | A | A | A | A | A | B | | | | | | |
| PINE OIL | | | | | | | B | B | | | | | D | D | D | A | | | A | | | | | | | |
| –PLATING SOLUTIONS– | | | | | | | | | | | | | | | | A | | | A | | | | | | | |
| ANTIMONY | A | | | | | | | | | A | | | | | | | | A | A | A | | | | | | A |
| ARSENIC | A | | | | | | | | | A | | | | | | | | A | A | A | | | | | | A |
| BRASS | A | | A | | | | | | A | A | A | | | | | | A | A | A | A | | | A | | | A |
| BRONZE | A | | | | | | | | | A | | | | | | | | A | A | A | | | | | | A |
| CADIUM | A | | A | | | | | | A | A | A | | | | | | D | A | D | A | | | A | | | |
| CHROME | A | | A | | | | | | A | A | B | | | | | | A | A | A | | | | | | | |
| COPPER | A | | A | | | | | | A | A | A | | | | | | A | A | A | A | | | A | | | |
| CYANIDE | | | | | | | | | | | | | | | | | A | | A | | | | | | | |
| GOLD | A | | A | | | | | | A | A | A | | | | | | A | A | A | A | | | | | | A |
| INDIUM | A | | | | | | | | A | A | | | | | | | A | A | | A | | | | | | A |
| IRON | A | | A | | | | | | | A | | | | | | | | A | A | A | | | A | | | A |
| LEAD | A | | A | | | | | | A | A | A | | | | | | A | A | A | A | | | A | | | |
| NICKEL | A | | A | | | | | | A | A | A | | | | | | A | A | A | A | | | A | | | |
| RHODIUM | A | | A | | | | | | A | A | A | | | | | | A | A | A | A | | | | | | |
| SILVER | A | | A | | | | | | A | A | A | | | | | | A | A | A | A | | | | | | A |
| TIN | A | | A | | | | | | A | A | A | | | | | | A | A | A | A | | | A | | | |
| ZINC | A | | A | | | | | | A | A | A | | | | | | A | A | A | A | | | A | | | |
| POLYVINYL ACETATE EMULSION | | | | | | | C | B | | | | | | | | | | | | | | | | | | |
| POLYVINYL ALCOHOL | | | | | | | C | B | | | | | | | | | | | | | | | | | | |
| POTASH | | | | A | | | | | | | | | | | | | | A | D | A | | | | | | A |
| POTASSIUM ACETATE | | | | | | | | | | | | | A | A | A | A | | | A | | | | | | | |
| POTASSIUM ALUM | | | | A | | | | | | | | | | | | | | | | | | | | | | |
| POTASSIUM ALUMINUM SULFATE | A | | | A | | | | | | A | | | A | A | A | A | | | A | | | | | | | |
| POTASSIUM AMYL XANTHATE | | | | B | | | | | | | | | | | | | | | | | | | | | | |
| POTASSIUM BICARBONATE | A | | | A | | | B | B | | A | A | A | A | A | A | A | A | A | A | A | | | B | | | B |
| POTASSIUM BICHROMATE | A | | | A | | | | | | | C | A | A | C | A | D | | | A | | | | | | | |
| POTASSIUM BISULFATE | | | | A | | | | | | | | | | | | | | A | | A | | | | | | |
| POTASSIUM BORATE | A | | | A | | | | | | A | A | | | | A | A | A | | A | | | | | | | |
| POTASSIUM BROMATE | A | | | A | | | | | | A | A | A | | | A | A | C | A | A | A | | | | | | |
| POTASSIUM BROMIDE | A | | | A | | | A | A | | A | A | A | | | A | A | A | A | A | A | | | A | A | A | B |
| POTASSIUM CARBONATE | A | | | A | | | C | C | | A | A | A | | | A | A | A | A | A | A | | | B | B | | A |
| POTASSIUM CHLORATE | A | | | A | | | | | | A | A | A | | | C | A | A | A | C | A | | | | | | A |
| POTASSIUM CHLORIDE | A | | | A | | A | A | A | A | A | A | A | A | A | A | A | A | A | A | A | C | B | B | A | D | A |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | CPVC | PVC | KYNAR | POLYESTER | EPOXY | FRP | TEFLON | FRP | POLYETHYLENE | POLYPROPYLENE | RYTON (PENTON) | HYPALON | NITRILE | BUTYL | NATURAL | VITON | NEOPRENE | ETHYLENE/PRO | BUNA "N" | 304 S.S. | HASTELLOY C | HASTELLOY B | TITANIUM | ALUMINUM | 316 S.S. | | | |
| POTASSIUM CHROMATE | A | | A | | | | | | | A | A | A | | | | A | A | A | A | A | | A | | | A | A | | B |
| POTASSIUM CYANIDE | A | | A | | | A | | A | | A | A | A | | A | A | A | A | A | A | A | A | | | | | B | | A |
| POTASSIUM DICHROMATE | A | | A | | | B | | B | | A | A | A | | | | | | A | A | A | A | | | | B | | A | A |
| POTASSIUM ETHYL XANTHATE | | | B | | | | | | | | | | | | | | | | | | | | | | | | | |
| POTASSIUM FERRICYANIDE | A | | A | | | A | | A | | A | A | A | | A | A | A | A | A | A | | A | | | | | | | |
| POTASSIUM FERROCYANIDE | A | | A | | | A | | A | | A | A | A | | | | | | A | | | A | | | | | | | |
| POTASSIUM FLUORIDE | A | | A | | | | | | | A | A | A | | A | A | A | A | A | A | | A | | | | | | | |
| POTASSIUM HYDROXIDE | A | | A | | A | B | | B | A | A | A | A | | A | B | A | A | D | A | A | A | | C | B | B | B | D | B |
| POTASSIUM HYPOCHLORITE | A | | A | | | | | | | | | A | | | | A | C | | D | | | | | | | | | |
| POTASSIUM IODIDE | A | | A | | | | | | | | A | | | | A | A | A | | A | | | | | | | | | |
| POTASSIUM NITRATE | A | | A | | | A | | A | | A | A | A | | A | A | A | A | A | A | A | A | | | B | | | | B |
| POTASSIUM PERBORATE | A | | A | | | | | | | A | A | A | | | A | A | C | | A | | | | | | | | | |
| POTASSIUM PERCHLORATE | A | | A | | | | | | | A | A | A | | | C | A | D | | C | | | | | | | | | |
| POTASSIUM PERMANGANATE | A | | A | | | C | | D | | A | A | A | | | A | A | A | A | A | | D | | | A | | A | | B |
| POTASSIUM PERSULFATE | A | | A | | | B | | D | | A | A | A | | | C | A | D | | C | | | | | | | | | |
| POTASSIUM PHOSPHATE | | | | | | C | | B | | | | | | | A | A | A | | A | | | | | | | | | |
| POTASSIUM SULFATE | A | | A | | | | | | | A | A | A | | A | A | A | A | A | A | A | A | | | B | | A | | B |
| POTASSIUM SULFIDE | | | | | | | | | | A | | | | A | A | A | A | | A | | | | | | | | | |
| POTASSIUM SULFITE | | | | | | | | | | A | | | | A | A | A | A | | A | | | | | | | | | |
| POTASSIUM THIOSULFATE | | | | | | | | | | | | | | | | | A | | A | | | | | | | | | |
| PROPANE | A | | A | | | C | | B | | | A | A | | | | | | A | | D | A | | | | | | | A |
| PROPARGYL ALCOHOL | A | | A | | | | | | | A | | | | | | | | | | | | | | | | | | |
| PROPYL ALCOHOL | B | | A | | | | | | | A | A | | | | | | | | | | | | | | | | | |
| PROPYLENE CHLOROHYDRIN | | | | | C | | | | A | | | | | | | | | | | | | | | | | | | |
| PROPYLENE DICHLORIDE | D | | D | | | | | | | C | C | | | | D | D | D | | D | | | | | | | | | |
| PROPYLENE GLYCOL | | | | | | A | | A | | A | | | | | | | | A | C | | A | | | | | | | A |
| PROPYLENE OXIDE | | | D | | | | | | | | | | | | | | | D | | | D | | | | | | | |
| PYROGALLIC ACID | | | B | | | | | | | | | | | | A | A | A | A | A | | | | | B | B | | | A |
| PYRIDINE | D | | D | | D | | | | A | B | C | | | | | | D | D | D | B | D | | A | A | A | | A | B |
| QUATERNARY AMMONIUM SALTS | | | | | | | | | B | | | | | | | | | | | | | | | | | | | |
| RAYON ACID WATER | | | | | | | | | | | | | | | A | A | A | | A | | | | | | | | | |
| RAYON COAGULATING BATH | A | | A | | | | | | | A | A | | | | | | | | | | | | | | | | | |
| RAYON SPIN BATH | | | | | | | | | | | | | | | A | C | A | | C | | | | | | | | | |
| ROSINS | | | | | | | | | | | | | | | | | | | | | A | | | | | | | A |
| RUM | | | | | | | | | | | | | | | | | | A | | | A | | | | | | | A |
| RUST INHIBITORS | | | | | | | | | | | A | | | | | | | A | C | | A | | | | | | | A |
| SALAD DRESSING | | | | | | | | | | | | | | | | | | | | | A | | | | | | | A |
| SALENIC ACID | A | | A | | | | | | | | | | | | | | | | | | | | | | | | | |
| SALICYLIC ACID | | | A | | | | | | | | | A | | | A | A | A | A | A | | C | | | | | | | |
| SALINE SOLUTIONS | | | | | | | | | | | | | | A | A | A | A | | A | | | | | | | | | |
| SALT BRINE | | | | | | | | | | | | | | A | A | A | A | | A | | | | | | | | | |
| SALICYLALDEHYDE | | | | | | | | | | | | B | | | | | | | | | | | | | | | | |
| SEA WATER | A | | A | | | | | | | A | A | | | | | | | A | A | A | A | | | | | A | | A |
| SELENIC ACID | | | | | | | | | | B | B | | | | A | A | A | | A | | | | | | | | | |
| SEWAGE | | | | | | | | | | | | | | A | A | A | A | | A | | | | | | | | | |
| SHELLAC BLEACHED | | | | | | | | | | | | | | | | | | | | | | | | | | | | A |
| SHELLAC ORANGE | | | | | | | | | | | | | | | | | | | | | | | | | | | | A |
| SHORTNING | | | | | | | | | | A | A | | | | | | | | | | | | | | | | | |
| SILICIC ACID | | | A | | | | | | | A | A | | | | | | | | | | | | | | | | | |
| SILVER CYANIDE | A | | A | | | | | | | | A | A | | A | A | A | A | | A | | | | | | | | | |

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| CHEMICALS | PLASTICS | | | | | | | | | | | ELASTOMERS | | | | | | | | ALLOYS | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | CPVC | PVC | KYNAR | POLYESTER | EPOXY FRP | TEELON | POLYETHYLENE | POLYPROPYLENE | RYTON (PENTON) | HYPALON | NITRILE | BUTYL | NATURAL | VITON | NEOPRENE | ETHYLENE/PRO | BUNA-"N" | 304 S.S. | HASTELLOY C | HASTELLOY B | TITANIUM | ALUMINUM | 316 S.S. |
| SILVER BROMIDE | | | | | | | | | | | | | | | | | | | | | A | B | | | B |
| SILVER NITRATE | | | A | A | | | A | A | | A | A | | A | A | A | A | A | A | C | A | | B | A | | A |
| SILVER SULFATE | | | | A | | | | | | | | | | | | | A | | | C | | | | | |
| SILICONE OIL | | | A | A | | | | | | A | | | | | | | A | A | A | A | | | | | A |
| SOAP | | | A | A | | | | | | A | A | | | | | | A | | | A | | | | | |
| SOAP SOLUTIONS | | | A | A | | | | | A | A | | | A | A | A | C | A | A | | A | | | | | A |
| SODIUM ACETATE | | | A | A | | | A | A | A | A | A | | | | | | A | A | | A | | | A | | B |
| SODIUM ALUM | | | | A | | | | | | | | | | | | | | | | | | | | | |
| SODIUM ALUMINATE | | | | | | | | | | | | | | | | | A | A | A | A | | B | B | | A |
| SODIUM BENZOATE | | | A | A | | | B | A | | A | A | A | | | | | | | | | | | | | |
| SODIUM BICARTONATE | | | A | A | | | B | A | | A | A | A | | | | | A | A | A | A | | B | B | | A |
| SODIUM BICHROMATE | | | | A | | | | | | | | A | | | | | | | | | | | | | |
| SODIUM BISULFATE | | | A | A | | | A | A | | A | A | A | | | | | A | C | | B | | B | B | A | A |
| SODIUM BISULFITE | | | A | A | | | | | | A | A | A | | | | | A | A | | A | | A | | A | A |
| SODIUM BORATE | | | A | A | | | | | | A | A | A | | | | | A | | | A | | | | | |
| SODIUM BROMIDE | | | A | A | | | A | A | | A | A | A | | | | | | | | | | | | | |
| SODIUM CARBONATE | | | A | A | | | B | A | | A | A | A | | | | | A | A | A | A | | | B | A | A |
| SODIUM CHLORATE | | | A | A | | | B | | | A | A | A | | | | | A | A | | A | | A | | A | B |
| SODIUM BROMATE | | | | | | | A | | | | | | | | | | | | | | | | | | |
| SODIUM CHLORIDE | | | A | A | | A | A | A | A | A | A | A | | | | | A | A | A | A | C | A | A | A | C | B |
| SODIUM CHLORITE | | | A | D | | | | | | | A | A | | | | | | | | | | | | | |
| SODIUM CHROMATE | | | | | | | | | | | A | | | | | | A | A | | A | | | | | |
| SODIUM CYANIDE | | | A | A | | | A | A | | A | A | A | | | | | A | A | A | A | | | | A | A |
| SODIUM DICHROMATE | | | A | A | | | A | A | | A | A | A | | | | | | | | | | | | | |
| SODIUM FERRICYANIDE | | | A | A | | | A | A | | A | A | A | | | | | | | | | | | | | |
| SODIUM FERROCYANIDE | | | A | A | | | A | A | | A | A | A | | | | | | | | | | | | | |
| SODIUM FLUORIDE | | | A | A | | | | | | A | A | A | | | | | | | | | | | | | |
| SODIUM HYDROXIDE 15% | | | A | A | | A | C | B | A | | A | A | A | A | A | A | A | A | A | A | B | | A | A | D | A |
| SODIUM HYDROXIDE 30% | | | A | A | | A | C | C | A | | A | A | A | A | A | A | | A | | | B | | | | D | B |
| SODIUM HYDROXIDE 50% | | | A | A | | A | C | C | A | | A | A | A | A | A | A | A | A | | D | B | A | A | A | D | B |
| SODIUM HYDROXIDE 70% | | | A | A | | | | | | | A | A | A | | A | A | B | A | | D | | B | B | A | | |
| SODIUM HYDROXIDE SOLUTION | | | A | A | | | | | A | | A | A | | | A | A | | A | | | | | | | | |
| SODIUM HYPOCHLORITE CONC. | | | A | A | | | B | D | A | | B | A | | C | A | | A | D | | D | | | | | | |
| SODIUM HYPOCHLORITE SOLUTION | | | A | A | | A | | | A | | A | D | | C | A | | A | D | B | | D | A | | A | D | C |
| SODIUM HEXAMETAPHOSPHATE | | | | | | | | | A | | A | | | | | | | | | | | | | | | |
| SODIUM IODIDE | | | | | | | | | | | | A | | | | | | | | | | | | | | |
| SODIUM METAPHOSPHATE | | | A | A | | | | | | | A | | | | | | A | B | A | A | | | | | A | |
| SODIUM METASILICATE | | | | | | | | | | | | | | | | | A | | | A | | | | | A | |
| SODIUM NITRATE | | | A | A | | | A | A | A | | A | A | | | | | A | C | A | C | | | | A | B | |
| SODIUM NITRITE | | | | A | | | A | A | | | A | A | | | | | | | | | | | | | | |
| SODIUM PALMITRATE | | | A | A | | | | | | | A | | | | | | | | | | | | | | | |
| SODIUM PERBORATE | | | A | A | | | | | | | A | | | | | | A | D | A | C | | | | | C | |
| SODIUM PERCHLORATE | | | | A | | | | | | | | | | | | | | | | | | | | | | |
| SODIUM PEROXIDE | | | | A | | | | | | | | | | | | | A | D | A | C | | B | B | | A | |
| SODIUM PHOSPHATE ALKALINE | | | A | A | | | | | | | A | | | | | | A | | | A | | | | | | |
| SODIUM PHOSPHATE ACID | | | A | A | | | | | | | A | | | | | | A | | | A | | | | | | |
| SODIUM PHOSPHATE NEUTRAL | | | A | A | | | | | | | A | | | | | | A | | | A | | | | | | |
| SODIUM POLYPHOSPHATE | | | | | | | | | | | | | | | | | A | D | A | B | | | | | B | |
| SODIUM SILICATE | | | A | A | | | A | A | | | A | | | | | | A | A | A | A | | | | A | B | |
| SODIUM SULFATE | | | A | A | | | A | A | A | A | A | | | | | | A | | A | A | | B | B | A | B | |
| SODIUM SULFIDE | | | A | A | | | B | A | | A | A | A | | | | | A | A | A | A | | | B | A | B | |
| SODIUM SULFITE | | | A | A | | | A | A | | A | A | A | | | | | A | | | A | | | | | | |

A – No Effect -- Excellent  B – Minor Effect – Good  C – Moderate Effect – Fair  D – Severe Effect – Not Recommended

Industrial Plastics Inc.

# ENGINEERING

Industrial Plastics Inc.

# CHEMICAL RESISTANCE CHART

| CHEMICALS | PLASTICS | | | | | | | | | | ELASTOMERS | | | | | | | | | | ALLOYS | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | CPVC | PVC | KYNAR | POLYESTER | EPOXY FRP | TEFLON | POLYETHYLENE | POLYPROPYLENE | RYTON (PENTON) | HYPALON | NITRILE | BUTYL | NATURAL | VITON | NEOPRENE | ETHYLENE/PRO | BUNA "N" | 304 S.S. | HASTELLOY | HASTELLOY C | TITANIUM | ALUMINUM | 316 S.S. |
| SODIUM TETRABORATE | | | A | | | | | | | | | | | | | | A | | A | | | | | | | | | A |
| SODIUM THIOSULFATE | | | A | A | | | A | B | | | A | A | | | | | A | | A | B | | | | | | | | A |
| SODIUM THIOCYANATE | | | | | | | B | A | | | | | | | | | | | | | | | | | | | | |
| SOUR CRUDE OIL | | | | A | | | | | | B | A | | | | | | D | | | D | | | | | | | | |
| SORGHUM | | | | | | | | | | | | | | | | | A | | A | | | | | | | | | A |
| SOY JUICE | | | | | | | | | | | | | | | | | A | | A | | | | | | | | | A |
| SOY BEAN OIL | | | | | | | | | | | | | A | A | | D | | | A | | | | | | | | | |
| STANNIC CHLORIDE | | | A | A | | | A | A | | A | A | A | A | A | A | A | A | C | A | A | | | | | | A | | A |
| STANNIC FLUOBORATE | | | | | | | | | | | | | | | | | A | A | | A | | | | | | | | |
| STANNOUS CHLORIDE | | | A | A | | | A | A | | A | A | A | A | A | A | A | A | C | | A | | | | | | | | |
| STARCH | | | | A | | | | | | A | A | | A | A | A | A | A | A | | A | | | | | | | | A |
| STEAM 300°F | | | | | | C | | | A | | | | | | | | | | | | | | | | A | | | D A |
| STEARIC ACID | | | A | A | | | A | A | | A | A | A | C | A | C | C | A | C | B | B | | | A | A | A | | | B |
| STRONTIUM CARBONATE | | | | | | | A | A | | | | | | | | | | | | | | | | | | | | |
| STODDARD SOLVENT | | | A | D | A | | | | A | | A | | | | | | A | D | D | B | | | A | | | | A | A |
| STYRENE | | | | | | | | C | | | | | | | | | B | D | D | D | | | | | | | | A |
| SUCCINIC ACID | | | | A | | | | | | | A | | | | | | | | | | | | | | | | | |
| SULFAMIC ACID | | | | A | | | | | | | A | A | | | | | | | | | | | | | | | | |
| SUGAR ION-EXCHANGE | | | | | | | | | | | | | | A | A | A | | A | | | | | | | | | | |
| SUGAR SOLUTIONS | | | | | | | A | A | | | | | A | A | A | A | A | A | | A | | | A | B | | | | A |
| SULFATED DETERGENTS | | | A | A | | | | | | | A | | | | | | | | | | | | | | | | | |
| SULFATE LIQUORS | | | A | A | | | | | | | A | | A | | A | A | | A | | | | | A | | | | | C |
| SULFITE LIQUORS | | | | A | | | A | B | | | | | | A | C | D | A | C | | B | | | | | | | | |
| SULFINOL | | | | | A | | | | A | | | | | | | | | | | | | | A | | | | | A |
| SULFUR | | | | A | | | | | | B | D | A | | | | | D | | | D | | | | | | | | |
| SULFUR SLURRYS | | | A | A | | | | | | | A | | | | | | | | | | | | | | | | | |
| SULFUR CHLORIDE | | | A | A | | | D | D | | | D | D | A | | | A | A | A | D | D | | | | | | | | D |
| SULFUR DIOXIDE WET | | | D | D | | | A | D | | B | C | A | | C | C | D | D | C | | D | | | | | | | | |
| SULFUR DIOXIDE DRY | | | D | D | A | | | | A | | C | C | | | | | A | D | A | D | | | A | B | | | A | B |
| SULFUR TRIOXIDE | | | A | A | | | B | | | | | D | | | | | A | D | B | D | | | | | | | | C |
| SULFUR TRIOXIDE GAS | | | | A | | | | | | | | A | C | C | C | D | A | C | | D | | | | | | | | |
| SULFURIC ACID 10% | | | A | A | A | B | B | A | A | A | A | A | A | A | A | A | A | A | D | A | | | D | A | C | C | D | C |
| SULFURIC ACID 30% | | | A | A | A | B | B | A | A | A | A | A | A | A | A | A | A | A | D | C | | | D | B | C | C | D | D |
| SULFURIC ACID 50% | | | A | A | A | B | B | A | A | A | A | D | A | | A | A | A | A | D | C | | | D | B | C | C | D | D |
| SULFURIC ACID 60% | | | A | A | | | C | C | | B | A | A | | | | | A | D | D | C | | | | B | C | C | | D |
| SULFURIC ACID 70% | | | A | A | | | C | C | | B | A | A | | | | | A | D | D | C | | | | B | C | C | | D |
| SULFURIC ACID 80% | | | A | A | | | | D | | C | A | A | A | D | C | D | A | D | D | C | | | | A | C | D | | D |
| SULFURIC ACID 90% | | | A | C | | | D | D | | D | A | A | | | | | A | D | D | C | | | | A | C | D | | D |
| SULFURIC ACID 95% | | | A | D | A | | D | D | A | D | A | D | C | D | D | D | A | D | D | C | | | A | A | C | D | D | D |
| SULFURIC ACID 100% | | | D | D | | | D | D | | | D | D | | | | | A | D | D | D | | | | A | A | D | | A |
| SULFUROUS ACID | | | A | A | | | A | A | | A | A | A | | C | C | A | A | C | B | C | | | | B | | | | B |
| SYRUP | | | A | | | | | | | | A | | | | | | A | A | | A | | | | | | | | A |
| TALL OIL | | | A | A | | | A | A | | | A | A | | | | | | | | C | | | | | | | | |
| TALLOW | | | | | | | | | | A | B | | | | | | A | | | A | | | | | | | | A |
| TANNIC ACID | | | A | A | | | A | A | | A | A | A | A | A | A | A | A | A | A | | | | | | | A | | C |
| TANNING LIQUORS | | | A | A | | | | | | | A | A | | A | C | C | A | A | | C | | | | A | | | | A |
| TAR | | | | | | | | | | | | | | | | | A | | | C | | | | | | | | |
| TARTARIC ACID | | | A | A | | | A | A | | A | A | A | A | A | A | A | A | A | | A | | | | B | B | A | | B |
| TETRAETHYL LEAD | | | A | A | | | | C | | | | A | | | | | A | | | C | | | | | | | | |
| TETRACHLORETHANE | | | | | | | | | | | A | | | | | | A | | D | C | | | | | | | | A |
| TETRA HYDRODURANE | | | | D | | | | | | | | | | | | | | | | | | | | | | | | |
| TETRA HYDROFURAN | | | D | D | D | | | | A | C | D | C | | | | | B | | B | D | | | A | | | | C | A |

A – No Effect – Excellent  B – Minor Effect – Good  C – Moderate Effect – Fair  D – Severe Effect – Not Recommended

Industrial Plastics Inc.

# ENGINEERING

Industrial Plastics Inc.

# CHEMICAL RESISTANCE CHART

| CHEMICALS | PLASTICS | | | | | | | | | | | ELASTOMERS | | | | | | | | | ALLOYS | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | CPVC | PVC | KYNAR | POLYESTER | EPOXY | FRP | TEFLON | POLYETHYLENE | POLYPROPYLENE | RYTON (PENTON) | HYPALON | NITRILE | BUTYL | NATURAL | VITON | NEOPRENE | ETHYLENE/PRO | BUNA "N" | 304 S.S. | HASTELLOY C | HASTELLOY B | TITANIUM | ALUMINUM | 316 S.S. |
| TETRA SODIUM PHOSPHATE | | | | A | | | | | | | | | | | | | | | | | | | | |
| TETRALIN | | D | | D | | | | | | | D | | | | | | | | | | | | | |
| THIONYL CHLORIDE | | D | | D | | | D | | D | D | D | | | | | | | | | | | | | |
| THREAD CUTTING OIL | | B | | A | | | | | | | A | A | | | | | | | | | | | | |
| TIRPINEOL | | | | A | | | | | | | | | | | | | | | | | | | | |
| TITANIUM TETRACHLORIDE | | D | | D | | | | | | | | A | | | | | | A | | | C | | | |
| TOLUENE | | | | | | A | D | B | A | C | C | D | | | | | | | | | | A | | |
| TOLUENE TOLUOL | | D | | D | | | | | | | C | A | | D | D | D | D | A | D | D | D | | | |
| TOLUENE KEROSENE 25%-75% | | D | | D | | | | | | | D | | | | | | | | | | | | | |
| TOMATO JUICE | | A | | A | | | | | A | | A | C | | | | | | A | A | | A | A | | |
| TOXAPHENE–XYLENE | | D | | D | | | | | | | | | | | | | | | | | | | | |
| TRANSFORMER OIL | | A | | A | | | A | A | | C | B | | | | | | | A | | | A | | | |
| TRIBUTYL PHOSPHATE | | D | | D | | | | | | | C | A | | D | D | D | D | D | D | | D | | | |
| TRIBUTYL CITRATE | | | | A | | | | | | | | | | | | | | | | | | | | |
| TRICHLOROACETIC ACID | | | | A | | C | | | A | | A | D | | | D | D | D | D | D | | D | D | | |
| TRICHLOROETHANE | | | | | | | | | | | | | | | | | | A | D | D | D | | | |
| TRICHLOROETHYLENE | | D | | D | | A | D | C | A | | D | D | | D | D | D | D | A | D | D | C | C | | |
| TRICHLOROPROPANE | | A | | A | | | | C | | | D | A | | | C | C | D | A | C | | A | | | |
| TRICRESYL PHOSPHATE | | | | | | | | | | | | | | | D | C | D | A | D | A | D | | A | |
| TRIETHANOLAMINE | | | | | | | | B | | | | | | | | | | | | | | | | |
| TRIETHYLAMINE | | A | | A | | | | C | | | D | A | | | C | C | D | A | C | | A | | | |
| TRIETHYL PHOSPHATE | | | | | | | | | A | | | D | | | | | | | | | | A | | |
| TRIMETHYL PROPANE | | A | | A | | | | | | | | A | | | | | | | | | | | | |
| TRIPHENYL PHOSPHATE | | | | | | | B | B | | | | | | | | | | | | | | | | |
| TRISODIUM PHOSPHATE | | A | | A | | A | B | A | A | A | A | C | | | A | A | A | A | A | | A | A | | |
| TRITHANOLAMINE | | B | | B | | | | | | | A | A | | A | A | A | A | D | A | | D | | | |
| TUNG OIL | | | | | | | | | | | | | | A | | | D | | A | | | | | |
| TUNGSTIC ACID | | | | | | | | | | | | | | | A | A | A | | A | | | | | |
| TUNGSTIC OIL | | | | | | | | | | | | | | | A | A | A | | A | | | | | |
| TURPENTINE | | A | | A | | A | | B | A | C | A | C | | D | A | D | D | A | D | D | A | A | | |
| UNICHROME SOLUTION ALKALI | | | | | | | | | | | | | | | A | A | C | | A | | | | | |
| UREA | | A | | A | | | A | A | | A | A | A | | A | A | A | A | A | A | | D | | | |
| UREA AMMONIA LIQUOR | | | | | | | | | | | | | | A | A | A | A | | A | | | | | |
| URINE | | A | | A | | | | | | A | A | A | | | | | | A | D | A | A | | | |
| VANILLA EXTRACT | | | | | | | | | | A | A | | | | | | | | | | | | | |
| VARNISH | | | | | | | | | | | | | | D | C | D | D | | D | | | | | |
| VASELINE | | A | | A | | | | | | | A | | | | | | | | | | | | | |
| VEGETABLE OIL | | A | | A | | | | | | | | | | | | | | A | D | | A | | | |
| VINEGAR | | A | | A | | C | A | A | A | A | A | C | | A | A | A | A | B | C | A | B | A | | |
| VINEGAR WHITE | | A | | A | | | | | | | A | A | | | | | | A | | | C | | | |
| VINYL ACETATE | | D | | D | | | D | B | | | | A | | | A | C | D | | A | | | | | |
| VINYL CHLORIDE | | | | | | | | | | | | | | | A | C | D | | A | | | | | |
| WATER | | A | | A | | | | | | | A | A | | A | A | A | A | A | A | | A | | | |
| WATER ACID MINE | | A | | A | | | | | | | A | A | | | | | | A | C | | A | | | |
| WATER DEIONIZED | | | | | | A | A | A | A | | | C | | A | A | A | A | | A | | | A | | |
| WATER DEMINERALIZED | | A | | A | | | A | A | | | A | A | | | | | | A | | | A | | | |
| WATER DISTILLED | | A | | A | | | A | A | | | A | A | | | | | | A | A | A | A | | | |
| WATER POTABLE | | A | | A | | A | A | A | A | | A | A | | | | | | A | A | A | A | A | | |
| WATER SALT | | A | | A | | | A | A | | | A | A | | | | | | A | A | A | A | | | |
| WATER SEA | | A | | A | | A | A | A | A | | A | C | | | | | | A | | | A | C | | |

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Industrial Plastics Inc.

# ENGINEERING

Industrial Plastics Inc.

## CHEMICAL RESISTANCE CHART

| CHEMICALS | PLASTICS | | | | | | | | | | ELASTOMERS | | | | | | | | | | ALLOYS | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | CPVC | PVC | KYNAR | POLYESTER | EPOXY | FRP | TEFLON | FRP | POLYETHYLENE | POLYPROPYLENE | RYTON (PENTON) | HYPALON | NITRILE | BUTYL | NATURAL | VITON | NEOPRENE | ETHYLENE/PRO | BUNA "N" | 304 S.S. | HASTELLOY C | HASTELLOY B | TITANIUM | ALUMINUM | 316 S.S. | | | |
| WATER SEWAGE | | | A | A | | | | | | | | A | A | | | | | | A | | A | | | | | | |
| WATER STEAM CONDENSATE | | | | | | | | | A | | | | | | | | | | | | | | | | | | |
| WEED KILLERS | | | | | | | | | | | | | | | | | | | A | C | B | | | | | | A |
| WETTING AGENTS | | | | | | | | | | | A | A | | | | | | | | | | | | | | | |
| WHEY | | | | | | | | | | | | | | | | | | | A | | A | | | | | | A |
| WHISKEY | | | A | A | | | | | | | A | A | A | | A | A | A | A | A | A | A | | | | | | A |
| WHITE LIQUOR | | | A | A | | | B | | A | | | A | A | | | A | A | A | A | A | B | | | | | | A |
| WHITE WATER | | | | | | | | | | | | A | | | | | | | A | A | | | | | | | A |
| WINE | | | A | A | | | | | | | A | A | A | | A | A | A | A | A | A | A | | | | | | A |
| XYLENE | | | D | D | | | D | | B | | A | C | D | B | | D | D | D | D | A | D | D | D | A | A | B | | A | A |
| X-RAY DEVELOPER BATH | | | | | | | | | | | | | | | | A | A | A | | | A | | | | | | |
| YEAST | | | | | | | | | | | A | A | | | | | | | | | | | | | | | |
| ZEOLITE WATER | | | | | | | | | | | | | | | | A | A | A | | | A | | | | | | |
| ZINC ACETATE | | | | | | | A | | A | | | | | | | | | | | | | | | | | | |
| ZINC CHLORIDE | | | A | A | | A | A | | A | A | A | A | A | | | | | | A | A | A | A | | D | C | B | A | D | C |
| ZINC NITRATE | | | A | A | | | | | | | | A | A | | | | | | A | | | | | | | | | |
| ZINC PHOSPHATE | | | | | | | A | | A | | | | | | | | | | | | | | | | | | |
| ZINC SULFATE | | | A | A | | | A | | A | | A | A | A | | | | | | A | A | A | A | | | | A | | A |
| ZINC SALTS | | | | | | | | | | | | | | | A | A | A | A | | | A | | | | | | |

To the best of our knowledge the information contained herein is accurate. However, neither Harrington Industrial Plastics Inc., nor any of its affiliates assumes any liability whatsoever for the accuracy or completeness of the information contained herein. Final determination of the suitability of any infringement of patents is the sole responsiblity of the user.
The chemical resistance chart is to be used as a guide only. There is no warranty expressed or implied and the final determination of the chemical resistance is the responsibility of the user.

A – No Effect – Excellent  B – Minor Effect – Good  C – Moderate Effect – Fair  D – Severe Effect – Not Recommended

**MATERIALS**
X - Very Good Service
\+ - Moderate Service
— - Limited or Variable Service
o - Unsatisfactory
Blank - No Information

**CHEMICALS**
SOLIDS ASSUMED IN SOL'N.
ROOM TEMPERATURES ASSUMED UNLESS OTHERWISE STATED

| | METALS | | | | | | | | | | | | | | | | | | | | | | | | | | | | CARBONS & CERAMICS | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CHEMICALS | CARBON STEEL, Fe | CAST IRON & DUCTILE IRON Fe. | 304 STAINLESS STEEL: Fe, 18Cr, 8Ni | 316 STAINLESS STEEL: Fe, 16Cr, 10Ni, 2Mo | 347 STAINLESS STEEL: Fe, 17Cr, 9Ni; (Cx10)Cb. | NI-RESIST IRON: Fe, 14Ni, 2Cr, 2Si | DURIMET 20: CARPENTER 20: Fe: 4Cu, 20Cr, 29Ni | WORTHITE 3Mo, 2Cu, Fe, 20Cr, 24Ni, 3Si | DURIRON: Fe, 14Si; Durichlor, Fe, 14Si, 3Mo* | COPPER; BRASS; BRONZES; EVERDUR | ALUMINUM: Al (and Alloys) | LEAD, Pb | MONEL: 67Ni, 30Cu, 1.4 Fe | NICKEL Ni | INCONEL: 76Ni, 15Cr, 8Fe | HASTELLOY B: Ni, 26Mo, 4Fe | HASTELLOY C: Ni, 16Mo, 4Fe, 14Cr, 4W | HASTELLOY D: Ni, 8Si, 3Cu | CHLORIMET 3: 3Fe, 1Si, 60Ni, 18Mo, 18Cr | CHLORIMET 2: 63Ni, 32Mo, 3Fe, 1Si | STELLITE: Co, 28Cr, 4W | ZIRCONIUM: Zr | TANTALUM: Ta | SILVER: Ag | PLATINUM: Pt | DOWMETAL: (Mg alloys) | TITANIUM: Ti | MOLYBDENUM Mo *NOTE Duriron is as shown. Durichlor is also satisfactory on Chlorides and HCl | CARBON & GRAPHITE | GLASS, "PYREX" brand | SILICAWARE | SILICATE CEMENTS | CHEMICAL STONEWARE | TRANSITE (asbestos & cement) | CHEMICAL PORCELAIN | CONCRETE-Unbonded | CONCRETE-Mortar Bonded |
| ACETIC ACID, 100%, $CH_3COOH$ | o | o | + | x | — | o | x | x | x | o | x | o | — | + | — | x | x | x | x | x | x | x | x | x | x | | x | | x | x | x | x | x | | x | | |
| ACETIC ACID, Dilute | o | o | x | x | — | o | x | x | x | x | — | — | — | o | + | x | x | + | x | x | x | x | x | x | x | | x | x | x | x | x | | x | | x | | |
| ACETIC ANHYDRIDE, $(CH_3CO)_2O$ | — | + | x | x | x | — | x | x | x | — | — | o | — | — | + | + | x | + | x | x | x | | x | x | x | | x | | x | x | x | x | x | | x | | |
| ACETONE, $CH_3COCH_3$ | x | | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | | x | | x | | | x | | x | x | x | | x | x | x | | |
| ACETYL CHLORIDE, $CH_3COCl$ | o | | — | x | | | x | | x | o | | | + | | | | | | x | x | | | | | | | | | | x | | | | | x | | |
| ALUMINUM CHLORIDE, $AlCl_3$ | o | o | o | o | o | — | x | o | x | — | o | o | o | — | — | x | + | x | x | x | — | x | x | x | x | | x | | x | x | x | x | x | | x | | |
| " HYDROXIDE, $Al(OH)_3$ | | | x | x | | | x | x | + | x | x | | + | + | | | | | x | x | | | x | | | | | | | x | | | | | x | | |
| " SULFATE, $Al_2(SO_4)_3$ | o | | — | — | x | — | x | x | x | — | x | x | — | — | — | x | x | x | x | x | x | x | x | x | x | | x | | x | x | x | | x | x | x | | |
| ALUMS, CONC., $Al_2(SO_4)_3 \cdot K_2SO_4$, etc. | o | | o | — | — | | + | | x | — | — | x | | | | | | | x | x | | | x | | x | | | | x | x | | | | | x | | |
| ALUMS, DILUTE | o | o | x | — | — | — | x | x | x | — | x | + | + | + | | + | + | | x | x | | x | x | x | x | | | | x | x | x | x | x | x | x | | |
| AMINES, various | x | x | x | x | x | | x | x | x | — | — | | | | | x | x | x | x | x | x | | — | x | x | | | | x | x | | | x | | x | | |
| AMMONIA (Gas), Moist, $NH_3$ | x | | x | x | x | x | x | | x | o | o | | | | | x | x | x | x | x | x | | | x | x | x | | | x | x | x | o | x | x | x | | |
| AMMONIUM CARBONATE, $(NH_4)_2CO_3$ | + | + | + | + | x | | x | | x | — | — | | + | x | + | + | + | + | x | x | | | x | | | | | | | x | | x | | | x | | |
| " CHLORIDE, $NH_4Cl$ | o | o | o | — | — | x | x | x | x | o | o | — | + | + | — | + | + | x | x | x | — | x | x | x | x | | x | + | x | x | x | x | x | x | x | x | |
| " HYDROXIDE, $NH_4OH$ | x | x | x | x | x | x | x | | + | o | — | + | o | o | x | + | + | + | x | x | x | x | — | x | x | x | x | — | x | — | | | x | | x | | |
| " NITRATE, $NH_4NO_3$ | — | | x | x | x | — | x | x | x | o | o | | x | | — | o | x | o | x | x | | | x | | | | | | x | x | x | | x | | x | x | |
| " PERSULFATE, $(NH_4)_2S_2O_8$ | o | | x | x | x | | x | x | x | — | — | | o | o | — | o | x | o | x | x | | | x | | | | | | | x | | | | | | | |
| " PHOSPHATE, $(NH_4)H_2PO_4$ | o | | x | x | | — | x | | x | o | | | | | | | | | x | x | | | | | | | | | | x | | | | | x | | |
| " $(NH_4)_2HPO_4$ | — | | x | x | | x | x | | x | — | — | | | | | | | | x | x | | | | | | | | | | x | | | | | x | | |
| " $(NH_4)_3PO_4$ | x | — | x | x | x | x | x | x | x | o | — | x | x | x | x | x | x | x | x | x | x | | x | | | | | | x | x | | | x | | x | | |
| " SULFATE, $(NH_4)_2SO_4$ | x | | — | — | + | x | x | x | x | — | — | — | + | + | x | x | x | x | x | x | x | x | x | x | | | x | | x | x | x | | x | | x | | |
| AMYL ACETATE, $C_5H_{11}COOCH_3$ | — | | x | x | x | x | x | x | x | — | x | | + | + | + | x | x | x | x | x | | | x | | | | | | x | x | x | | x | | x | x | |
| " ALCOHOL, $C_5H_{11}OH$ | x | | x | x | | | x | | x | x | x | | | | | | | | x | x | | | | | | | | | x | x | x | | x | x | x | | |
| " CHLORIDE, $C_5H_{11}Cl$ | x | | — | — | — | | x | — | x | x | o | | — | + | — | x | x | x | x | x | | | x | | | | | | x | x | x | | x | | x | | |
| ANTIMONY TRICHLORIDE, $SbCl_3$ | o | | o | o | o | | | | x | — | o | x | x | x | x | x | x | | x | x | | | x | | | | | | | x | x | | x | | x | | |
| ARSENIC ACID, $H_3AsO_4$ | o | | — | — | | x | x | x | x | — | | — | | | — | | | | x | x | | | x | x | | | | | x | x | | | | | x | | |
| BARIUM CARBONATE, $BaCO_3$ | | | x | x | x | | x | x | x | x | o | | + | x | x | x | x | x | x | x | | x | x | | | | x | | | x | | | | | x | | |
| " HYDROXIDE, $Ba(OH)_2$ | x | | | x | | x | x | x | + | o | o | | x | x | | + | + | + | x | x | | x | x | | | | + | | | x | | | | | x | | |
| " SULFIDE, BaS | o | | x | x | | x | x | x | x | o | o | | — | | | | | | x | x | | | | o | | | | | | — | | | | | x | | |
| BENZALDEHYDE, $C_6H_5CHO$ | x | | x | x | | | x | | x | | — | o | | | | | | | x | x | | | | | | | | | x | x | x | | x | x | x | x | |
| BENZENE, $C_6H_6$ | + | + | x | x | x | x | x | x | x | x | x | + | + | + | x | + | + | + | x | x | x | | x | x | x | x | | | x | x | | x | x | | x | | |
| BENZOIC ACID, $C_6H_5COOH$ | o | | x | x | + | | x | x | x | + | x | o | + | + | + | x | x | x | x | x | | | x | x | | | | | | x | | | | | x | | |
| BORAX, $Na_2B_4O_7$ | x | — | x | x | x | x | x | | x | — | — | | x | x | x | | | | x | x | | | | o | | | | | x | x | x | | x | x | x | x | |
| BORIC ACID, $H_3BO_3$ | o | o | + | + | + | — | x | x | x | + | + | + | + | + | x | x | x | x | x | x | x | | x | x | x | | x | | x | x | | x | x | | x | | |
| BROMINE, Wet, $Br_2$ | o | | o | o | o | o | o | o | o | o | o | — | o | o | o | o | x | o | x | o | — | | x | o | — | | o | | o | x | x | | x | | x | x | |
| BUTANOL, $C_4H_9OH$ | x | | x | x | | | x | | x | x | x | | x | x | x | x | x | x | x | x | | | | | | | | | | x | | | | | x | | |
| BUTYL ACETATE, $C_4H_9COOCH_3$ | — | | | x | | | x | x | x | x | x | x | + | | | x | x | x | x | x | | | x | | | — | | | x | x | x | | x | x | x | x | x |
| BUTYRIC ACID, $C_3H_7COOH$ | o | o | o | x | o | | x | x | x | — | — | o | + | + | + | x | x | x | x | x | | | x | | | | x | | | x | | | | | x | | |
| CALCIUM BISULFATE, $CaHSO_4$ | o | | o | x | | o | x | | | o | o | | o | o | | | | | x | x | | | | | | | | | | x | | | | | x | | |
| " BISULFITE, $CaHSO_3$ | x | | o | x | | o | x | x | o | — | — | x | o | | | | | | x | x | | | | | | | x | | | x | x | | x | | x | | |
| CALCIUM CARBONATE, $CaCO_3$ | x | | x | x | | x | x | x | x | x | o | x | x | x | x | x | x | x | x | x | | | x | | | | x | | | x | | | | | x | | |
| " CHLORATE, $CaClO_3$ | | | — | x | o | | + | — | + | — | | | + | + | + | | + | + | + | + | | | x | | | | | | x | x | | | | | x | | |
| " CHLORIDE, $CaCl_2$ | + | + | — | — | — | — | + | x | x | + | — | o | + | + | + | + | x | + | x | x | — | x | x | | | | x | | x | x | x | x | x | x | x | x | |
| " HYDROXIDE, $Ca(OH)_2$ | x | | x | x | x | x | x | x | + | + | | | x | x | x | x | x | x | x | x | | | x | | | | x | | | x | | | | | x | | |
| " HYPOCHLORITE, $Ca(OCl)_2$ | — | o | o | — | — | — | — | — | x | o | o | o | o | o | o | o | — | o | — | o | o | x | x | | x | | x | | x | x | x | o | x | | x | x | |
| " SULFATE, $CaSO_4$ | — | | x | x | | | x | x | x | x | — | | + | | | + | + | + | x | x | | | x | | | | | | | x | | | | | x | | |
| CARBON DIOXIDE (Dry), $CO_2$ | x | | x | x | x | x | x | | x | x | x | x | x | x | x | x | x | | x | x | | | | x | | | | x | | x | | | | | x | | |
| " " (Wet or $H_2CO_3$) | x | | x | x | x | — | x | x | x | — | — | — | — | x | x | x | x | x | x | x | x | | x | x | | | | | x | x | x | | x | x | x | x | x |
| CARBON DISULFIDE, $CS_2$ | x | + | + | + | x | x | x | x | x | — | — | + | + | + | + | | | | x | x | | | x | — | | | | | x | x | x | x | x | | x | | |
| CARBON TETRACHLORIDE (Moist) $CCl_4$ | — | — | o | — | — | — | x | x | x | — | — | + | + | + | x | + | x | + | x | x | x | x | x | x | | | x | | x | x | x | x | x | x | x | x | |
| CHLORACETIC ACID, $ClCH_2CO_2H$ | o | o | o | o | o | | — | o | x | o | o | o | — | — | + | x | x | — | x | x | — | | x | x | x | | x | | | x | | | x | | x | | |
| CHLORIC ACID, $HClO_3$ | | | o | o | | | | | | | | | | | | | | | | | | | | o | | | | | | x | | | | | | | |
| CHLORINE (DRY), $Cl_2$ | x | x | x | x | x | | x | x | x | x | o | x | x | x | x | x | x | x | x | x | | | x | x | x | | o | + | x | x | x | | x | | x | | |
| " (Wet), $Cl_2$ | o | o | o | o | o | o | o | o | — | o | o | — | o | — | o | o | x | o | x | o | | o | x | x | x | | — | o | — | x | x | | x | | x | | |
| CHLOROBENZENE, $C_6H_5Cl$ | x | | x | x | x | | x | x | x | + | | | — | — | — | | | | x | x | | | x | | | | | | | x | x | | x | | x | | |
| CHLOROFORM, $CHCl_3$ | x | | x | x | x | | x | x | x | x | — | x | x | x | x | x | x | x | x | x | | | x | | | | x | | x | x | x | | x | | x | | |
| CHROMIC ACID, $CrO_3$ sol'n | — | + | o | — | o | o | + | x | x | o | + | + | o | o | — | o | + | o | + | o | x | x | x | o | x | — | x | + | o | x | x | x | x | | x | | |
| COPPER CHLORIDE, $CuCl_2$ | o | | o | o | o | | o | x | o | o | o | | o | o | o | x | x | x | — | o | | — | x | — | | | x | | | x | x | | x | | x | | |
| " CYANIDE, $Cu_2(CN)_2$ | | | x | x | x | | x | x | x | o | o | | o | o | o | x | x | x | x | x | | | x | | | | | | | + | | | | | x | | |
| " NITRATE, $Cu(NO_3)_2$ | o | | x | x | | | x | x | x | o | o | | o | o | o | o | x | o | x | x | | | x | o | | | | | | x | | | | | x | | |
| " SULFATE, $CuSO_4$ | o | o | x | x | x | — | x | x | x | o | o | — | — | — | — | x | x | x | x | x | x | x | x | — | x | | | | x | x | x | x | x | | x | | |
| CRESYLIC ACID | o | | x | x | x | | x | x | x | o | — | | — | x | — | — | — | — | x | x | | | | | | | | | | x | | | | | x | | |
| DICHLORETHANE, $C_2H_4Cl_2$ | o | | x | x | x | | x | | x | | | | x | x | x | x | x | | x | x | | | | | | | | | | x | | | | | x | | |
| DIETHYLAMINE, $(C_2H_5)_2NH$ | x | | | x | | | x | | | | | | | | | | | | x | x | | | | | | | | | x | x | | | | | x | | |
| DIPHENYL, $C_6H_5C_6H_5$ | x | | x | | | | x | | x | | | | | x | | | | | x | x | | | | | | | | | | x | | | | | x | | |
| ETHERS, Various | x | | x | x | x | | x | x | x | x | x | x | + | + | + | x | x | x | x | x | | | | | | | | | x | x | x | | x | x | x | x | x |
| ETHYL ACETATE, $C_2H_5COOCH_3$ | x | | x | x | | x | x | x | x | x | x | | x | x | x | x | x | x | x | x | | | x | | | | | | x | x | x | | x | x | x | x | x |

| RUBBERS | | | | | | THERMOPLASTICS | | | | | | | | | | | | | | | THERMOSETTING PLASTICS | | | | | | | | | | | | | | | | | | WOODS | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| HARD RUBBER (Natural) | SOFT RUBBER (Natural) | NEOPRENE | BUTADIENE DERIVATIVES | NITRILE Rubber (Chemigum) | VITON | ASPHALTIC, BITUMASTIC | CELLULOSE ACETATE | CELLULOSE ACETATEBUTYRATE | ETHYL CELLULOSE (Ethocel) | CELLULOSE NITRATE | ACRYLIC (Lucite, Plexiglas) | COUMARONE RESINS | POLYETHYLENE | POLYVINYL CHLORIDE, Rigid or Unplast. | TYGON (P. V. C. & Copolymers) | SARAN (Vinyl chloride, vinyldene chloride) | KEL-F (Polytrifluorochloroethylene) | TEFLON (Polytetrafluoroethylene) | USCOLITE CP -(styrene-acrylonitrile-butadiene) | PENTON (Chlorinated Polyether) | SHELLAC COMPOUNDS | ORGANIC POLYSULFIDES | POLYSTYRENE (Styron) | VINYLIDENE CHLORIDES | VINYL CHLORIDE ACETATES | CAST PHENOL FORMALDEHYDE | HAVEG 41 (Mod Phenolic w. asbestos) | HERESITE (phenol formaldehyde) | MOLDED PHENOLFORMALD. (Durez) | PHENOL FURFURAL PLASTICS | UREA FORMALDEHYDE | CASEIN PLASTICS | EPOXY RESINS | FURANE RESINS Haveg 61. Duralon | SILICONE RESINS | PERMANITE (Furan, Glass Fiber) | NYLON (Adipic Acid—Hexameth. Diamine) | DURCON 6 (Modif. Epoxy) | CYPRESS | FIR | MAPLE | OAK | PINE | REDWOOD |
| x | – | o | o | o | o | o | o | | x | o | o | | o | o | o | – | x | x | o | + | | x | o | o | o | – | – | x | x | – | | | – | x | o | – | – | x | – | – | x | x | x | – |
| x | – | o | x | o | | x | x | x | x | x | x | x | x | – | – | x | x | x | – | x | x | x | o | – | – | x | x | x | x | x | | x | x | x | x | x | o | x | x | x | x | x | x | x |
| x | – | o | – | o | o | o | o | | o | o | o | | | o | o | – | | x | | + | | | o | | | – | o | x | x | x | | | | o | | – | | x | | | | | | |
| o | o | o | x | – | o | o | o | o | o | o | o | o | o | o | | o | | x | o | + | o | x | – | o | o | – | o | | – | – | x | x | x | | | x | x | | | | | | | |
| | | | | | | | | | | | | | | | | | x | x | | | | | | | | | | | | | | | | | | | | x | | | | | | |
| x | x | x | x | x | x | x | | | | x | | | x | x | x | x | x | x | x | x | x | | x | x | x | x | x | x | x | x | | | x | x | | x | x | x | | | | | | |
| | | | | | x | | | | | | | | x | x | | | x | x | | x | | | | | | | | | | | | | | | | | x | x | | | | | | |
| x | x | x | x | – | x | x | | | | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | – | x | x | x | | | x | | x | | x | x | x | x | x | x | – | x | x |
| | | x | | | | | | | | | | | x | x | x | x | x | x | x | x | | | | | | | x | x | | | | | x | | | | | x | | | | | | |
| x | x | x | x | x | | x | | | | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | – | x | x | x | | | x | x | x | | | | x | x | x | x | – | x | x |
| – | | | | | o | | | | | | | | | o | – | | x | x | | | | | | | | | x | x | | | | | | | | | x | x | | | | | | |
| – | – | x | x | | o | | – | x | x | | x | | x | – | | o | x | x | – | x | x | | o | x | x | x | | | x | – | | | x | x | – | | | x | | | | | | |
| x | | | | o | | x | | | | | | | x | x | | x | x | x | x | x | | | x | | | | | | x | x | | | x | x | | | x | x | | | | | | |
| x | x | x | x | – | x | x | x | x | | x | x | x | x | x | x | x | x | x | x | x | x | | x | x | x | x | x | x | x | x | | x | x | x | | x | o | +* | | | | | | |
| – | x | – | | x | + | – | | | | | x | | x | x | – | o | x | x | x | x | | | x | o | | | x | x | o | o | | | x | x | – | x | x | x | | | | | | |
| – | – | – | x | | + | x | x | | | x | x | | x | x | | x | x | x | x | x | – | | x | x | x | x | | | x | x | | x | x | | | | x | x | | | | | | |
| | | | | | | x | | | | | | | | x | x | | x | x | | x | | | | | | | | | | | | | x | x | | | | x | | | | | | |
| | | | | | | | | | | | | | | x | | | x | x | x | x | | | | | | | | | | | | | | | | | | x | | | | | | |
| | | | | | | | | | | | | | | x | | | x | x | x | x | | | | | | | | | | | | | | | | | | x | | | | | | |
| x | | | | | | | | | | | | | x | x | x | | x | x | x | x | | | | | | | x | x | | | | | | | | | | x | | | | | | |
| x | x | x | x | | | x | | | | x | x | x | | x | x | x | x | x | x | x | x | x | | x | x | x | x | x | x | x | | x | x | | | x | | o | | | | | | |
| o | o | o | o | | o | o | o | o | o | o | o | o | – | o | | o | x | x | | x | o | | o | o | x | – | | | – | – | | x | x | | | x | x | x | | | | | | |
| | – | x | x | | x | o | x | o | o | o | x | – | – | x | | x | x | x | x | x | o | | x | – | – | x | | | x | x | | x | x | | | | x | x | | | | | | |
| – | o | – | x | | – | o | | | | | | | | o | | x | x | x | | x | | | | x | x | – | | | – | – | | x | x | | | | | x | | | | | | |
| | | | x | | x | | | | – | | | | | x | | x | x | x | x | x | | | | | | | | | | | | | | | | | | x | | | | | | |
| | | x | | | x | | | | | | | | x | – | | | x | x | | x | | | | | | | | | | | | | | | | | | x | | | | | | |
| | | | | | x | | | | | | | | | x | | | x | x | x | x | | | | | | | | | | | | | | | | | | x | | | | | | |
| | | | | | x | x | | | | | | | x | x | | | x | x | x | x | | | | | | | | | | | | | | | | | | x | | | | | | |
| x | | | | | x | | | | | | | | x | – | x | x | x | x | x | x | | | | | | | | | | | | | | | | | x | x | | | | | | |
| o | o | o | x | | | o | | | | | | | o | o | | – | x | x | | – | o | | | x | | x | | | x | x | | | – | | | | | x | x | | | | | |
| o | o | o | | o | – | o | – | o | o | | o | | – | o | o | – | x | x | | + | | | o | | o | | – | x | x | x | | | x | x | | x | x | x* | | | | | | |
| | | | | | | x | | | | | | | | x | x | x | x | x | | x | | | | | | | | | | | | | x | | | | o | +* | | | | | | |
| x | x | x | x | | x | x | x | x | x | x | x | x | | x | | | x | x | x | x | x | | x | x | x | x | | | x | x | | | | | | | x | x | x | – | – | – | x | – |
| x | x | x | | | x | | | | | | | | | – | x | x | x | x | x | x | | | | | | | x | x | x | x | | | | x | | x | x | x | | | | | | |
| – | o | | – | | – | o | | | | | | | o | o | – | o | x | x | | – | | | – | | | | o | x | – | – | – | | o | o | | o | o | x* | | | | | | |
| – | – | – | | | | | | | | | x | | | x | | x | x | x | x | x | | | | | | | | | | | | | – | | | x | | x | | | | | | |
| o | o | o | o | | o | o | o | o | o | o | o | | | o | | o | x | x | | + | | | o | o | o | – | | | – | – | o | x | x | | | | | x | | | | | | |
| x | – | o | | | o | o | | | | | | | | o | | – | x | x | | x | | | | | | | | | | | | | – | | | | o | x | | | | | | |
| | | | | | | | | | | | | | | | | | x | x | | | | | | | | | | | | | | | | | | | | x | | | | | | |
| x | x | x | x | | | | | | | | | | | x | | x | x | x | x | x | | | | | | x | | | x | x | | | | | | | | x | | | | | | |
| x | x | – | | | x | | | | | | | | | x | | x | x | x | | x | | | | | | | | | | | | | | | | | x | x | | | | | | |
| | | | | | | x | | | | | | | | x | | | x | x | x | x | | | | | | | | | | | | | x | | | | | x | | | | | | |
| x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | – | x | x | – | – | | | x | x | | x | o | x | x | x | x | x | x | – |
| x | x | x | | | x | x | | | | | | | | x | | x | x | x | x | x | | | | | | | | | | | | | x | | | x | x | x | | | | | | |
| x | x | o | x | – | | – | | | | | | | x | x | x | x | x | x | x | x | | x | x | | x | o | – | | o | o | | | x | x | | | o | x | o | o | o | o | – | o |
| x | x | x | | | x | x | | | | | | | | x | | x | x | x | x | x | | | | | | | | | | | | | x | | | | x | x | | | | | | |
| x | x | x | | | | x | | | | | | | | x | | x | | x | x | x | | | | | | | | | | | | | x | | | | | o | | | | | | |
| x | x | x | x | | | x | x | x | x | x | x | x | x | x | x | x | | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | | | | | | x | x | x | x | x | x | x |
| o | o | o | x | | x | o | o | o | o | x | x | | o | o | | – | x | x | | – | – | | o | o | | x | | | x | x | | | o | x | | x | x | x | | | | | | |
| o | o | o | x | – | x | o | x | – | | x | x | | o | – | o | – | x | x | | x | o | – | o | x | x | x | x | x | x | x | | | x | x | | x | x | x | | | | | | |
| – | – | – | x | | x | o | | | – | | | | | x | o | – | x | x | | + | | x | x | | | | x | x | x | x | | | | | | | o | x | | | | | | |
| | | | | | | | | | | | | | | | | | x | x | | | | | | | | | | | | | | | | | | | | o | | | | | | |
| x | – | o | – | | x | o | – | – | | | | | x | – | x | – | x | x | x | + | | | x | x | x | – | – | | – | – | | | – | | – | – | o | o | | | | | | |
| x | x | o | x | | | – | – | – | | | | | x | – | x | – | x | x | x | + | | | x | x | x | – | – | | – | – | | | o | | – | – | o | + | | | | | | |
| o | o | o | | | – | o | | | | | – | | o | o | | – | x | x | | + | | | o | o | | | – | | | | | | – | x | | x | | –* | | | | | | |
| o | o | o | | | – | o | o | o | o | | o | | o | o | | – | x | x | | + | | o | | | | | | | | | | | x | | | | x | x* | | | | | | |
| o | o | o | o | o | – | o | o | o | o | | o | o | x | – | x | x | x | x | – | – | | | o | x | | o | o | x | o | o | | | o | o | | o | o | x | | | | | | |
| | x | x | x | | x | x | | | | | | | x | x | | x | x | x | x | x | – | | | | | | x | | | | | | x | x | | | o | x | | | | | | |
| | | | | | | x | | | | | | | | x | | | | x | x | x | | | | | | | | | | | | | x | | | | | x | | | | | | |
| x | | x | | | x | | | | | | | | x | x | | x | x | x | x | x | | | | | | | | | | | | | | | | | x | x | | | | | | |
| x | x | x | x | o | x | x | x | x | | x | o | | x | x | x | x | x | x | x | x | x | | x | | | x | x | x | x | x | | | x | x | | x | o | x | | | | | | |
| o | o | o | | | – | | | | | | | | | – | | | + | x | | x | | | | | | | | | | | | | | | | | o | x | | | | | | |
| | | | | | | | | | | | | | | | | | – | x | | | | | | | | | | | | | | | | | | | | x | | | | | | |
| | | o | | | | | | | | | | | | o | | | x | x | | x | | | | | | | | | | | | | | | | | | x | | | | | | |
| | | | | | | | | | | | | | | | | | x | x | | | | | | | | | | | | | | | | | | | | x | | | | | | |
| o | o | o | o | | o | o | o | o | o | o | o | | o | o | | – | x | x | | x | | | o | o | o | – | – | | – | – | | x | – | x | | x | | x | | | | | | |
| o | o | o | o | | o | o | o | o | o | o | o | | o | o | | – | x | x | | + | | | o | o | o | – | o | | – | – | | x | x | x | | x | x | x | | | | | | |

…rcon 5 would be the preferred formula

**MATERIALS**
X - Very Good Service
\+ - Moderate Service
– - Limited or Variable Service
o - Unsatisfactory
Blank - No Information

**CHEMICALS**
SOLIDS ASSUMED IN SOL'N.
ROOM TEMPERATURES ASSUMED
UNLESS OTHERWISE STATED

## METALS

*NOTE: Duriron is as shown. Durichlor is also satisfactory on Chlorides and HCl

| CHEMICALS | CARBON STEEL, Fe | CAST IRON & DUCTILE IRON, Fe | 304 STAINLESS STEEL; Fe, 18Cr, 8Ni | 316 STAINLESS STEEL; Fe, 16Cr, 10Ni, 2Mo | 347 STAINLESS STEEL; Fe, 17Cr, 9Ni; (Cx10)Cb | NI-RESIST IRON; Fe, 14Ni, 2Cr, 2Si | DURIMET 20; CARPENTER 20; Fe; 4Cu, 20Cr, 29Ni, 2Mo | WORTHITE 3Mo, 2Cu, 20Cr, 24Ni, 3Si | DURIRON; Fe, 14Si; Durichlor, 14Si 3Mo* | COPPER; BRASS; BRONZES; EVERDUR | ALUMINUM; Al (and Alloys) | LEAD, Pb | MONEL; 67Ni, 30Cu, 1.4 Fe | NICKEL; Ni | INCONEL; 76Ni, 15Cr, 8Fe | HASTELLOY B; Ni, 26Mo, 4Fe | HASTELLOY C; Ni, 16Mo, 4Fe, 14Cr, 4W | HASTELLOY D; Ni, 8Si, 3Cu | CHLORIMET 3; 3Fe, 1Si, 60Ni, 18Mo, 18Cr | CHLORIMET 2; 63Ni, 32Mo, 3Fe, 1Si | STELLITE; Co, 28Cr, 4W | ZIRCONIUM; Zr | TANTALUM; Ta | SILVER; Ag | PLATINUM; Pt | DOWMETAL; (Mg alloys) | TITANIUM; Ti | MOLYBDENUM; Mo |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ETHYL CHLORIDE, $C_2H_5Cl$ | x | | x | x | x | o | x | - | x | - | - | | + | + | x | x | x | x | x | x | | | x | | | | | |
| ETHYLENE CHLOROHYDRIN, $Cl(C_2H_4)OH$ | x | | x | | | | x | | x | | | x | | | | | | | x | x | | | | | | | | |
| " DICHLORIDE, $C_2H_4Cl_2$ | x | | x | x | x | | x | | x | - | o | x | + | + | - | x | | | x | x | | | x | | | | x | |
| " GLYCOL, $CH_2OHCH_2OH$ | - | + | x | x | x | x | x | x | x | + | x | + | + | + | + | | | | x | x | | | | | | | | |
| " OXIDE, $CH_2OCH_2$ | x | | x | | | | x | | x | | | | | | | | | | x | x | | | | | | | | |
| FATTY ACIDS, Various | o | o | x | x | x | - | x | x | x | - | x | o | + | x | x | x | x | x | x | x | x | | x | x | x | | | |
| FERRIC CHLORIDE, $FeCl_3$ | o | o | o | o | o | o | o | o | - | o | o | o | o | o | o | o | + | o | - | o | - | o | x | o | | | x | o |
| " NITRATE, $Fe(NO_3)_3$ | o | | x | x | x | | x | x | x | o | o | | o | o | o | o | + | o | x | | | | x | o | | | | |
| " SULFATE, $Fe_2(SO_4)_3$ | o | | - | x | x | o | x | x | x | o | o | x | o | o | o | o | + | o | x | | x | | x | o | | | x | |
| FERROUS CHLORIDE, $FeCl_2$ | o | o | o | o | o | x | - | o | + | o | o | o | o | o | o | - | + | + | + | - | | | x | o | | | | |
| " SULFATE, $FeSO_4$ | o | o | + | o | x | - | x | x | x | - | + | - | o | o | o | + | + | + | x | x | - | | x | o | | | x | |
| FLUORINE, $F_2$ | | | o | o | | | - | | o | o | o | - | o | x | x | + | x | | + | | | | o | x | | | o | o |
| FORMALDEHYDE, $CH_2O$ | - | - | - | - | - | - | x | x | x | x | - | o | - | x | - | x | x | x | x | x | x | | x | x | | - | x | |
| FORMIC ACID, HCOOH | o | o | + | + | - | | x | x | x | o | - | o | + | + | - | - | x | - | x | x | x | x | x | | | | o | + |
| FUEL OIL | x | | - | x | x | x | x | | x | x | x | | x | x | + | x | x | x | x | x | | | x | | | | | |
| GALLIC ACID, $(OH)_3C_6H_2COOH$ | o | | x | x | x | | x | | x | x | x | | - | + | + | x | x | x | x | x | | | | | | | | |
| GASOLINE, Refined | x | | x | x | x | x | x | | x | x | x | | + | + | + | x | x | x | x | x | | | x | | | | | |
| GLYCEROL, $CH_2OHCHOHCH_2OH$ | + | | + | + | + | x | x | | x | x | x | - | + | x | x | x | x | x | x | x | | | | x | | | x | |
| HYDROBROMIC ACID, HBr | o | | o | o | o | | o | o | - | - | o | o | o | o | o | x | - | - | - | + | | | x | | | | x | |
| HYDROCHLORIC ACID, (Conc.), HCl | o | o | o | o | o | o | o | o | + | o | o | o | o | o | o | + | - | o | + | x | x | x | x | x | x | | o | x |
| " (Dilute) | o | o | o | o | o | - | o | o | x | o | o | - | - | - | - | + | - | - | x | x | - | x | x | x | x | | - | |
| " (Dry Gas) | x | | - | x | | | x | | x | | o | - | - | - | - | x | x | | x | x | | x | x | | | | | |
| HYDROCYANIC ACID, (Conc.), HCN | o | | x | x | x | x | x | x | x | o | x | - | x | - | - | x | x | x | x | x | | | x | | | | | |
| " " (Dil. & Gas) | | | o | o | | | | | | | | | | | | | | | | | | | x | | | | | |
| HYDROFLUORIC ACID, (Conc.), HF | - | o | o | o | o | o | + | - | o | o | o | o | + | - | - | + | + | + | x | x | - | | o | x | x | x | o | |
| " " (Dilute) | o | o | o | o | o | - | + | o | o | - | o | + | + | + | - | + | + | + | x | x | - | | o | | x | o | o | |
| HYDROFLUOSILICIC ACID, $H_2SiF_6$ | o | | o | o | o | o | + | | o | o | - | | - | - | - | - | - | - | x | x | | | o | | | | | |
| HYDROCARBONS (Aliphatic) | x | x | x | x | x | x | x | | x | x | x | | x | x | x | x | x | x | x | x | x | | x | x | x | x | | + |
| " (Aromatic) | x | x | x | x | x | x | x | | x | x | x | | x | x | x | x | x | x | x | x | x | | x | x | x | x | | |
| HYDROGEN GAS, $H_2$ | x | | | | | | x | | x | x | x | x | x | x | | | | | x | x | | | | x | | | | x |
| HYDROGEN PEROXIDE (Conc.), $H_2O_2$ | o | o | + | o | - | o | + | - | + | o | x | - | - | - | | - | x | - | x | x | x | | x | o | x | | x | |
| " " (Dilute) | o | o | + | + | | | x | x | x | o | x | o | + | + | + | x | x | - | x | x | x | x | x | x | x | | - | |
| HYDROGEN SULFIDE (Dry) $H_2S$ | x | | - | x | | - | x | | x | o | o | x | - | x | + | - | x | - | x | + | | | x | o | | | | + |
| " " (Wet) | - | | - | x | - | - | x | x | + | o | o | o | o | x | + | - | + | - | x | + | | | | o | | | | |
| IODINE, $I_2$ Wet | o | o | o | o | o | | o | | o | o | o | o | o | o | - | o | - | o | + | o | - | | x | - | x | - | | |
| IODOFORM, $CHI_3$ | o | | o | x | x | | x | | x | | x | | | | | | | | x | x | | | | | | | | |
| KEROSENE | x | | x | x | x | | x | | x | x | x | | x | x | x | x | x | x | x | x | | | x | | | | | |
| KETONES, Various | x | | x | | | | x | | x | | - | x | | | | | | | x | x | | | | | | | | |
| LACTIC ACID, $CH_3CHOHCOOH$ | o | o | - | - | x | - | x | x | x | - | - | o | - | - | - | x | x | x | x | x | x | x | x | x | x | | x | x |
| LEAD ACETATE, $Pb(CH_3COO)_2$ | o | | x | x | + | | x | x | x | - | o | | x | + | | x | x | x | x | x | | | x | | | | x | |
| MAGNESIUM CHLORIDE, $MgCl_2$ | - | - | - | + | - | x | x | x | x | + | - | o | + | + | + | x | x | x | x | x | - | | x | x | | | x | |
| " HYDROXIDE, $Mg(OH)_2$ | x | | x | x | + | | x | x | + | - | o | | x | x | x | x | x | x | x | x | | | x | x | | | x | |
| " SULFATE, $MgSO_4$ | + | o | + | + | + | x | x | x | x | + | x | + | + | + | + | x | + | x | x | x | | x | x | x | | | x | |
| MALEIC ACID, $CO_2HC_2H_2CO_2H$ | o | | x | x | | | x | x | x | | | | | | | x | | | x | x | | | | x | | | | |
| MALIC ACID, $CO_2HCH_2CHOHCO_2H$ | o | | x | x | x | | + | | x | o | - | | + | + | + | x | x | x | x | | | | x | | | | | |
| MERCURIC CHLORIDE, $HgCl_2$ | o | | o | o | o | | - | - | + | o | o | - | - | | + | o | x | o | + | o | | x | x | o | | | x | |
| MERCURY, Hg | x | | x | x | x | | x | | x | o | o | o | + | + | x | x | x | x | x | x | | | | o | | | - | |
| METHANOL, Conc., $CH_3OH$ | + | + | + | + | + | x | x | x | x | + | - | + | + | + | + | x | x | + | x | x | | x | x | x | | | | |
| " (Dilute) | - | | | | | | x | | x | - | - | | | | | x | x | - | x | x | | | x | | | | | |
| METHYL CHLORIDE, $CH_3Cl$ | o | | - | - | + | | x | x | x | x | | x | x | x | x | | | | x | x | | | x | | | | | |
| NAPHTHA, Petroleum | x | | x | x | x | x | x | | x | x | x | | + | + | + | x | x | x | x | x | | | | | | | | |
| NICKEL CHLORIDE, $NiCl_2$ | o | | - | - | | | + | o | + | - | o | | - | x | | o | x | o | x | x | | x | x | | | | x | |
| " SULFATE, $NiSO_4$ | o | o | - | - | | | x | x | x | + | - | + | + | - | - | o | + | o | x | x | | x | x | | | | | |
| NITRATING ACID (>15% $H_2SO_4$) | x | x | - | - | - | | x | x | x | o | o | | o | o | | o | x | o | x | x | x | | - | x | x | | - | |
| " " (<15% $H_2SO_4$) | o | | - | - | - | | x | x | x | o | o | | o | o | | o | x | o | x | x | x | | - | o | x | | x | |
| " " (<15% $HNO_3$) | o | | - | o | - | | x | | x | o | o | | o | o | | o | x | o | x | o | x | o | - | o | x | | - | |
| " " (<1% Acid) | o | | - | x | - | | x | | x | o | o | | o | o | | o | x | o | x | | x | o | - | o | x | | | |
| NITRIC ACID, Conc., $HNO_3$ | o | o | + | + | x | | x | x | x | o | - | - | o | o | - | o | + | o | x | o | x | x | x | o | x | | x | + |
| " " Dilute | o | o | x | x | x | o | x | x | x | o | o | o | o | o | o | o | x | o | x | o | x | x | x | o | x | | x | o |
| NITROBENZENE, $C_6H_5NO_2$ | x | | x | x | | | x | x | x | | | o | | | | | | | x | x | | | x | | | | | |
| NITROUS ACID, $HNO_2$ | o | | x | x | - | | x | x | x | x | | | x | o | | | | | x | | | | x | | | | | |
| OLEIC ACID, $C_8H_{17}CH:CH(CH_2)_7CO_2H$ | - | - | - | x | x | - | x | x | x | - | x | o | x | x | x | x | x | x | x | x | x | | x | x | x | | | |
| OXALIC ACID, $CO_2HCO_2H$ | o | o | - | - | - | - | x | x | x | + | - | o | + | - | x | + | + | + | x | x | x | x | x | x | x | | - | + |
| PHENOL (Conc.) $C_6H_5OH$ | + | + | - | x | - | x | x | x | x | o | - | - | + | + | x | + | + | + | x | x | x | x | x | x | x | x | - | |
| " (Dilute) | + | + | x | x | x | | x | | x | - | x | - | + | + | - | + | + | + | x | x | | x | | | | | | |
| PHOSPHORIC ACID (100%), $H_3PO_4$ | o | o | - | - | x | | x | | x | | o | + | - | o | - | + | x | x | x | x | x | x | x | + | x | | | x |

## CARBONS & CERAMICS

| CHEMICALS | CARBON & GRAPHITE; (Karbate, Impervite) | GLASS, "PYREX" brand | SILICAWARE | SILICATE CEMENTS | CHEMICAL STONEWARE | TRANSITE (asbestos & cement) | CHEMICAL PORCELAIN | CONCRETE-Unbonded | CONCRETE-Mortar Bonded |
|---|---|---|---|---|---|---|---|---|---|
| ETHYL CHLORIDE, $C_2H_5Cl$ | x | x | | | | | x | | |
| ETHYLENE CHLOROHYDRIN, $Cl(C_2H_4)OH$ | - | x | x | | x | | x | | |
| " DICHLORIDE, $C_2H_4Cl_2$ | x | x | x | | x | | x | | |
| " GLYCOL, $CH_2OHCH_2OH$ | x | x | x | x | x | | x | | |
| " OXIDE, $CH_2OCH_2$ | | x | | | | | x | | |
| FATTY ACIDS, Various | x | x | x | x | x | x | x | x | x |
| FERRIC CHLORIDE, $FeCl_3$ | x | x | x | x | x | | x | x | |
| " NITRATE, $Fe(NO_3)_3$ | | x | | | | | x | | |
| " SULFATE, $Fe_2(SO_4)_3$ | - | x | x | | x | | x | | |
| FERROUS CHLORIDE, $FeCl_2$ | x | x | x | x | x | | x | | |
| " SULFATE, $FeSO_4$ | x | x | x | x | x | | x | | |
| FLUORINE, $F_2$ | o | o | | | | | o | | |
| FORMALDEHYDE, $CH_2O$ | x | x | x | | x | | x | x | |
| FORMIC ACID, HCOOH | x | x | x | x | x | | x | | |
| FUEL OIL | | x | | | | | x | | |
| GALLIC ACID, $(OH)_3C_6H_2COOH$ | | x | | | | | x | | |
| GASOLINE, Refined | x | x | x | | x | | x | | |
| GLYCEROL, $CH_2OHCHOHCH_2OH$ | x | x | x | | x | | x | x | |
| HYDROBROMIC ACID, HBr | x | x | x | | x | | x | | |
| HYDROCHLORIC ACID, (Conc.), HCl | x | x | x | x | x | | x | | |
| " (Dilute) | x | x | x | | x | | x | | |
| " (Dry Gas) | x | x | | | | | x | | |
| HYDROCYANIC ACID, (Conc.), HCN | | x | | | | | x | | |
| " " (Dil. & Gas) | | x | | | | | x | | |
| HYDROFLUORIC ACID, (Conc.), HF | o | o | | | o | | o | | |
| " " (Dilute) | x | o | | o | o | | o | | |
| HYDROFLUOSILICIC ACID, $H_2SiF_6$ | x | - | | | | | o | | |
| HYDROCARBONS (Aliphatic) | x | x | x | | x | | x | | |
| " (Aromatic) | x | x | x | | x | | x | | |
| HYDROGEN GAS, $H_2$ | | x | | | | | x | | |
| HYDROGEN PEROXIDE (Conc.), $H_2O_2$ | | x | x | | x | | x | | |
| " " (Dilute) | x | x | x | x | x | | x | | |
| HYDROGEN SULFIDE (Dry) $H_2S$ | | x | x | | x | | x | x | |
| " " (Wet) | | x | | | | | x | | |
| IODINE, $I_2$ Wet | o | x | - | | x | | x | x | |
| IODOFORM, $CHI_3$ | | x | | | | | x | | |
| KEROSENE | x | x | | | | | x | | |
| KETONES, Various | - | x | | | | | x | | |
| LACTIC ACID, $CH_3CHOHCOOH$ | x | x | x | | x | | x | | |
| LEAD ACETATE, $Pb(CH_3COO)_2$ | | x | | | | | x | | |
| MAGNESIUM CHLORIDE, $MgCl_2$ | | x | x | x | x | x | x | x | x |
| " HYDROXIDE, $Mg(OH)_2$ | | x | | | | | x | | |
| " SULFATE, $MgSO_4$ | | x | x | x | x | x | x | x | x |
| MALEIC ACID, $CO_2HC_2H_2CO_2H$ | | x | | | | | x | | |
| MALIC ACID, $CO_2HCH_2CHOHCO_2H$ | | x | x | | x | | x | | |
| MERCURIC CHLORIDE, $HgCl_2$ | | x | | | | | x | | |
| MERCURY, Hg | | x | | | | | x | | |
| METHANOL, Conc., $CH_3OH$ | | x | | x | | | x | | |
| " (Dilute) | | x | | | | | x | | |
| METHYL CHLORIDE, $CH_3Cl$ | | x | | | | | x | | |
| NAPHTHA, Petroleum | x | x | x | | x | | x | | |
| NICKEL CHLORIDE, $NiCl_2$ | x | x | | | | | x | | |
| " SULFATE, $NiSO_4$ | x | x | | | | | x | | |
| NITRATING ACID (>15% $H_2SO_4$) | o | x | | | x | | x | | |
| " " (<15% $H_2SO_4$) | o | x | | | x | | x | | |
| " " (<15% $HNO_3$) | o | x | | | x | | x | | |
| " " (<1% Acid) | o | x | | | x | | x | | |
| NITRIC ACID, Conc., $HNO_3$ | o | x | x | x | x | | x | | |
| " " Dilute | - | x | x | | x | | x | | |
| NITROBENZENE, $C_6H_5NO_2$ | | x | | | | | x | | |
| NITROUS ACID, $HNO_2$ | | x | x | | x | | x | | |
| OLEIC ACID, $C_8H_{17}CH:CH(CH_2)_7CO_2H$ | x | x | x | | x | x | x | x | x |
| OXALIC ACID, $CO_2HCO_2H$ | x | x | x | x | x | x | x | x | |
| PHENOL (Conc.) $C_6H_5OH$ | x | x | x | | x | x | x | x | |
| " (Dilute) | | x | | | | | x | | |
| PHOSPHORIC ACID (100%), $H_3PO_4$ | x | - | o | | o | o | o | o | x |

MATERIALS
X - Very Good Service
+ - Moderate Service
— - Limited or Variable Service
o - Unsatisfactory
Blank - No Information

CHEMICALS
SOLIDS ASSUMED IN SOL'N
ROOM TEMPERATURES ASSUMED
UNLESS OTHERWISE STATED

| | METALS | | | | | | | | | | | | | | | | | | | | | | | | | | | | CARBONS & CERAMICS | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CHEMICALS | CARBON STEEL, Fe | CAST IRON & DUCTILE IRON Fe. | 304 STAINLESS STEEL; Fe, 18Cr, 8Ni | 316 STAINLESS STEEL; Fe, 16Cr, 10Ni, 2Mo | 347 STAINLESS STEEL; Fe, 17Cr, 9Ni; (Cx10)Cb | NI-RESIST IRON; Fe, 14Ni, 2Cr, 2Si | DURIMET 20; CARPENTER 20; Fe; 4Cu, 20Cr, 29Ni, 2Mo | WORTHITE 3Mo, 2Cu, Fe, 20Cr, 24Ni, 3Si | DURIRON; Fe, 14Si; Durichlor, Fe, 14Si, 3Mo * | COPPER; BRASS; BRONZES; EVERDUR | ALUMINUM; Al (and Alloys) | LEAD, Pb | MONEL; 67Ni, 30Cu, 1.4 Fe | NICKEL; Ni | INCONEL; 76Ni, 15Cr, 8Fe | HASTELLOY B; Ni, 26Mo, 4Fe | HASTELLOY C; Ni, 16Mo, 4Fe, 14Cr, 4W | HASTELLOY D; Ni, 8Si, 3Cu | CHLORIMET 3; 3Fe, 1Si, 60Ni, 18Mo, 18Cr | CHLORIMET 2; 63Ni, 32Mo, 3Fe, 1Si | STELLITE; Co, 28Cr, 4W | ZIRCONIUM; Zr | TANTALUM; Ta | SILVER; Ag | PLATINUM; Pt | DOWMETAL; (Mg alloys) | TITANIUM; Ti | MOLYBDENUM - Mo *NOTE: Duriron is as shown. Durichlor is also satisfactory in Chlorides and HCl | CARBON & GRAPHITE; (Karbate, Impervite) | GLASS, "PYREX" brand | SILICAWARE | SILICATE CEMENTS | CHEMICAL STONEWARE (Knightware) | TRANSITE (asbestos & cement) | CHEMICAL PORCELAIN | CONCRETE-Unbonded | CONCRETE-Mortar Bonded |
| PHOSPHORIC ACID (>45% Cold) | o | o | — | x | x | — | x | — | x | o | o | + | — | — | — | + | x | + | x | x | x | x | x | x | x | | — | | x | x | | | — | | — | | |
| " ACID (<45%) " | o | o | — | x | x | — | x | — | x | o | — | + | — | — | — | + | x | + | x | x | x | x | x | x | x | | x | | x | x | | | — | | — | | |
| " ANHYDRIDE, Dry or Moist | o | | x | x | | | x | | x | | | | | | | | | | x | x | | | | | | | | | x | x | | | | | | | |
| " " Molten, $P_2O_5$ | x | | x | x | | | x | | x | o | o | | o | o | | | | | x | x | | | | | | | | | | o | | | | | | | |
| PHTHALIC ANHYDRIDE, $C_6H_4(CO)_2O$ | x | | x | | | | x | x | x | | | | | | | x | x | | x | x | | | x | | | | | | | x | | | | | x | | |
| PICRIC ACID, Sol'n., $HOC_6H_2(NO_2)_3$ | | | x | x | + | | x | x | x | o | — | — | o | o | o | x | x | x | x | x | | | | | | | | | | x | | | | | x | | |
| POTASSIUM BROMIDE, KBr | o | | — | — | | | x | | x | x | — | x | + | x | | x | x | x | x | x | | | x | o | | | x | | | x | | | | | x | | |
| " CARBONATE, $K_2CO_3$ | — | | x | x | | — | x | x | x | — | o | x | x | x | + | x | x | x | x | x | | | — | | | | | | | — | | | | | x | | |
| " CHLORATE, $KClO_3$ | x | | x | x | | | x | — | x | — | + | | + | + | + | o | x | o | x | o | | | x | | | | | | | x | | | | | x | | |
| " CHLORIDE, KCl | x | | — | — | | x | x | x | x | — | — | | + | + | | x | x | x | x | x | | | x | | | | x | | | x | | | | | x | | |
| " CYANIDE, KCN | x | | x | x | | x | x | | x | o | o | | x | | | x | x | x | x | x | | | x | o | x | | | | | — | | | | | x | | |
| " DICHROMATE, $K_2Cr_2O_7$ | | | x | x | — | | x | x | x | x | x | | — | — | + | o | x | o | x | x | | x | x | x | | | x | | | x | | | | | x | | |
| " FERROCYANIDE, $K_4Fe(CN)_6$ | o | | x | x | | | x | x | x | x | — | x | x | x | x | x | x | x | x | x | | | x | o | | | | | | x | | | | | x | | |
| " HYDROXIDE, KOH | + | — | + | + | — | — | x | x | + | o | o | o | x | x | x | + | + | + | x | x | | x | — | x | | | — | + | | — | | o | | | — | | |
| " NITRATE, $KNO_3$ | x | | x | x | x | | x | x | x | x | x | — | + | + | + | o | x | o | x | x | | | x | o | | | | | | x | | | | | x | | |
| " PERMANGANATE, $KMnO_4$ | + | + | + | + | + | | x | x | x | x | x | o | — | + | + | o | x | o | x | o | | | x | | | | x | | | x | | | | | x | | |
| " SULFATE, $K_2SO_4$ | x | | + | + | + | x | x | x | x | + | x | x | + | + | + | + | + | + | x | x | | | x | | | | x | | | x | | x | | | x | | |
| " SULFIDE, $K_2S$ | — | | x | x | | — | x | | x | | | | | | | | | | x | x | | | | o | | | | | | — | | | | | x | | |
| PYROGALLOL, $C_6H_3(OH)_3$ | | | x | x | | | x | | x | x | | | | + | | x | x | x | x | x | | | | | | | | | | x | | | | | x | | |
| SILVER NITRATE, $AgNO_3$ | | | x | x | | | x | x | x | o | o | o | | | + | + | + | + | x | x | | x | x | | | | | | | x | | | | | x | | |
| [illegible]M, Molten 210°- 400°F. | x | x | x | x | x | | x | x | x | x | x | | x | x | x | x | x | | x | x | | x | x | | | — | | x | | — | | | | | o | | |
| S[illegible]M ACETATE; $NaCH_3COO$ | o | | — | x | | | x | x | x | x | — | x | + | | | x | x | x | x | x | | | | | | | x | | | x | | | | | x | | |
| BICARBONATE, $NaHCO_3$ | — | | x | x | x | x | x | x | x | — | x | x | x | x | x | x | x | x | x | x | | x | x | x | | | | | x | x | x | | x | x | x | x | x |
| " BISULFATE, $NaHSO_4$ | o | o | — | x | x | | x | x | x | — | o | x | + | | | x | x | x | x | x | x | | — | | x | | x | | x | x | x | | x | | x | | |
| " BISULFITE, $NaHSO_3$ | o | | x | x | | | x | x | — | — | x | x | | | | | | | x | x | | | | | | | | | x | x | x | | x | | x | | |
| " BORATE $NaBO_2$ | | | x | x | | | x | | x | x | — | | + | | | x | x | x | x | x | | | x | | | | | | | x | x | | | x | x | x | |
| " CARBONATE, $Na_2CO_3$ | + | + | + | + | x | x | x | x | x | + | o | — | + | + | — | + | x | x | x | x | x | | — | x | x | x | x | | x | — | — | o | x | x | x | x | |
| " CHLORATE, $NaClO_3$ | — | | x | x | | | — | — | x | + | + | | | | + | o | x | o | x | o | | | x | | | | x | | | x | x | | x | x | x | x | x |
| " CHLORIDE, NaCl | + | + | — | — | — | — | x | x | + | + | — | + | + | + | — | + | + | — | x | x | — | x | x | x | | | x | | x | x | | x | x | | x | | |
| " CYANIDE, NaCN | x | | x | x | | | x | x | x | o | o | x | x | | | | | | x | x | | | | o | | | x | | | — | | | | | x | | |
| " FLUORIDE, NaF | o | | — | — | | | + | — | o | — | — | | + | | | x | x | x | x | x | | x | o | | | | x | | | — | | | | | x | | |
| " HYDROXIDE, (Conc.), NaOH | — | — | — | — | x | x | x | x | — | — | o | o | x | x | x | x | + | x | x | x | x | x | o | x | x | | x | | x | — | o | o | o | | o | | |
| " " (Dilute) | x | + | + | + | x | | x | x | + | x | o | o | — | — | — | x | + | x | x | x | x | x | — | | x | — | x | + | x | — | o | o | — | | — | | |
| " HYDROSULFITE | | | | | | | x | | x | — | x | | o | o | o | — | x | — | x | x | | | | | | | | | | x | x | | x | | x | | |
| " HYPOCHLORITE, NaOCl | o | o | — | — | — | — | — | — | x | o | o | o | o | o | o | o | — | o | + | o | — | | — | x | x | | x | | o | x | | | x | | x | | |
| " HYPOSULFATE | — | | x | x | | | x | | x | o | o | | x | | | | | | x | x | | | | o | | | | | | x | | | | | x | | |
| " NITRATE, $NaNO_3$ | x | + | x | x | x | — | x | x | x | + | x | o | + | + | x | o | + | o | x | o | x | | — | — | x | | | | x | x | x | x | x | | x | | |
| " PEROXIDE, $Na_2O_2$ | — | | x | x | + | | x | | x | — | — | | x | + | + | + | x | + | x | x | | | o | o | | | | | | — | | | | | x | | |
| " PHOSPHATE, (Tri) $Na_3PO_4$ | x | | x | x | + | | x | | x | — | o | | + | + | | x | x | x | x | x | | | x | x | | | x | | | — | — | | x | x | x | | |
| " SILICATE, $Na_2SiO_3$ | x | | x | x | + | x | x | | x | — | — | | + | x | + | x | x | x | x | x | | | x | | | | | | | — | | | | | x | x | |
| " SULFATE, $Na_2SO_4$ | x | x | — | — | x | x | x | x | x | x | x | — | + | x | x | x | x | x | x | x | — | | — | x | | | x | | x | x | | | x | | x | | |
| " SULFIDE, $Na_2S$ | + | x | — | x | x | x | x | x | x | o | o | — | + | + | + | x | x | x | x | x | x | | — | o | | | x | | x | — | — | | x | x | x | | |
| " SULFITE, $Na_2SO_3$ | + | x | — | — | — | x | x | x | o | — | — | x | — | — | — | o | x | o | x | x | x | | — | | | | x | | x | x | x | | x | | x | | |
| STANNIC CHLORIDE, $SnCl_4$ | o | | o | o | o | | x | — | x | o | o | x | o | o | o | o | x | o | — | o | | | x | | | | x | | | x | | | | | x | | |
| STANNOUS CHLORIDE, $SnCl_2$ | o | | o | — | | | x | — | x | o | o | | o | o | o | x | x | x | x | x | | x | x | | | | x | | | x | | | | | x | | |
| STEARIC ACID, $CH_3(CH_2)_{16}COOH$ | — | — | x | x | x | — | x | x | x | — | — | — | x | x | x | x | x | x | x | x | x | | x | x | | | x | | x | x | | | x | | x | | |
| SULFUR, Molten, S | — | x | — | — | — | — | x | x | x | o | x | o | — | — | x | o | o | o | x | — | o | | x | o | | | x | + | — | x | | | — | | — | | |
| SULFUR CHLORIDE, (Wet), $S_2Cl_2$ | — | | o | — | | x | — | — | x | o | o | | — | — | | | | | x | | | | | o | | | | | | x | | | | | x | | |
| " DIOXIDE (Dry), $SO_2$ | x | x | x | x | — | x | x | x | x | x | x | x | o | o | o | o | x | o | x | — | x | | x | o | | x | | | x | x | x | | x | | x | | |
| " DIOXIDE (Wet) | o | | — | x | | | x | | — | o | | x | o | o | o | o | x | o | x | | | | x | | | | + | | x | x | x | | | | x | | |
| " TRIOXIDE, $SO_3$ | x | | x | x | | x | x | x | — | — | x | | o | o | o | | | | x | | | | o | o | | | | | | x | | | x | | x | | |
| SULFURIC ACID (Fuming to 98%) | — | — | o | o | | — | x | x | o | o | — | o | o | o | o | x | o | x | x | x | | o | o | o | | | o | | o | x | x | x | | | | | |
| " " (Hot Conc.) $H_2SO_4$ | o | | o | o | | | + | | x | o | o | — | o | o | o | o | o | x | + | + | o | o | — | | | | o | | | x | | | | | | | |
| " " (Cold Conc.) | + | + | x | x | — | | x | x | x | o | — | x | + | | | x | x | x | x | x | — | o | — | | x | | o | — | o | x | | | | | x | | |
| " " (75%-95%) | + | — | o | o | — | — | x | x | x | o | o | x | o | o | — | x | x | — | x | x | — | — | — | o | x | | o | | x | x | | | x | | x | | |
| " " (10%-75%) | o | o | o | o | — | — | x | x | x | o | o | x | — | o | — | x | x | x | x | x | — | x | — | x | x | | — | x | x | x | x | | x | | x | | |
| " (<10%) | o | o | o | [illegible] | — | — | — | x | x | o | — | x | — | — | — | x | x | x | x | x | — | x | x | x | x | | x | | x | x | x | | x | | x | | |
| SU[illegible]ROUS ACID, $H_2SO_3$ | o | o | — | x | — | o | x | x | o | o | — | — | o | o | o | o | + | + | x | x | x | x | x | x | | | x | | x | x | x | x | x | | x | | |
| SULFURYL CHLORIDE, $SO_2Cl_2$ | | | | | | | + | | x | | | | | | | | | | + | + | | | x | | | | | | | x | x | | x | | x | | |
| TANNIC ACID | — | | x | x | | | x | x | x | — | x | | + | + | + | x | x | x | x | x | | x | x | x | | | x | | x | x | | | x | | x | x | |
| TARTARIC ACID, $(CHOHCOOH)_2$ | — | | x | x | | | x | x | x | — | o | x | + | + | | x | x | x | x | x | | x | x | x | | | x | + | x | x | x | | x | | x | | |
| TOLUENE, $CH_3C_6H_5$ | x | | x | | | | x | | x | x | x | x | x | | | | | | x | x | | x | | | | | | | x | x | x | | x | | x | | |
| TRICHLORETHYLENE, Dry, $Cl_2C.CHCl$ | — | — | — | x | — | — | x | x | x | — | — | | x | x | x | x | x | x | x | x | x | | x | | | x | x | | x | x | | | x | | x | | |
| WATER, Fresh $H_2O$ | x | | x | x | | | x | | x | x | x | | x | x | | | | | x | x | | | x | x | | | | x | x | x | x | | x | x | x | x | x |
| WATER, Distilled Lab. | o | | x | x | | o | x | | x | x | o | | o | - | | | | | x | x | | | | x | | | | | | + | | | | | x | | |
| ZINC CHLORIDE, $ZnCl_2$ | o | o | o | — | o | — | x | x | x | o | o | — | + | + | | + | + | + | x | x | | x | x | x | | | x | | x | x | | x | | | x | x | |

RUBBERS | THERMOPLASTICS | THERMOSETTING PLASTICS | WOODS

| HARD RUBBER (Natural) | SOFT RUBBER (Natural) | NEOPRENE | BUTADIENE DERIVATIVES | NITRILE Rubber (Chemigum) | VITON | ASPHALTIC, BITUMASTIC | CELLULOSE ACETATE | CELLULOSE ACETATEBUTYRATE | ETHYL CELLULOSE (Ethocel) | CELLULOSE NITRATE | ACRYLIC (Lucite, Plexiglas) | COUMARONE RESINS | POLYETHYLENE | POLYVINYL CHLORIDE, Rigid or Unplast. | TYGON (P. V. C. & Copolymers) | SARAN (Vinyl chloride, vinyldene chloride) | KEL-F (Polytrifluorochloroethylene) | TEFLON (Polytetrafluoroethylene) | USCOLITE CP -(styrene-acrylonitrile-butadiene) | PENTON (Chlorinated Polyether) | SHELLAC COMPOUNDS | ORGANIC POLYSULFIDES | POLYSTYRENE (Styron) | VINYLIDENE CHLORIDES | VINYL CHLORIDE ACETATES | CAST PHENOL FORMALDEHYDE | HAVEG 41 (Mod Phenolic w. asbestos) | HERESITE (phenol formaldehyde) | MOLDED PHENOLFORMALD. (Durez) | PHENOL FURFURAL PLASTICS | UREA FORMALDEHYDE | CASEIN PLASTICS | EPOXY RESINS | FURANE RESINS Haveg 61, Duralon | SILICONE RESINS | PERMANITE (Furan, Glass Fiber) | NYLON (Adipic Acid—Hexameth. Diamine) | DURCON 6 (Modif. Epoxy) | CYPRESS | FIR | MAPLE | OAK | PINE | REDWOOD |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| o | | - | | | x | o | | | | | | | | o | | - | x | x | | x | | | | | | | | | | | | | x | | | | x | x | | | | | | |
| - | - | - | - | | | o | o | o | | | | | | o | | o | x | x | | x | | | | - | | - | | | - | - | | | x | | | | | x | x | | | | | x |
| o | o | o | o | | - | o | o | | | | o | | - | o | | - | x | x | | + | | | o | o | o | | x | | | | | | x | | | x | x | x | | | | | | |
| - | - | - | x | x | x | x | x | x | | x | x | | o | x | - | | x | x | x | x | | | x | - | - | - | x | | - | - | | | x | x | | | x | x | | | | x | | |
| | | | | | - | | | | | | | | | o | | o | | x | | x | | | | | | | | | | | | | | | | | x | x | | | | | | |
| o | o | o | x | | x | o | x | x | | x | | | o | - | x | x | x | x | x | x | | | o | x | - | - | x | x | x | - | x | | x | x | - | | x | x | x | x | x | x | x | - |
| x | x | - | x | | x | x | | | - | x | | | x | x | x | - | x | x | x | x | x | | x | x | x | x | x | x | x | x | x | | x | x | | | o | +• | | | | | | |
| o | | x | | | x | x | | | | | | | | x | x | x | x | x | x | x | | | | | | | x | | | | | | x | x | | x | | x | | | | | | |
| x | x | x | x | | x | x | | | - | x | | | | x | x | x | x | x | x | x | x | | x | x | x | x | x | x | x | x | x | | x | x | | x | x | x | | | | | | |
| x | x | x | x | | x | x | | | | x | | | | x | | - | x | x | x | x | x | | x | x | x | x | x | | x | x | x | | x | x | | | o | x | | | | | | |
| x | x | x | x | x | x | x | | | | x | | | x | x | x | - | x | x | x | x | x | | x | x | x | x | x | x | x | x | x | | x | x | | x | o | + | | | | | | |
| | | | | | | o | | | | | | | - | - | | | | - | o | o | | | | | | | o | | | | | | o | o | | | o | | | | | | | |
| - | - | - | x | | o | x | o | x | | x | x | x | x | - | - | x | x | x | - | x | x | | | x | x | | x | x | | | x | x | x | | | | x | x | | | | | | |
| - | o | - | x | x | + | o | | | - | | o | | x | - | - | x | x | x | - | x | - | | x | x | x | x | x | x | x | x | x | x | x | x | | | o | x | | | | | | |
| | | | | | | | | x | | | | | o | x | | | x | x | | | | | - | x | | | x | | | | | | | | | | | +• | | | | | | |
| | | | | | + | | | | | | | | | x | x | | x | x | | x | | | | | | | | | | | | | | | | | x | x | | | | | | |
| - | o | - | x | | x | o | x | x | - | x | x | | | - | - | x | x | x | - | x | | | - | - | - | - | x | | - | - | | x | x | x | | x | x | x | | | | | | |
| x | x | - | - | x | x | x | x | x | | x | x | | x | x | x | x | x | x | x | x | | | x | - | x | - | | | - | | | | x | | | x | x | x | | | | | | |
| - | x | - | x | | + | o | x | | | | | | x | x | - | x | x | x | - | x | x | x | x | x | x | x | x | | x | x | | | x | - | | x | o | x | | | | | | |
| x | x | - | x | o | - | x | o | o | o | o | x | x | x | x | x | x | x | x | x | x | x | o | o | o | | - | x | x | - | - | | | x | - | - | x | o | x | o | - | o | o | o | o |
| x | x | - | x | - | | x | x | x | - | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | - | - | | x | x | | - | x | o | x | x | x | x | x | x | - |
| | | | | | | o | | | | | | | | x | | | x | x | x | | | | | | | | | | | | | | x | | | | | x | | | | | | |
| | | | | | | x | | | | | | | | x | | | x | x | - | | | | | | | | | | | | | | x | | | | | x | | | | | | |
| - | | - | | | | | | | | | | | | x | | x | | x | | - | | | | | | | | | | | | | x | | | | | x | | | | | | |
| o | o | o | | o | | | | | | | x | | x | - | o | o | x | x | | + | | | x | | | - | o | o | - | - | | - | x | o | o | - | | x | | | | | | |
| x | x | - | | x | + | o | | | | | x | | x | - | - | - | x | x | x | x | | | x | | | | o | - | x | x | | | x | x | o | x | o | x | | | | | | |
| | | x | | | | | | | | | | | | | | - | | x | | x | | | | | | | | | | | | | | | | x | | x | | | | | | |
| o | o | x | x | | | | | - | - | x | x | | | - | | | x | x | | | - | - | x | - | - | - | x | x | - | - | x | x | | | | | | +• | | | | | | |
| o | o | | o | | | | x | - | - | | - | | | | | o | + | x | | | o | o | o | | - | - | x | x | - | - | | x | | | | | | x | | | | | | |
| | | | | | x | x | | | | | | | | | | | x | x | | x | | | | | | | | | | | | | x | | | | x | x | | | | | | |
| - | - | o | x | | | - | - | | | | x | | | x | - | | x | x | - | + | | o | o | o | | - | x | x | x | - | | | | | | | o | x | | | | | | |
| - | - | o | x | x | | - | - | | | | x | | x | x | x | x | x | x | x | | | o | o | - | | x | x | x | - | - | | | o | o | | | o | x | | | | | | |
| x | x | | x | | x | x | | | | | | | | x | | | x | x | x | x | | | - | x | | - | x | | x | - | | | x | x | | x | o | x | | | | | | |
| | | | | | x | | | | | | | | | x | | | x | x | | x | | | | | | | | | | | | | | | | | | x | | | | | | |
| - | - | o | - | | x | o | - | | | | | | - | o | | - | x | x | | | | | | | | | o | x | | | | | o | o | | o | o | x | | | | | | |
| | | | | | - | | | | | | | | | | | | | x | | | | | | | | | | | | | | | | | | | x | x | | | | | | |
| o | o | o | | | x | | | | | | x | | | x | | x | x | x | x | x | | | | | | | | | | | | | | | | | x | x | | | | | | |
| o | | o | | | o | o | | o | | | - | | o | o | o | o | + | x | o | + | | | o | - | | | x | | | | | | - | | | x | x | x | | | | | | |
| x | - | x | | | + | | - | x | - | | | | x | x | x | x | x | x | - | x | | | x | | | | x | x | | | | | x | x | | x | - | x | | | | | | x |
| | | | | | | x | | | | | | | | x | | | x | x | x | x | | | | | | | x | | | | | | x | x | | x | | x | | | | | | |
| x | x | x | x | | x | x | x | x | | x | | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | | x | x | | | x | x | | | | | | |
| x | | x | | | x | | | | | | | | | x | | | x | x | x | x | | | | | | | | | | | | | | | | | x | x | | | | | | |
| x | x | x | x | | x | x | x | x | | x | | x | x | x | | x | x | x | x | x | x | x | x | x | x | x | | | x | x | x | | x | x | | | x | x | | | | | | |
| | | x | | | + | o | | | | | | | | - | | - | x | x | x | x | | | | | | | | | | | | | x | | | | x | +• | | | | | | |
| x | x | x | x | | - | | | | | | | | | x | | | x | x | | x | | | x | | | | | | | | | | | | | | x | x | | | | | | |
| x | | - | | | x | x | x | | | | | | | - | x | x | x | x | x | x | | | | | | | | | | | | | x | | | | | x | | | | | | |
| | | | | | x | x | | | | | | | | - | | x | x | x | | x | | | | | | | | | | | | | x | | | | x | x | | | | | | |
| - | x | = | | x | - | x | | | | | o | | - | x | x | x | x | x | x | x | | | x | | | - | | | x | x | | | x | x | | | x | x | | | | | | |
| x | x | | | | | | | | | | | | | x | | | x | x | x | x | | | x | | | | | | x | x | | | x | | | x | | x | | | | | | |
| o | | o | | | | o | | | | | | | | o | | - | x | x | | x | | | | | | | | | | | | | x | | | | x | x | | | | | | |
| - | o | x | x | | + | o | | | | x | x | | | x | | | x | x | | x | | | - | - | - | - | | | - | - | | x | x | | | | x | x | | | | | | |
| x | | x | | | x | x | | | | | | | x | x | x | x | x | x | x | x | | | | | | | | | | | | | x | x | | | x | | | | | | | |
| x | x | x | | | x | x | | | | | | | x | x | x | x | x | x | x | x | | | x | | | | | | x | x | | | x | x | | | x | x | | | | | | |
| - | - | | | | | o | | | | | | | | | o | | x | x | | | | | | | | | o | x | | | | | o | | | | | x• | | | | | | |
| - | - | | | | | o | | | | | | | | | - | | x | x | | | | | | | | | - | x | | | | | | | | | | x | | | | | | |
| - | - | | | | | o | | | | | | | | | - | | x | x | | | | | | | | | - | x | | | | | | | | | | x | | | | | | |
| | | | | | | o | | | | | | | | | - | | x | x | | | | | | | | | - | x | | | | | | | | | | +• | | | | | | |
| o | o | o | o | o | o | | | | o | | | | o | o | o | - | x | x | o | o | | | o | o | o | o | o | x | o | o | | | o | o | - | o | o | x | | | | | | |
| - | o | o | x | o | - | - | | | - | | x | | - | x | - | - | x | x | x | + | | | x | - | - | - | - | x | - | - | | | o | | - | o | | x | | | | | | |
| o | o | o | | | o | o | | | | | | | - | o | | - | x | x | | + | | | | | | | | | | | | | - | | | | | x | | | | | | |
| - | o | o | x | | | x | | | | | | | | | | | x | x | | x | | x | | | | | | | | | | | | | | | | x | | | | | | |
| o | o | o | x | | + | o | x | x | | x | | | o | x | x | x | x | x | x | x | | | x | x | x | - | x | x | x | - | x | | x | | | | x | x | x | x | x | x | | - |
| o | x | - | x | | - | x | | | | | | | x | x | x | x | x | x | x | x | | | x | | | x | x | x | x | x | | | x | x | | x | x | x | | | | | | |
| - | o | - | x | | x | o | o | o | - | | x | | | - | - | - | x | x | o | + | | | o | | | | - | x | - | - | | | | x | | x | o | x | | | | | | |
| - | - | | | | | - | | | | | | | | x | - | - | x | x | o | | | | o | | | | | | x | x | | | - | x | | | | x | | | | | | |
| x | x | x | x | | | x | x | | o | | | | x | x | x | | x | x | x | | | | | x | x | | x | x | | | | | | - | - | - | - | x | | | | | | |
| | | - | - | x | + | | | | | | | | - | x | x | | x | x | x | | | | | | | | x | x | o | o | | | x | x | o | | | x | | | | | | |

| | |
|---|---|
| **RUBBERS** | |
| | HARD RUBBER (Natural) |
| | SOFT RUBBER (Natural) |
| | NEOPRENE |
| | BUTADIENE DERIVATIVES |
| | NITRILE Rubber (Chemigum) |
| | VITON |
| **THERMOPLASTICS** | |
| | ASPHALTIC, BITUMASTIC |
| | CELLULOSE ACETATE |
| | CELLULOSE ACETATEBUTYRATE |
| | ETHYL CELLULOSE (Ethocel) |
| | CELLULOSE NITRATE |
| | ACRYLIC (Lucite, Plexiglas) |
| | COUMARONE RESINS |
| | POLYETHYLENE |
| | POLYVINYL CHLORIDE, Rigid or Unplast. |
| | TYGON (P. V. C. & Copolymers) |
| | SARAN (Vinyl chloride, vinyldene chloride) |
| | KEL-F (Polytrifluorochloroethylene |
| | TEFLON (Polytetrafluoroethylene ) |
| | USCOLITE CP -( styrene -acrylonitrile-butadiene ) |
| | PENTON (Chlorinated Polyether) |
| **THERMOSETTING PLASTICS** | |
| | SHELLAC COMPOUNDS |
| | ORGANIC POLYSULFIDES |
| | POLYSTYRENE (Styron) |
| | VINYLIDENE CHLORIDES |
| | VINYL CHLORIDE ACETATES |
| | CAST PHENOL FORMALDEHYDE |
| | HAVEG 41 (Mod Phenolic w. asbestos) |
| | HERESITE (phenol formaldehyde) |
| | MOLDED PHENOLFORMALD. (Durez) |
| | PHENOL FURFURAL PLASTICS |
| | UREA FORMALDEHYDE |
| | CASEIN PLASTICS |
| | EPOXY RESINS |
| | FURANE RESINS Haveg 61, Duralon |
| | SILICONE RESINS |
| | PERMANITE (Furan, Glass Fiber) |
| | NYLON (Adipic Acid—Hexameth. Diamine) |
| | DURCON 6 (Modif. Epoxy) |
| **WOODS** | |
| | CYPRESS |
| | FIR |
| | MAPLE |
| | OAK |
| | PINE |
| | REDWOOD |

# APPENDIX I

## FIRST TIME CUSTOMER'S INSTRUCTIONS FOR SAMPLING/TRANSPORTING REPRESENTATIVE SAMPLES

## SAMPLE COLLECTION

COLLECT, PACKAGE AND LABEL FOR SHIPMENT AND ANALYSIS ONE LITER (ABOUT ONE QUART) AND ONE EXTRACTION VIAL REPRESENTATIVE SAMPLE OF THE WASTE TO BE CONSIDERED. THIS SAMPLE MUST BE COLLECTED IN ACCORDANCE WITH "TEST METHODS FOR THE EVALUATION OF SOLID WASTE, PHYSICAL/CHEMICAL METHODS", SW846, USEPA, OFFICE OF SOLID WASTE, WASHINGTON, DC, 20460. FILL TO APPROXIMATELY 50-75% OF CAPACITY TO ALLOW FOR EXPANSION DURING TRANSPORTATION. AN IDENTIFICATION LABEL MUST BE ATTACHED TO THE SAMPLE AND CONTAIN: GENERATOR NAME, WASTE NAME, GENERATOR'S EPA I.D. NUMBER, AND SAMPLING DATE.

IF THE WASTE IS A HAZARDOUS MATERIAL, THE SAMPLE MUST BE PACKAGED AND SHIPPED IN ACCORDANCE WITH USDOT REGULATIONS FOR THE WASTE MATERIAL (49 CFR). IF SHIPPING VIA UNITED PARCEL, CONSULT ITS "GUIDE FOR SHIPPING HAZARDOUS MATERIALS VIA UPS". ANY WASTE SAMPLE NOT SHIPPED IN CONFORMANCE WITH THE SPECIFIED INSTRUCTIONS MAY BE DISPOSED OF IMMEDIATELY.

# DEFINITIONS: GENERATOR CERTIFICATION

THE FOLLOWING INFORMATION IS REQUIRED FOR ALL WASTE TO BE CONSIDERED FOR TRANSPORTATION AND STORAGE. IT IS USED TO DETERMINE THAT THE WASTE MAY BE TRANSPORTED AND STORED IN A LEGAL, SAFE AND ENVIRONMENTALLY SOUND MANNER. THIS INFORMATION WILL BE MAINTAINED IN STRICT CONFIDENCE. ANSWERS MUST BE MADE TO ALL QUESTIONS AND MUST BE COMPLETED IN INK. RESPONSES OF "NONE" SHOULD BE MADE IF APPROPRIATE. MOST ITEMS REQUIRED ARE SELF-EXPLANATORY. OTHER ITEMS NEED DEFINITION OR INSTRUCTION AS FOLLOWS:

## I - GENERAL INFORMATION

**USEPA ID** - For the facility generating the waste. **STATE ID** - If applicable.

**TECHNICAL CONTACT** - A person who could give additional information about the waste if needed.

**WASTE DESCRIPTION** - A name which will be generally descriptive of its major chemical composition.

## II - PHYSICAL CHARACTERISTICS OF WASTE

ODOR - If present, describe as well as possible (e.g., solvent, acrid, sweet, etc).

**PHYSICAL STATE** - Check as many as apply.

**FREE LIQUID** - As packaged for shipment, estimate percent of volume.

pH - Indicate for liquid or liquid portions of waste.

**SPECIFIC GRAVITY** - The weight of the waste in terms of the weight of an equal volume of water.

**FLASH POINT** - A value attained using the appropriate testing method as set forth in 40 CFR 261.

## III - OTHER COMPONENTS

If the data for this PART (or any other PART) were obtained form a laboratory analysis of the waste, please attach the analytical method used.

## IV - SHIPPING INFORMATION

**DOT HAZARDOUS MATERIAL** - Is the waste a US DOT hazardous material as defined in 49 CFR 172.101? If YES, enter the **SHIPPING NAME, HAZARD CLASS, DOT ID NUMBER,** and **R.Q.** (Reportable Quantity) as defined in 40 CFR 302. To assist you, we recommend the following shipping names for the recyclable products: See attachment A.

**ANTICIPATED VOLUME** - Gallons and cubic yards are emphasized as units of volume measurement. If another unit of measure must be used, indicate that unit.

**FREQUENCY** - The period during which the above ANTICIPATED VOLUME will be generated.

## V - HAZARDOUS CHARACTERISTICS [GENERAL INFORMATION]

**REACTIVITY - PYROPHORIC:** will ignite spontaneously in air at below 130`F (54.4`C). **SHOCK SENSITIVE;** normally unstable and readily undergoes violent change without detonating. **EXPLOSIVE;** capable of detonation or explosive reaction if subjected to a strong initiating source or if heated under confinement; or a forbidden explosive as defined in 49 CFR 173.53, or a Class B explosive as defined in 49 CFR 173.88. **WATER REACTIVE;** reacts violently with water, or forms potentially explosive mixtures with water, or when mixed with water forms toxic gases, vapors, or fumes in a quantity sufficient to present a danger to human health or the environment. **OTHER;** indications of other reactive characteristics must be included (e.g., auto-polymerization, peroxide-forming, etc).

**OTHER HAZARDOUS CHARACTERISTICS** - Complete if the waste contains or has ever contained any component which is considered to be any of the following. **RADIOACTIVE;** emits alpha, beta or gamma radiation above normal background levels. **ETIOLOGICAL;** a viable micro-organism or its toxin which causes or may cause human disease.

**PESTICIDE MANUFACTURING WASTE;** the waste was produced from a pesticide or herbicide manufacturing process; or, the waste is or contains waste pesticide or herbicide. **OTHER;** list any known hazardous characteristics and elaborate in PART A (e.g., carcino-genic, teratogenic, mutagenic).

**USEPA HAZARDOUS WASTE** - As defined according to RCRA in 40 CFR 261. If yes, enter applicable **USEPA CODES.**

**STATE HAZARDOUS MATERIAL** - Indicate whether the waste is regulated as a hazardous waste in your state. If yes, then complete the **STATE CODES.**

## SIGNATURE

The generator of the waste or the generator's agent must sign and date the Generator's Certification.

Waste analysis Plan

To Our Customers:

To better serve you, our customer, in the area of recycling responsibility involving our recycled products, MacDermid Inc. (MacDermid) is asking for your cooperation. We are updating our Waste Generator Certifications as part of a periodic reassessment of materials received by MacDermid for reclamation.

To protect you and MacDermid with the tightening of Federal and state law and to maintain proper record keeping under RCRA regulations under 40CFR Section 262.11 Hazardous Waste Determination, CFR40 Section 264.12 Required Notices and CFR40 Section 264.13 General Waste Analysis, we are implementing the following program:

1. Written Agreement. A written Agreement between you and MacDermid is enclosed showing warranties, indemnifications, etc. Please read this carefully and sign it as indicated.

2. Return Parameters. Attached to the Agreement is our schedule showing return parameters for recycling as well as our Generator Profile Sheet which should be completed based on the given parameters. Although some of our customers may have already completed these sheets, we would appreciate your completing them again as an update.

3. Customer Waste Analysis. A one quart sample is requested for each type of recyclable material from our customer. This will be used as a "fingerprint" representation of your return material. Waste Analysis will be kept on file as per RCRA regulations.

If you have any questions, please contact your MacDermid sales representative.

Sincerely,

Michael A. Pfaff
Vice President Marketing

MAP:smb

Enclosure

# AGREEMENT

This Agreement, upon receipt by MacDermid Incorporated (MacDermid) Waterbury, CT, of your acceptance as evidenced by your signature, shall be the Agreement between MacDermid and _____ _____ (Company) with respect to the following provisions set below:

1. **WASTE** - This term as used herein refers to hazardous or non-hazardous material as authorized by MacDermid for recycling. See attached Schedule ____.

2. **MACDERMID WARRANTY.** MacDermid shall obtain all permits, licenses and other forms of documentation required in order to comply with all existing laws, ordinances and regulations of the United States and of any state, county, township or municipal sub-division thereof, or other governmental agency which are applicable to the removal of Waste.

3. **MACDERMID INDEMNIFICATION** - Following loading and departure from Company's plant, if MacDermid provides transportation, or following delivery F.O.B. MacDermid's facility, if Company provides transportation, except as provided in Company Indemnification below, Company shall be relieved of responsibility for and MacDermid shall become solely responsible for any and all loss, damage or injury to persons or property and MacDermid shall indemnify and hold harmless Company from any and all liability, damages, costs, claims, demands, and expenses of whatever type or nature, including, but not limited to, pollution or other damage, which shall be caused by or arise out of the Waste.

4. **COMPANY WARRANTY** - Company hereby represents and warrants that the Waste loaded and transported under this Agreement shall be the Waste defined in Schedule ____, attached hereto and made a part hereof, and has been thoroughly characterized on the Generator Certification submitted to and approved by MacDermid. Company agrees to prepare and execute a MacDermid Generator Certification for each type of Waste, including any Waste with process changes that could significantly alter its composition and/or chemical/physical properties. Company further represents and warrants that such Waste shall be prepared for shipment and packaged in containers specified by MacDermid, in accordance with applicable regulations of the United States Department of Transportation, Environmental Protection Agency and/or any federal, state, and/or local agency having jurisdiction. Company agrees to be responsible for properly loading packaged Waste on MacDermid's trailers if MacDermid is providing transportation. (See Schedule ____.)

   Failure to comply with this provision will affect MacDermid Indemnification.

5. **COMPANY INDEMNIFICATION** - Company shall be solely responsible for and indemnify and hold harmless MacDermid against any and all liability, damages, costs, claims, demands, and expenses of any type or nature whatsoever resulting from the acts and/or omissions of Company and/or its agents, employees, contractors, until departure of Waste from Company's plant, if MacDermid provides transportation or, if Company provides transportation, until delivery F.O.B. MacDermid's facility.

   In addition to the above, Company agrees to indemnify and hold harmless MacDermid from any and all loss, damages, including damage to equipment, claims, suits, or costs which shall arise out of any injury to any person or persons or damage to any property (including the person or property of Company or its employees) caused by or resulting in any way from Company's failure to comply with Company's Warranty concerning the Waste.

6. **TITLE** - Following proper loading and departure from Company's plant, if MacDermid provides transportation or, following delivery F.O.B. MacDermid's facility, if Company provides transportation, MacDermid shall take title, responsibility and risk of loss. <u>However</u>, title, responsibility, risk of loss and all other incidents of ownership to <u>non-conforming</u> Waste as determined solely by MacDermid, shall not be deemed to have transferred to MacDermid.

7. **MACDERMID REJECTION** - Company agrees that MacDermid, upon notice to Company, has the absolute and unqualified right to reject any shipment of Waste not in conformity with Schedule ____ supplied to Company and approved by MacDermid.

   Further, Company agrees that MacDermid reserves the right to reject any shipment of Waste if acceptance by MacDermid of said shipment of Waste would result in violation of any law, statute, regulation, ordinance, permit, license or order of the United States or of any state, county, municipality or other governmental agency, department or commission.

8. **PAYMENT** - MacDermid shall invoice Company for the transportation and waste disposal of Waste at the rates and terms set forth by Schedule ____ attached hereto and made part hereof. MacDermid shall add an amount equal to one and one-half percent (1-1/2%) or the maximum legally permissible amount to invoices which remain unpaid for more than thirty (30) days after date of invoice. Additional like charges will be made for each subsequent thirty (30) day period that such invoice remains unpaid.

   **PAYMENT - Rejected Material.** In addition to the provisions of Company Indemnification above, the Company shall, upon failure to comply with Company Warranty regarding the Waste, as determined solely by MacDermid, pay a fee to MacDermid as stated in Schedule ____.

9. **TERM** - MacDermid or Company may terminate this Agreement at any time upon thirty (30) days prior written notice.

10. **EFFECT** - This agreement shall be binding upon and inure to the benefit of MacDermid, its employees, agents, successors and assigns, and Company, its employees, agents, successors and assigns.

11. **APPLICABLE LAW** - This Agreement shall be governed by and construed in accordance with the laws of Connecticut.

12. **NOTICES** - Any notice required or permitted to be given hereunder shall be given when adequately deposited in the U.S. Mail, postage prepaid.

13. **CONSTRUCTION** - Captions are included herein for convenience and for reference only and shall not be considered in construing this Agreement. The Agreement is for the sole and exclusive benefit of MacDermid, Company and their respective employees, agents, successors and assigns. Nothing contained herein shall constitute an admission or a waiver of any defense of any of them in any proceeding or action brought by any other person or governmental agency. There are no third party beneficiaries of this Agreement except as herein stated.

14. **FORCE MAJEURE** - Delays or failure of either party in the performance of its required obligations shall be excused if caused by circumstances, said circumstances unrelated to the Waste, beyond the reasonable control of the party affected, including, but not limited to, acts of God, strikes, fire, flood, windstorm, explosion, riot, war, sabotage, action or request of governmental authority, accident, inability to obtain material, equipment or transportation, provided that a prompt notice of such delay is given and the parties shall be diligent in attempting to remove such cause(s).

All previous representations, including, but not limited to, proposal(s), purchase order(s) and/or invoice(s), either written or oral, are hereby annulled and superseded. No modification of this Agreement shall be effective unless in writing and executed by MacDermid and Company.

ACCEPTED this ____ day of _____, 198_.

_____ (Company)

Address:

Customer EPA ID No. _____

MACDERMID INCORPORATED

BY: _____

Address:

*This information may be made available to State or Federal Environmental Enforcement Agencies if requested by those agencies.

5/90

# MACDERMID INCORPORATED
## Waterbury, Connecticut 06702
## (203) 575-5700
## GENERATOR PROFILE CERTIFICATION

For Schedule: _____

MACDERMID INCORPORATED
Waterbury, Connecticut
EPA NO. CTD001164599
Status: Storage Facility

MACDERMID INCORPORATED
Ferndale, Michigan
EPA NO. MID005338371
Status: Storage Facility

This Certification is to be completed by the Generator for each type of recyclable material shipped to Waterbury, CT or Ferndale, MI. APPROVAL MUST BE GIVEN PRIOR TO FIRST SHIPMENT.

A. Generator Name: _____
Address: _____
Technical Contact: _____
Telephone No.: _____
Facility EPA ID No.: _____

B. Waste Description: _____
_____
EPA Waste No.: _____
CT Regulated Waste No.: _____
DOT Shipping Name: _____
_____

C. Typical Characteristics of Waste

Color: _____
Odor: _____
Physical State @ 70 F: _____
_____

Sp. Gravity: _____
Flash Point: _____
pH: _____
Layers: _____

D. Check Items Suspected to be present

| | No | Yes | | No | Yes |
|---|---|---|---|---|---|
| Antimony | ___ | ___ | Selenium | ___ | ___ |
| Arsenic | ___ | ___ | Silver | ___ | ___ |
| Beryllium | ___ | ___ | Thallium | ___ | ___ |
| Cadmium | ___ | ___ | Phenols | ___ | ___ |
| Lead | ___ | ___ | PCB's | ___ | ___ |
| Mercury | ___ | ___ | Dioxins | ___ | ___ |
| Herbicides | ___ | ___ | Pesticides | ___ | ___ |
| Barium | ___ | ___ | Chromium-Hex | ___ | ___ |

E. Other Components

| | No | Yes |
|---|---|---|
| Copper | ___ | ___ |
| Iron | ___ | ___ |
| Nickel | ___ | ___ |
| Tin | ___ | ___ |
| Zinc | ___ | ___ |
| Cyanide | ___ | ___ |
| Fluoride | ___ | ___ |

F. Solvents
No ☐
Yes ☐

Name:
_____
_____
_____
_____

G. Typical Chemical Composition
_____%
_____%
_____%
_____%

H. Other Contaminants
_____%
_____%
_____%
_____%

I. Anticipated Volume

Bulk: //_____ /mo. _____/yr.
Drums:// _____/mo. _____/yr.

I certify that all information submitted in this and any attached documents is complete, accurate, and that all known or suspected hazards have been disclosed.

_____ _____ _____
Authorized Signature Title Date

(R-5/10/90)

# APPENDIX J

## REACTIVITY GROUP NUMBERS FOR CHEMICAL CONSTITUENTS

# APPENDICES

## APPENDIX 1. LIST OF CHEMICAL SUBSTANCES

This appendix lists the chemical substances that may be found in hazardous wastestreams. The list is not inclusive but represents the data compiled through a literature survey and examination of hazardous waste management practices.

The list consists of three columns. The first column lists the chemical or trade names in alphabetical order. The trade names are denoted by asterisks (*). The second column list the synonyms or common names of the chemical substances when available. The third column lists the reactivity group numbers (RGN) assigned to the substances as derived in Appendix 2. A compound may be assigned more than one RGN.

This appendix is used to obtain the RGN of waste constituents when known specifically. The RGN is used to determine the compatibility of the combinations of wastes according to the compatibility method in Section 4.

The chemical substances listed were compiled from several sources. The list of Hazardous Wastes and Hazardous Materials and List of Extremely Hazardous Wastes and Extremely Hazardous Materials in California's Industrial Waste Law of 1972 (Ref. 44) served as the starting reference. The primary sources of information consisted of published reports (Ref. 1, 7, 12, 13, 14, 32, and 52) identifying the hazardous chemical substances in industrial wastestreams. Additional chemical entries were abstracted from the California Waste Haulers Record files (Ref. 10), California Extremely Hazardous Waste Disposal Permit files (Ref. 8), and the TRW Systems' report on recommended methods of reduction, neutralization, recovery, and disposal of hazardous wastes (Ref. 77).

| Names | Synonyms | RGN |
|---|---|---|
| Abate* | | 32 |
| Acenaphthene | | 16 |
| Acetamide | | 6 |
| Acetaldehyde | | 5 |
| Acetic acid | | 3 |
| Acetic anhydride | | 107 |
| Acetone | Dimethyl ketone | 19 |
| Acetone cyanohydrin | Hydroxyisobutyronitrile | 4, 26 |
| Acetonitrile | Methyl cyanide | 26 |
| Acetophenone | | 19 |
| Acetoxybutane | Butyl acetate | 13 |
| Acetoxypentane | Amyl acetate | 13 |
| Acetyl acetone | | 19 |

| Names | Synonyms | RGN |
|---|---|---|
| Acetyl azide | | 102 |
| Acetyl benzoyl peroxide | | 30 |
| Acetyl bromide | | 17, 107 |
| Acetyl chloride | | 17, 107 |
| Acetylene | | 28 |
| Acetyl nitrate | | 27, 102 |
| Acetyl peroxide | | 30 |
| Acrolein | Aqualin | 5, 103 |
| Acrylic acid | | 3, 103 |
| Acrylonitrile | | 26, 103 |
| Adipic acid | | 3 |
| Adiponitrile | | 26 |
| Agallol | Methoxyethylmercuric chloride | 24 |
| Agaloaretan | Methoxymethylmercuric chloride | 24 |
| Aldicarb | Temik* | 9, 20 |
| Aldrin | | 17 |
| Alkyl aluminum chloride | | 107 |
| Alkyl resins | | 101 |
| Allene | | 28 |
| Allyl alcohol | 2-Propen-1-ol | 4 |
| Allyl bromide | Bromopropene | 17 |
| Allyl chloride | Chloropropene | 17 |
| Allyl chlorocarbonate | Allyl chloroformate | 13, 17 |
| Allyl chloroformate | Allyl chlorocarbonate | 13, 17 |
| Allyl trichlorosilane | | 107 |
| Aluminum | | 22, 23 |
| Aluminum aminoborohydride | | 107 |
| Aluminum borohydride | | 105, 107 |
| Aluminum bromide | | 107 |
| Aluminum carbide | | 105 |
| Aluminum chloride | | 107 |
| Aluminum diethyl monochloride | Diethylaluminum chloride | 105, 107 |
| Aluminum fluoride | | 15, 107 |
| Aluminum hydride | | 105 |
| Aluminum hypophosphide | | 107 |
| Aluminum phosphide | | 107 |
| Aluminum tetraazidoborate | | 8 |
| Aminobenzene | Aniline | 7 |
| Aminobutane | Butylamine | 7 |
| Aminochlorotoluene | Chlorotoluidine | 7, 17 |
| Aminodiphenyl | | 7 |
| Aminoethane | Ethylamine | 7 |
| Aminoethanol | | 4, 7 |
| Aminoethanolamine | | 7 |
| Aminohexane | Hexylamine | 7 |
| Aminomethane | Methylamine | 7 |
| Aminopentane | Amylamine | 7 |
| Aminophenol | | 7, 31 |

| Names | Synonyms | RGN |
|---|---|---|
| Aminopropane | Isopropyl amine | 7 |
| Amino propionitrile | | 7, 26 |
| Aminothiazole | | 7, 8 |
| Aminotoluene | Toluidine | 7 |
| Ammonia | | 10 |
| Ammonium arsenate | | 24 |
| Ammonium azide | | 102 |
| Ammonium bifluoride | | 15 |
| Ammonium chlorate | | 102, 104 |
| Ammonium dichromate | | 24, 102 |
| Ammonium fluoride | | 15 |
| Ammonium hexanitrocobaltate | | 24, 102 |
| Ammonium hydroxide | | 10 |
| Ammonium hypophosphide | | 105 |
| Ammonium molybdate | | 24 |
| Ammonium nitrate | | 102 |
| Ammonium nitridoosmate | | 24, 104 |
| Ammonium nitrite | | 102 |
| Ammonium perchlorate | | 104 |
| Ammonium periodate | | 102, 104 |
| Ammonium permanganate | | 24, 102, 104 |
| Ammonium persulfate | | 104 |
| Ammonium picrate | | 102 |
| Ammonium sulfide | | 33, 105 |
| Ammonium tetrachromate | | 24, 104 |
| Ammonium tetraperoxychromate | | 24, 102, 104 |
| Ammonium trichromate | | 24, 104 |
| Amyl acetate | Acetoxy pentane | 13 |
| Amyl alcohol | | 4 |
| Amyl chloride | Chloropentane | 17 |
| Amyl cyanide | | 26 |
| Amylamine | Aminopentane | 7 |
| Amylene | Pentene | 28 |
| Amyl mercaptan | Pentanethiol | 20 |
| Aniline | | 7 |
| Animert* V-101 | Tetrasul | 20 |
| Anisole | | 14 |
| Anisole chloride | | 107 |
| Anthracene | | 16 |
| Antimony | | 23, 24 |
| Antimony chloride | Antimony trichloride | 24, 107 |
| Antimony fluoride | Antimony trifluoride | 24, 107 |
| Antimony nitride | | 24, 25 |
| Antimony oxychloride | | 24 |
| Antimony oxide | Antimony trioxide | 24 |
| Antimony pentachloride | | 24 |
| Antimony pentafluoride | | 24 |
| Antimony pentasulfide | | 24, 33, 105 |
| Antimony perchlorate | | 24, 104 |
| Antimony potassium tartrate | | 24 |

| Names | Synonyms | RGN |
|---|---|---|
| Antimony sulfate | Antimony trisulfate | 24 |
| Antimony sulfide | Antimony trisulfide | 24, 33, 105 |
| Antimony tribromide | | 24, 107 |
| Antimony trichloride | Antimony chloride | 24, 107 |
| Antimony trifluoride | Antimony fluoride | 24, 107 |
| Antimony triiodide | | 24, 107 |
| Antimony trioxide | Antimony oxide | 24 |
| Antimony trisulfate | Antimony sulfate | 24 |
| Antimony trisulfide | Antimony sulfide | 24, 33 |
| Antimony trivinyl | | 24, 107 |
| Aqualin | Acrolein | 5, 103 |
| Aqueous solutions & mixtures | | 106 |
| Aretan* | Methoxyethylmercuric chloride | 24 |
| Aroclor* | Polychlorinated biphenyl | 17 |
| Arsenic | | 24 |
| Arsenic bromide | Arsenic tribromide | 24, 107 |
| Arsenic chloride | Arsenic trichloride | 24, 107 |
| Arsenic dislufide | Arsenic sulfide | 24, 33, 105 |
| Arsenic iodide | Arsenic triiodide | 24, 107 |
| Arsenic oxide | Arsenic pentoxide | 24 |
| Arsenic pentaselenide | | 24 |
| Arsenic pentasulfide | | 24, 33 |
| Arsenic pentoxide | Arsenic oxide | 24 |
| Arsenic sulfide | Arsenic disulfide | 24, 33, 105 |
| Arsenic tribromide | Arsenic bromide | 24, 107 |
| Arsenic trichloride | Arsenic chloride | 24, 107 |
| Arsenic trifluoride | | 24 |
| Arsenic triiodide | Arsenic iodide | 24, 107 |
| Arsenic trisulfide | | 24, 33, 105 |
| Arsine | | 24, 105 |
| Askarel | Polychlorinated biphenyl | 17 |
| Asphalt | | 101 |
| Azidocarbonyl guanidine | | 8, 102 |
| Azido-s-triazole | | 8 |
| Azinphos ethyl | | 32 |
| Aziridine | Ethyleneimine | 7, 103 |
| a,a'-Azodiisobutyronitrile | | 8, 26 |
| Azodrin* | Monocrotophos | 32 |
| Bakelite* | | 101 |
| Banol | Carbanolate | 9 |
| Barium | | 21, 24, 107 |
| Barium azide | | 24, 102 |
| Barium bromate | | 24, 104 |
| Barium carbide | | 24, 105, 107 |
| Barium chlorate | | 24, 104 |
| Barium chloride | | 24 |
| Barium chromate | | 24, 104 |
| Barium fluoride | | 15, 24 |
| Barium fluosilicate | | 24 |

| Names | Synonyms | RGN |
|---|---|---|
| Barium hydride | | 24, 105 |
| Barium hydroxide | | 10, 24 |
| Barium hypophosphide | | 24, 105 |
| Barium iodate | | 24, 104 |
| Barium iodide | | 24 |
| Barium monoxide | Barium oxide | 10, 24, 107 |
| Barium nitrate | | 24, 104 |
| Barium oxide | Barium monoxide | 10, 24, 107 |
| Barium perchlorate | | 24, 104 |
| Barium permanganate | | 24, 104 |
| Barium peroxide | | 24, 104 |
| Barium phosphate | | 24 |
| Barium stearate | | 24 |
| Barium sulfide | | 24, 33, 105, 107 |
| Barium sulfite | | 24 |
| Bassa* | BPMC | 9 |
| Bayer 25141 | Fensulfothion | 32 |
| Baygon* | | 9 |
| Benzadox | Topcide* | 6 |
| Benzal bromide | | 17 |
| Benzal chloride | | 17 |
| Benzaldehyde | | 5 |
| Benz-a-pyrene | | 16 |
| Benzene | | 16 |
| Benzene diazonium chloride | | 8, 102 |
| Benzene phosphorus dichloride | | 107 |
| Benzidine | | 7 |
| Benzoic acid | | 3 |
| Benzonitrile | | 26 |
| Benzophenone | | 19 |
| Benzoquinone | Quinone | 19 |
| Benzotriazole | | 8, 102 |
| Benzotribromide | | 17 |
| Benzotrichloride | | 17 |
| Benzotrifluoride | Trifluoromethylbenzene | 17 |
| Benzoyl chloride | | 107 |
| Benzoyl peroxide | Dibenzoyl peroxide | 30, 102 |
| Benzyl alcohol | | 4 |
| Benzylamine | | 7 |
| Benzyl benzene | Diphenylmethane | 16 |
| Benzyl bromide | Bromotoluene | 17 |
| Benzyl chloride | Chlorotoluene | 17 |
| Benzyl chlorocarbonate | Benzyl chloroformate | 17 |
| Benzyl chloroformate | Benzyl chlorocarbonate | 17 |
| Benzyl silane | | 105, 107 |
| Benzyl sodium | | 105 |
| Beryllium | | 24 |
| Beryllium copper alloy | | 24 |
| Beryllium fluoride | | 15, 24 |
| Beryllium hydride | | 24, 105, 107 |

| Names | Synonyms | RGN |
|---|---|---|
| Beryllium hydroxide | | 10, 24 |
| Beryllium oxide | | 24 |
| Beryllium sulfide | | 33, 105 |
| Beryllium tetrahydroborate | | 24, 105, 107 |
| Bidrin* | | 32 |
| Bismuth | | 22, 23, 24 |
| Bismuth chromate | | 24 |
| Bismuthic acid | | 24 |
| Bismuth nitride | | 24, 25, 102 |
| Bismuth pentafluoride | | 24, 107 |
| Bismuth pentaoxide | | 24 |
| Bismuth sulfide | | 24, 33, 105 |
| Bismuth tribromide | | 24 |
| Bismuth trichloride | | 24 |
| Bismuth triiodide | | 24 |
| Bismuth trioxide | | 24 |
| Bismuth trisulfide | | 24, 33, 105 |
| Blada-fum* | Sulfotepp | 32 |
| Blue vitriol | Copper sulfate | 24 |
| Bomyl | | 32 |
| Borane | | 24, 107 |
| Bordeaux arsenites | | 24 |
| Boric acid | | 1 |
| Boron arsenotribromide | | 24, 105 |
| Boron bromodiiodide | | 24, 107 |
| Boron dibromoiodide | | 24, 107 |
| Boron nitride | | 24, 25 |
| Boron phosphide | | 24, 107 |
| Boron triazide | | 24, 102 |
| Boron tribromide | | 24, 107 |
| Boron trichloride | | 24, 107 |
| Boron trifluoride | | 24, 107 |
| Boron triiodide | | 24, 107 |
| Boron trisulfide | | 24, 33, 105 |
| BPMC | Bassa* | 9 |
| Brass | | 23 |
| Bromic acid | | 2 |
| Bromine | | 104 |
| Bromine azide | | 102 |
| Bromine cyanide | Cyanogen bromide | 11 |
| Bromine monofluoride | | 104, 107 |
| Bromine pentafluoride | | 104, 107 |
| Bromine trifluoride | | 104, 107 |
| Bromoacetylene | | 17 |
| Bromobenzoyl acetanilide | | 6, 19 |
| Bromobenzyl trifluoride | | 17 |
| Bromodiborane | | 105 |
| Bromodiethylaluminum | | 107 |
| Bromodimethoxyaniline | | 14 |
| Bromoform | Tribromomethane | 17 |

| Names | Synonyms | RGN |
|---|---|---|
| Bromomethane | Methyl bromide | 17 |
| Bromophenol | | 17, 31 |
| Bromopropene | Allyl bromide | 17 |
| Bromopropyne | | 17 |
| Bromosilane | | 105 |
| Bromotoluene | Benzyl bromide | 17 |
| Bromotrichloromethane | | 17 |
| Bromotrifluomethane | | 17 |
| Bromoxynil | 3,5-Dibromo-4-hydroxy benzonitrile | 17, 26, 31 |
| Bronze | | 23 |
| Buna-N* | | 101 |
| Bunker fuel oil | | 101 |
| Butacarb | | 9 |
| Butadiene | | 28, 103 |
| Butadiyne | Diacetylene | 28 |
| Butanal | Butyraldehyde | 5 |
| Butane | | 29 |
| Butanediol | | 4 |
| Butanethiol | Butyl mercaptan | 20 |
| Butanetriol trinitrate | | 102 |
| Butanol | Butyl alcohol | 4 |
| Butanone | Methyl ethyl ketone | 19 |
| Butenal | Crotonaldehyde | 5 |
| Butene | | 28 |
| Butene-2-one | Methyl vinyl ketone | 19 |
| Butyl acetate | Acetoxybutane | 13 |
| n-Butyl acrylate | | 13, 103 |
| Butylamine | Aminobutane | 7 |
| Butyl alcohol | Butanol | 4 |
| t-Butyl azidoformate | | 8 |
| Butyl benzene | Phenylbutane | 16 |
| Butyl benzyl phthalate | | 13 |
| Butyl cellusolve* | | 4 |
| Butyl dichloroborane | | 105 |
| Butyl ether | Dibutyl ether | 14 |
| Butly formate | | 13 |
| Butyl fluoride | | 17 |
| Butyl glycidyl ether | | 34 |
| Butyl hydroperoxide | | 30 |
| t-Butyl hypochlorite | | 102, 104 |
| n-Butyl lithium | | 105, 107 |
| Butyl mercaptan | Butanethiol | 20 |
| Butyl peroxide | | 30 |
| Butyl peroxyacetate | t-Butyl perbenzoate | 30 |
| Butyl peroxybenzoate | | 30 |
| Butyl peroxypivalate | | 30 |
| t-Butyl perbenzoate | Butyl peroxyacetate | 30 |
| t-Butyl-3-phenyl oxazirane | | 34 |
| Butyl trichlorosilane | | 107 |

| Names | Synonyms | RGN |
|---|---|---|
| Butyramide | | 6 |
| Butyraldehyde | Butanol | 5 |
| Butyric acid | | 3 |
| Butyronitrile | | 26 |
| Bux* | | 9 |
| Cacodylic acid | Dimethylarsenic acid | 24 |
| Cadmium | | 23, 24 |
| Cadmium acetylide | | 24, 105, 107 |
| Cadmium amide | | 24, 10, 107 |
| Cadmium azide | | 24, 102 |
| Cadmium bromide | | 24 |
| Cadmium chlorate | | 24, 104 |
| Cadmium chloride | | 24 |
| Cadmium cyanide | | 11, 24 |
| Cadmium fluoride | | 15, 24 |
| Cadmium hexamine chlorate | | 24, 102 |
| Cadmium hexamine perchlorate | | 24, 102 |
| Cadmium iodide | | 24 |
| Cadmium nitrate | | 24, 102, 104 |
| Cadmium nitride | | 24, 25, 102 |
| Cadmium oxide | | 24 |
| Cadmium phosphate | | 24 |
| Cadmium sulfide | | 24, 33, 105 |
| Cadmium trihydrazine chlorate | | 24, 102 |
| Cadmium trihydrazine perchlorate | | 24, 102 |
| Calcium | | 24, 102 |
| Calcium arsenate | | 24 |
| Calcium arsenite | | 24 |
| Calcium bromate | | 104 |
| Calcium carbide | | 105, 107 |
| Calcium chlorate | | 104 |
| Calcium chlorite | | 104 |
| Calcium fluoride | | 15 |
| Calcium hexammoniate | | 105 |
| Calcium hydride | | 105, 107 |
| Calcium hydroxide | Hydrated lime | 10 |
| Calcium hypochlorite | Calcium oxychloride | 104 |
| Calcium hypophosphide | | 105 |
| Calcium iodate | | 104 |
| Calcium-manganese-silicon alloy | | 23 |
| Calcium nitrate | Lime nitrate, nitrocalcite | 104 |
| Calcium oxide | Slaked lime | 10, 107 |
| Calcium oxychloride | Calcium hypochlorite | 104 |
| Calcium perchromate | | 104 |
| Calcium permanganate | | 104 |
| Calcium peroxide | | 104 |
| Calcium phosphide | | 107 |
| Calcium sulfide | | 33, 105 |
| Camphor oil | | 101 |
| Capric acid | | 3 |

| Names | Synonyms | RGN |
|---|---|---|
| Caproic acid | Hexanoic acid | 3 |
| Caprylic acid | | 3 |
| Caprylyl peroxide | Octyl peroxide | 30 |
| Carbacrol | | 31 |
| Carbaryl | | 9 |
| Carbetamide | | 6 |
| Carbanolate | Banol | 9 |
| Carbofuran | Furadan* | 9 |
| Carbolic acid | Phenol | 31 |
| Carbolic oil | | 31 |
| Carbon, activated, spent | | 101 |
| Carbon bisulfide | Carbon disulfide | 20 |
| Carbon disulfide | Carbon bisulfide | 20 |
| Carbon tetrachloride | Tetrachloromethane | 17 |
| Carbon tetrafluoride | | 17 |
| Carbon tetraiodide | | 17 |
| Castrix | Crimidine | 7 |
| Catechol | | 31 |
| Caustic potash | Potassium hydroxide | 10 |
| Caustic soda | Sodium hydroxide | 10 |
| CDEC | | 12 |
| Cellulose | | 101 |
| Cellulose nitrate | Nitro cellulose | 27, 102 |
| Cerium | | 22 |
| Cerium hydride | | 105 |
| Cerium trisulfide | | 33, 105 |
| Cerous phosphide | | 105 |
| Cesium | | 21 |
| Cesium amide | | 107 |
| Cesium azide | | 102 |
| Cesium carbide | | 105 |
| Cesium fluoride | | 15 |
| Cesium hexahydroaluminate | | 105 |
| Cesium hydride | | 105, 107 |
| Cesium phosphide | | 107 |
| Cesium sulfide | | 33, 105 |
| Chloral hydrate | Trichloroacetaldehyde | 5 |
| Chlordane | | 17 |
| Chlorestol | Polychlorinated biphenyl | 17 |
| Chlorfenvinphos | | 32 |
| Chloric acid | | 2, 104 |
| Chlorine | | 104 |
| Chlorine azide | | 102 |
| Chlorine dioxide | | 102, 104, 107 |
| Chlorine fluoroxide | | 102, 104 |
| Chlorine monofluoride | | 104, 107 |
| Chlorine monoxide | | 104 |
| Chlorine pentafluoride | | 104, 107 |
| Chlorine trifluoride | | 104, 107 |
| Chlorine trioxide | | 102, 104 |

| Names | Synonyms | RGN |
|---|---|---|
| Chloroacetaldehyde | | 5, 17 |
| Chloroacetic acid | Monochloroacetic acid | 3, 17 |
| Chloroacetone | Monochloroacetone | 17, 19 |
| Chloroacetophenone | Phenyl chloromethyl ketone | 17, 19 |
| Chloroacetyl chloride | | 107 |
| Chloroacetylene | | 102 |
| Chloroacrylonitrile | | 17, 26 |
| Chloroazodin | | 8, 17 |
| Chlorobenzene | | 17 |
| Chlorobenzotriazole | | 8, 17 |
| Chlorobenzoyl peroxide | | 17, 30 |
| Chlorobenzylidene malononitrile | | 17, 26 |
| Chlorobutyronitrile | | 17, 26 |
| Chloro chromic anhydride | Chromyl chloride | 24, 104, 107 |
| Chlorocreosol | | 17, 31 |
| Chlorodiborane | | 105 |
| Chlorodiisobutyl aluminum | | 105, 107 |
| Chlorodimethylamine diborane | | 105 |
| Chlorodinitrobenzene | Dinitrochlorobenzene | 17, 27 |
| Chloro dinitrotoluene | | 17, 27 |
| Chlorodipropyl borane | | 105 |
| Chloroethane | Ethyl chloride | 17 |
| Chloroethanol | | 4, 7 |
| Chloroethylenimine | | 17 |
| Chloroform | Trichloromethane | 17 |
| Chlorohydrin | | 17 |
| Chloromethane | Methyl chloride | 17 |
| Chloromethyl methyl ether | | 17 |
| Chloromethyl phenoxyacetic acid | | 3, 17 |
| Chloronitroaniline | | 17, 27 |
| Chloronitrobenzene | Nitrochlorobenzene | 17, 27 |
| Chloropentane | Amyl chloride | 17 |
| Chlorophenol | | 31 |
| Chlorophenyl isocyanate | | 17, 18, 107 |
| Chloropicrin | Chlorpicrin, Trichloronitromethane | 17, 27, 102 |
| Chloropropane | Isopropyl chloride | 17 |
| Chloropropene | Allyl chloride | 17 |
| Chloropropylene oxide | Epichlorohydrin | 17, 34 |
| Chlorosilane | | 105 |
| Chlorosulfonic acid | | 1 |
| Chlorothion* | | 17, 32 |
| Chlorotoluene | Benzyl chloride | 17 |
| Chlorotoluidine | | 7, 17 |
| Chlorotrinitrobenzene | Picryl chloride | 17, 27, 102 |
| β-Chlorovinyldichloroarsine | Lewisite | 24 |
| Chlorpicrin | Trichloronitromethane | 17, 27, 102 |
| Chromic acid | Chromic anhydride, Chromium trioxide | 2, 24, 104 |

| Names | Synonyms | RGN |
|---|---|---|
| Chromic anyhdride | Chromium trioxide, Chromic acid | 2, 24, 104 |
| Chromic chloride | Chromium trichloride | 24 |
| Chromic fluoride | Chromium trifluoride | 15, 24 |
| Chromic oxide | | 24 |
| Chromic sulfate | Chromium sulfate | 24 |
| Chromium | | 23, 24 |
| Chromium sulfate | Chromic sulfate | 24 |
| Chromic sulfide | | 24, 33, 105 |
| Chromium trichloride | Chromic chloride | 24 |
| Chromium trifluoride | Chromic fluoride | 15, 24 |
| Chromium trioxide | Chromic acid, Chromic anhydride | 2, 24, 104 |
| Chromyl chloride | Chloro chromic anhydride | 24, 104, 107 |
| Chrysene | | 16 |
| CMME | Methyl chloromethyl ether | 14, 17 |
| Coal oil | | 101 |
| Coal tar | | 31 |
| Cobalt | | 22, 23, 24 |
| Cobalt bromide | Cobaltous bromide | 24 |
| Cobalt chloride | Cobaltous chloride | 24 |
| Cobalt nitrate | Cobaltous nitrate | 24, 104 |
| Cobaltous bromide | Cobalt bromide | 24 |
| Cobaltous chloride | Cobalt chloride | 24 |
| Cobaltous nitrate | Cobalt nitrate | 24, 104 |
| Cobaltous resinate | Cobalt resinate | 24 |
| Cobaltous sulfate | Cobalt sulfate | 24 |
| Cobalt resinate | Cobaltous resinate | 24 |
| Cobalt sulfate | Cobaltous sulfate | 24 |
| Collodion | Pyroxylin | 27 |
| Copper | | 23, 24 |
| Copper acetoarsenite | Paris Green | 24 |
| Copper acetylide | | 24, 102, 105, 107 |
| Copper arsenate | Cupric arsenate | 24 |
| Copper arsenite | Cupric arsenite | 24 |
| Copper chloride | Cupric chloride | 24 |
| Copper chlorotetrazole | | 24 |
| Copper cyanide | Cupric cyanide | 11, 24 |
| Copper nitrate | Cupric nitrate | 24, 104 |
| Copper nitride | | 24, 25 |
| Copper sulfate | Cupric sulfate, Blue vitriol | 24 |
| Copper sulfide | | 24, 33, 105 |
| Compound 1836 | Diethyl chlorvinyl phosphate | 17, 32 |
| Coroxon* | | 32 |
| Coumafuryl | Fumarin | 19 |
| Coumatetralyl | | 19 |
| Cresol | | 31 |
| Cresol glydicyl ether | | 34 |
| Cresote | | 31 |
| Crimidine | Castrix | 7 |

| Names | Synonyms | RGN |
|---|---|---|
| Crotonaldehyde | Butenal | 5 |
| Crotyl alcohol | | 4 |
| Crotyl bromide | | 17 |
| Crotyl chloride | | 17 |
| Cumene | Isopropyl benzene | 16 |
| Cumene hydroperoxide | Dimethylbenzyl hydroperoxide | 30 |
| Cupric arsenate | Copper arsenate | 24 |
| Cupric arsenite | Copper arsenite | 24 |
| Cupric chloride | Copper chloride | 24 |
| Cupric cyanide | Copper cyanide | 11, 24 |
| Cupric nitrate | Copper nitrate | 24, 104 |
| Cupric sulfate | Copper sulfate | 24 |
| Cupriethylenediamine | | 7, 24 |
| Cyanoacetic acid | Malonic nitrile | 3, 26 |
| Cyanochloropentane | | 17, 26 |
| Cyanogen | | 26 |
| Cyanogen bromide | Bromine cyanide | 11 |
| Cyanophenphos | Surecide* | 26, 32 |
| Cyanuric triazide | | 102 |
| Cycloheptane | | 29 |
| Cyclohexane | | 29 |
| Cyclohexanol | | 4 |
| Cyclohexanone | | 19 |
| Cyclohexanone peroxide | | 30 |
| Cyclohexylamine | | 7 |
| Cyclohexenyl trichlorosilane | | 107 |
| Cyclohexyl phenol | | 31 |
| Cyclohexyl trichlorosilane | | 107 |
| Cyclopentane | | 29 |
| Cyclopentanol | | 4 |
| Cyclopentene | | 28 |
| Cyclopropane | | 29 |
| Cyclotrimethylene trinitraamine | RDX | 27, 102 |
| Cymene | | 16 |
| Cyolan* | Phospholan | 20, 32 |
| 2,4-D | Dichlorophenoxyacetic acid | 3, 17 |
| Dasanit* | Fensulfothion | 32 |
| DBCP | Dibromochloropropane | 17 |
| DCB | Dichlorobenzene | 17 |
| DDD | | 17 |
| DDNP | Diazodinitrophenol | 8, 27, 102 |
| DDT | | 17 |
| DDVP | Dichlorovos, Vapona* | 17, 32 |
| DEAC | Diethylaluminum chloride | 105, 107 |
| Decaborane | | 107 |
| Decahydronaphthalene | Decalin | 29 |
| Decalin | Decahydronaphthalene | 29 |
| Decane | | 29 |
| Decanol | | 4 |
| Decene | | 28 |

| Names | Synonyms | RGN |
|---|---|---|
| Decyl benzene | | 16 |
| Delnav* | Dioxathion | 32 |
| Demeton-s-methyl sulfoxid | Metasystox R* | 32 |
| Diacetone alcohol | | 4, 19 |
| Diacetyl | | 19 |
| Diacetylene | Butadiyne | 28 |
| Diamine | Hydrazine | 8, 105 |
| Diaminobenzene | Phenylene diamine | 7 |
| Diaminohexane | Hexamethylenediamine | 7 |
| Diazidoethane | | 8, 102 |
| Diazinon* | | 32 |
| Diazodinitrophenol | DDNP | 27, 102 |
| Dibenzoyl peroxide | Benzoyl peroxide | 30, 102 |
| Diborane | Diboron hexahydride | 105, 107 |
| Diboron hexahydride | Diborane | 105, 107 |
| Dibutyl ether | Butyl ether | 14 |
| Dibutyl phthalate | | 13 |
| 3,5-Dibromo-4-hydroxybenzonitrile | Bromoxynil | 17, 26, 31 |
| Dibromochloropropane | DBCP, Fumazone*, Nemagon* | 17 |
| Dibromoethane | Ethylene dibromide | 17 |
| Dichloroacetone | | 17, 19 |
| Dichloroamine | | 104 |
| Dichlororobenzene | DCB | 17 |
| Dichlorobenzidine | | 7, 17 |
| Dichlorodimethylsilane | Dimethyl dichlorosilane | 107 |
| Dichloroethane | Ethylene dichloride | 17 |
| Dichloroethene | Dichloroethylene | 17 |
| Dichloroether | Dichloroethyl ether | 14, 17 |
| Dichloroethylarsine | | 24, 107 |
| Ethyl dichlorosilane | | 107 |
| Ethyl ether | Dichloroether | 14, 17 |
| Dichloroisocyanuric acid | Dichloro-s-triazine-2,4,5-trione | 104 |
| Dichloromethane | Methylene chloride | 17 |
| Dichlorophene | | 17 |
| Dichlorophenol | | 17, 31 |
| Dichlorophenoxyacetic acid | 2,4-D | 3, 17 |
| Dichloropropane | Propylene dichloride | 17 |
| Dichloropropanol | | 4, 17 |
| Dichloropropene | Dichloropropylene | 17 |
| Dichloropropylene | Dichloropropene | 17 |
| Dichloro-s-triazine-2,4,5-trione | Dichloroisocyanuric acid | 104 |
| Dichlorovos | DDVP | 17, 32 |
| Dicumyl peroxide | | 30 |
| Dicyclopentadiene | | 28 |
| Dieldrin | | 17 |
| Diethanolamine | | 4, 7 |
| Diethyl aluminum chloride | Aluminum diethylmonochloride, DEAL | 105, 107 |
| Diethylamine | | 7 |
| Diethyl benzene | | 16 |

| Names | Synonyms | RGN |
|---|---|---|
| Diethyl chlorovinyl phosphate | Compound 1836 | 17, 32 |
| Diethyl dichlorosilane | | 107 |
| Diethylene dioxide | Dioxane | 14 |
| Diethylene glycol dinitrate | | 27, 102 |
| Diethylene glycol monobutyl ether acetate | | 13 |
| Diethylene triamine | | 7 |
| Diethyl ether | | 14 |
| Diethyl ketone | | 19 |
| Diethyltoluamide | | 6 |
| Diethyl zinc | Zinc ethyl | 24, 105, 107 |
| Diesel oil | | 101 |
| Difluorophosphoric acid | | 1 |
| Diglycidyl ether | Bis(2,3-epoxypropyl) ether | 34 |
| Diisobutylene | | 28 |
| Diisobutyl ketone | | 19 |
| Diisopropanolamine | | 4, 17 |
| Diisopropylbenzene hydroperoxide | | 30 |
| Diisopropyl beryllium | | 24, 104, 107 |
| Diisopropyl ether | Isopropyl ether | 14 |
| Diisopropyl peroxydicarbonate | Isopropyl percarbonate | 30 |
| Dimecron* | Phosphamidon | 32 |
| Dimefox | Hanane* | 6, 32 |
| Dimethyl acetylene | | 28 |
| Dimethyl amine | | 7 |
| Dimethylamino azobenzene | Methyl yellow | 7, 8 |
| Dimethyl arsenic acid | Cacodylic acid | 24 |
| Dimethylbenzyl hydroperoxide | Cumene hydroperoxide | 30 |
| Dimethyl butane | Neohexane | 29 |
| Dimethyl butyne | | 28 |
| Dimethyl dichlorosilane | Dichlorodimethylsilane | 107 |
| Dimethyldithiophosphoric acid | | 32 |
| Dimethyl ether | | 14 |
| Dimethyl formal | | 19 |
| Dimethyl formamide | | 6 |
| Dimethylhexane dihydroperoxide | | 30 |
| Dimethyl hydrazine | UDMH | 8 |
| Dimethyl ketone | Acetone | 19 |
| Dimethyl magnesium | | 105, 107 |
| Dimethylnitrobenzene | Nitroxylene | 27 |
| Dimethylnitrosoamine | N-Nitrosodimethyl amine | 7, 27 |
| Dimethyl sulfide | Methyl sulfide | 20 |
| Dimeton | | 32 |
| Dinitrobenzene | | 27 |
| Dinitrochlorobenzene | Chlorodinitrobenzene | 17, 27 |
| 2,4-Dinitro-6-sec-butyl phenol | Dinoseb | 27, 31 |
| Dinitrocresol | DNOC, Elgetol 30 | 27, 31 |
| Dinitrophenol | | 27, 31 |
| Dinitrophenyl hydrazine | | 8, 27 |
| Dinitrotoluene | | 27 |

| Names | Synonyms | RGN |
|---|---|---|
| Dinoseb | 2,4-Dinitro-6-sec-butylphenol | 27, 31 |
| Dioxacarb | | 9 |
| Dioxane | Diethylene dioxide | 14 |
| Dioxathion | Delnav* | 32 |
| Dipentaerythritol hexanitrate | | 27, 102 |
| Dipentene | | 28 |
| Diphenamide | | 6 |
| Diphenyl | Phenylbenzene | 16 |
| Diphenyl acetylene | | 16 |
| Diphenylamine | | 7 |
| Diphenylamine chloroarsine | Phenarsazine chloride | 7, 24 |
| Diphenyl ethane | | 16 |
| Diphenyl ethylene | Stilbene | 16 |
| Diphenyl methane | Benzylbenzene | 16 |
| Diphenylmethane diisocyanate | | 18, 107 |
| Diphenyl oxide | | 14 |
| Dipicryl amine | Hexanitrodiphenylamine | 7, 27, 102 |
| Dipropyl amine | | 7 |
| Disulfoton | Disyston* | 32 |
| Disulfuric acid | | 1 |
| Disulfur dinitride | | 25, 102 |
| Disulfuryl chloride | | 107 |
| Disyston* | Disulfoton | 32 |
| Dithane* M-45 | | 12 |
| Dithione* | Sulfotepp | 32 |
| DNOC | Dinitrocresol | 27, 31 |
| Dodecene | | 28 |
| Dodecyl benzene | | 16 |
| Dodecyl trichlorosilane | | 107 |
| Dowco-139* | Mexacarbate | 9 |
| Dowicide I | o-Phenyl phenol | 31 |
| Dowtherm | | 16 |
| Durene | | 16 |
| Dyfonate* | Fonofos | 32 |
| Dynes Thinner | | 101 |
| Elgetol 30 | Dinitrocresol | 27, 31 |
| Endolsulfan | Thiodan* | 17, 20 |
| Endothall | | 3 |
| Endothion | Exothion | 32 |
| Endrin | | 17 |
| EPN | | 32 |
| Epichlorohydrin | Chloropropylene oxide | 17, 34 |
| Epoxybutane | | 34 |
| Epoxybutene | | 34 |
| Epoxyethane | Ethylene oxide | 34, 103 |
| Epoxyethylbenzene | | 34 |
| Bis(2-3-Epoxypropyl) ether | Diglycidyl ether | 34 |
| Ethane | | 29 |
| Ethanethiol | Ethyl mercaptan | 20 |
| Ethanol | Ethyl alcohol | 4 |

| Names | Synonyms | RGN |
|---|---|---|
| Ethion* | Nialate | 32 |
| Ethoxyethanol | | 4, 14 |
| Ethyl acetate | | 13 |
| Ethyl acetylene | | 28 |
| Ethylacrylate | | 13, 103 |
| Ethyl alcohol | Ethanol | 4 |
| Ethylamine | Aminoethane | 7 |
| Ethyl benzene | Phenylethane | 16 |
| Ethyl butanoate | Ethyl butyrate | 13 |
| Ethyl butyrate | Ethyl butanoate | 13 |
| Ethyl chloride | Chloroethane | 17 |
| Ethyl chloroformate | | 13, 17 |
| Ethyl dichloroarsine | Dichloroethylarsine | 24, 107 |
| Ethyl dichlorosilane | | 107 |
| Ethyl ether | Diethyl ether | 14 |
| Ethylene | | 28 |
| Ethylene chromic oxide | | 24, 104 |
| Ethylene chlorohydrin | | 4, 17 |
| Ethylene cyanohydrin | Hydroxypropionitrile | 4, 26 |
| Ethylene diamine | | 7 |
| Ethylene dibromide | Dibromoethane | 17 |
| Ethylene dichloride | Dichloroethane | 17 |
| Ethylene glycol | | 4 |
| Ethylene glycol dinitrate | Glycol dinitrate | 27, 102 |
| Ethylene glycol monomethyl ether | | 4, 14, 17 |
| Ethyleneimine | Aziridine | 7, 103 |
| Ethylene oxide | Epoxyethane | 34, 103 |
| Ethyl formate | | 13 |
| 2-Ethylhexyl acrylate | | 13, 103 |
| Ethyl mercaptan | Ethanethiol | 20 |
| Ethyl nitrate | | 27, 102 |
| Ethyl nitrite | | 27, 102 |
| Ethyl propionate | | 13 |
| Ethyl trichlorosilane | | 107 |
| Exothion | Endothion | 32 |
| Eugenol | | 31 |
| Fensulfothion | Bayer 25141, Dasanit* | 32 |
| Ferbam | | 12 |
| Ferric arsenate | | 24 |
| Ferric sulfide | | 33 |
| Ferrous arsenate | Iron arsenate | 24 |
| Ferrous sulfide | | 33, 105 |
| Fluoranthrene | | 16 |
| Fluorene | | 16 |
| Fluorine | | 104, 107 |
| Fluorine azide | | 102 |
| Fluorine monoxide | Oxygen difluoride | 104, 107 |
| Fluoroacetanilide | | 6, 17 |
| Fluoroacetic acid | | 3 |
| Fluoroboric acid | | 1, 15 |

| Names | Synonyms | RGN |
|---|---|---|
| Fluorosulfonic acid | Fluosulfonic acid | 1, 107 |
| Fluosulfonic acid | Fluorosulfonic acid | 1, 107 |
| Fluosilicic acid | | 1, 15 |
| Fonofos* | Dyfonate* | 32 |
| Formaldehyde | Methanal | 5 |
| Formamide | | 6 |
| Formetanate hydrochloride | | 6 |
| Formic acid | Methanoic acid | 3 |
| Fostion* | Prothoate | 32 |
| Freon* | | 17 |
| Fumaric acid | | 3 |
| Fumarin | Coumafuryl | 19 |
| Fumazone* | Dibromochloropropane | 17 |
| Furadan* | Carbofuran | 9 |
| Furan | Furfuran | 14 |
| Furfural | | 5 |
| Furfuran | | 14 |
| Gas oil, cracked | | 101 |
| Gasoline | | 101 |
| Germanium sulfide | | 33, 105 |
| Glutaraldehyde | | 5 |
| Glycerin | | 4 |
| Glycidol | | 34 |
| Glycol diacetate | | 13 |
| Glycol dinitrate | Ethylene glycol dinitrate | 27, 102 |
| Glycol ether | | 14 |
| Glycolic acid | | 3 |
| Glycol monolactate trinitrate | | 27, 102 |
| Glycolonitrile | | 26 |
| Gold acetylide | | 105, 107 |
| Gold cyanate | Gold fulminate | 102 |
| Gold fulminate | Gold cyanate | 102 |
| Gold sulfide | | 33, 105 |
| Grease | | 101 |
| Guaiacol | | 31 |
| Guanyl nitrosaminoguanylidene hydrazine | | 8, 102 |
| Guanidine nitrate | | 27, 104 |
| Gun cotton | Nitrocellulose | 27, 102 |
| Guthion* | | 32 |
| Hafnium | | 22 |
| Hanane* | Dimefox | 6, 32 |
| Hemimellitene | | 16 |
| Heptachlor | | 17 |
| Heptane | | 29 |
| Heptanal | | 5 |
| Heptanol | | 4 |
| Heptanone | | 19 |
| Heptene | | 28 |
| Hexaborane | | 105 |
| Hexachlorobenzene | | 17 |

| Names | Synonyms | RGN |
|---|---|---|
| Hexadecyl trichorosilane | | 107 |
| Hexaethyl tetraphosphate | | 32 |
| Hexafluorophosphoric acid | | 1, 15 |
| Hexahydride diborane | Diborane | 105, 107 |
| Hexamethyl benzene | | 16 |
| Hexamethylenediamine | Diaminohexane | 7 |
| Hexamethylenetetraamine | | 7 |
| Hexanal | | 5 |
| Hexanitrodiphenylamine | Dipicrylamine | 7, 27, 102 |
| Hexanol | | 4 |
| Hexanoic acid | Caproic acid | 3 |
| Hexene | | 28 |
| Hexylamine | Aminohexane | 7 |
| Hexyl trichlorosilane | | 107 |
| Hexyne | | 28 |
| HMX | | 102 |
| Hopcide* | | 9 |
| Hydrated lime | Calcium hydroxide | 10 |
| Hydrazine | Diamine | 8, 105 |
| Hydrazine azide | | 8, 102 |
| Hydrazoic acid | Hydrogen azide | 102 |
| Hydriodic acid | Hydrogen iodide | 1 |
| Hydrobromic acid | Hydrogen bromide | 1, 107 |
| Hydrochloric acid | Muriatic acid | 1 |
| Hydrocyanic acid | Hydrogen cyanide | 1, 11 |
| Hydrofluoric acid | Hydrogen fluoride | 1, 15 |
| Hydrogen azide | Hydrazoic acid | 102 |
| Hydrogen bromide | Hydrobromic acid | 1, 107 |
| Hydrogen cyanide | Hydrocyanic acid | 1, 11 |
| Hydrogen fluoride | Hydrofluoric acid | 1, 15 |
| Hydrogen iodide | Hydroiodic acid | 1 |
| Hydrogen peroxide | | 104 |
| Hydrogen phosphide | Phosphine | 105 |
| Hydrogen selenide | | 24, 105 |
| Hydrogen sulfide | | 33, 105 |
| Hydroquinone | | 31 |
| Hydroxyacetophenone | | 19, 31 |
| Hydroxydibromobenzoic acid | | 3, 17 |
| Hydroxydiphenol | | 31 |
| Hydroxyhydroquinone | | 31 |
| Hydroxyacetophenone | | 19, 31 |
| Hydroxyisobutyronitrile | Acetone cyanohydrin | 4, 26 |
| Hydroxyl amine | | 105 |
| Hydroxypropionitrile | Ethylene cyanohydrin | 4, 26 |
| Hypochlorous acid | | 2 |
| Indene | | 16 |
| Indium | | 22, 23, 24 |
| Inerteen | Polychlorinated biphenyl | 17 |
| Iodine monochloride | | 107 |
| Iodine pentoxide | | 104 |

| Names | Synonyms | RGN |
|---|---|---|
| Iron | | 23 |
| Iron arsenate | Ferrous arsenate | 24 |
| Isobutane | | 29 |
| Isobutanol | | 4 |
| Isobutyl acetate | | 13 |
| Isobutyl acrylate | | 13, 103 |
| Isobutylene | | 28 |
| Isodecyl acrylate | | 13 |
| Isodurene | | 16 |
| Isoeugenol | | 31 |
| Isohexane | | 29 |
| Isooctane | Trimethylpentane | 29 |
| Isooctene | | 28 |
| Isopentane | Methylbutane | 29 |
| Isophorone | | 19 |
| Isoprene | Methyl butadiene | 28, 103 |
| Isopropanol | | 4 |
| Isopropyl acetate | | 13 |
| Isopropyl acetylene | | 28 |
| Isopropylamine | Aminopropane | 7 |
| Isopropyl benzene | Cumene | 16 |
| Isopropyl chloride | Chloropropane | 17 |
| Isopropyl ether | Diisopropyl ether | 14 |
| Isopropyl mercaptan | | 20 |
| N-Isopropylmethylcarbamate | | 9 |
| α-Isopropyl methylphosphoryl fluoride | | 17, 32 |
| Isopropyl percarbonate | Diisopropyl peroxydicarbonate | 30 |
| Isotactic propylene | | 101 |
| J-100 | | 101 |
| Jet oil | | 101 |
| Kerosene | | 101 |
| Lacquer thinner | | 101 |
| Landrin* | | 9 |
| Lannate* | Methomyl | 9, 20 |
| Lauroyl peroxide | | 30 |
| Lead | | 23, 24 |
| Lead acetate | | 24 |
| Lead arsenate | Lead orthoarsenate | 24 |
| Lead arsenite | | 24 |
| Lead azide | | 24, 102 |
| Lead carbonate | | 24 |
| Lead chlorite | | 24, 104 |
| Lead cyanide | | 11, 24 |
| Lead dinitroresorcinate | | 24, 27, 102 |
| Lead mononitroresorcinate | | 24, 27, 102 |
| Lead nitrate | | 24, 104 |
| Lead orthoarsenate | Lead arsenate | 24 |
| Lead oxide | | 24 |
| Lead styphnate | Lead trinitroresorcinate | 24, 27, 102 |
| Lead sulfide | | 24, 33, 104 |

| Names | Synonyms | RGN |
|---|---|---|
| Lead trinitroresorcinate | Lead styphnate | 24, 27, 102 |
| Lewisite | β-Chlorovinyldichloroarsine | 24 |
| Lime nitrate | Calcium nitrate | 104 |
| Lindane | | 17 |
| Lithium | | 21, 107 |
| Lithium aluminum hydride | | 105, 107 |
| Lithium amide | | 10, 107 |
| Lithium ferrosilicon | | 107 |
| Lithium hydride | | 105, 107 |
| Lithium hydroxide | | 10 |
| Lithium hypochlorite | | 104 |
| Lithium nitride | | 25 |
| Lithium peroxide | | 104, 107 |
| Lithium silicon | | 107 |
| Lithium sulfide | | 33, 105 |
| London purple | | 24 |
| Lye | Sodium hydroxide | 10 |
| Magnesium | | 21, 22 |
| Magnesium arsenate | | 24 |
| Magnesium arsenite | | 24 |
| Magnesium chlorate | | 104 |
| Magnesium fluoride | | 15 |
| Magnesium nitrate | | 104 |
| Magnesium perchlorate | | 104 |
| Magnesium peroxide | | 104 |
| Magnesium sulfide | | 33, 105 |
| Malathion | | 32 |
| Maleic acid | | 3 |
| Malonic nitrile | Cyanoacetic acid | 3, 26 |
| Maneb | | 12 |
| Manganese | | 22, 23, 24 |
| Manganese acetate | | 24 |
| Manganese arsenate | Manganous arsenate | 24 |
| Manganese bromide | Manganous bromide | 24 |
| Manganese chloride | Manganous chloride | 24 |
| Manganese methylcyclopentadienyl-tricarbonyl | | 24 |
| Manganese nitrate | Manganous nitrate | 24, 104 |
| Manganese sulfide | | 24, 33, 105 |
| Manganous arsenate | Manganese arsenate | 24 |
| Manganous bromide | Manganese bromide | 24 |
| Manganous chloride | Manganese chloride | 24 |
| Manganous nitrate | Manganese nitrate | 104 |
| Mannitol hexanitrate | Nitromannite | 27, 102 |
| Matacil* | | 9 |
| Mayer's reagent | Mercuric potassium iodide | 24 |
| Medinoterb acetate | | 13, 27 |
| Meobal | | 9 |
| Mercaptobenzothiazole | | 8, 20 |
| Mercatoethanol | | 4, 20 |

| Names | Synonyms | RGN |
|---|---|---|
| Mercarbam | | 32 |
| Mercuric acetate | | 24 |
| Mercuric ammonium chloride | Mercury ammonium chloride | 24 |
| Mercuric benzoate | Mercury benzoate | 24 |
| Mercuric bromide | | 24 |
| Mercuric chloride | Mercury chloride | 24 |
| Mercuric cyanide | Mercury cyanide | 11, 24 |
| Mercuric dioxysulfate | Mercuric subsulfate | 24 |
| Mercuric iodide | Mercury iodide | 24 |
| Mercuric nitrate | Mercury nitrate | 24, 104 |
| Mercuric oleate | Mercury oleate | 24 |
| Mercuric oxide | | 24 |
| Mercuric oxycyanide | | 11, 24, 102 |
| Mercuric potassium iodide | Mayer's reagent | 24 |
| Mercuric salicylate | Salicylated mercury | 24 |
| Mercuric subsulfate | Mercuric dioxysulfate | 24 |
| Mercuric sulfate | Mercury sulfate | 24 |
| Mercuric sulfide | | 24, 33, 105 |
| Mercuric thiocyanate | Mercury thiocyanide | 24 |
| Mercuric thiocyanide | Mercury thiocyanate | 24 |
| Mercurol | Mercury nucleate | 24 |
| Mercurous bromide | | 24 |
| Mercurous gluconate | | 24 |
| Mercurous iodide | | 24 |
| Mercurous nitrate | | 24, 104 |
| Mercurous oxide | | 24 |
| Mercurous sulfate | Mercury bisulfate | 24 |
| Mercury | | 24 |
| Mercury (vapor) | | 22, 24 |
| Mercury acetate | Mercuric acetate | 24 |
| Mercury ammonium chloride | Mercuric ammonium chloride | 24 |
| Mercury benzoate | Mercuric benzoate | 24 |
| Mercury bisulfate | Mercurous sulfate | 24 |
| Mercury chloride | Mercuric chloride | 24 |
| Mercury cyanide | Mercuric cyanide | 11, 24 |
| Mercury fulminate | | 24, 102 |
| Mercury iodide | Mercuric iodide | 24 |
| Mercury nitrate | Mercuric nitrate | 24, 104 |
| Mercury nucleate | Mercurol | 24 |
| Mercury oleate | Mercuric oleate | 24 |
| Mercury sulfate | Mercuric sulfate | 24 |
| Mesitylene | 1,3,5-trimethylbenzene | 16 |
| Mesityl oxide | | 19 |
| Mesurol* | | 9 |
| Metasystox-R | Demeton-S-methyl sulfoxid | 32 |
| Metham | | 12 |
| Methanal | Formaldehyde | 5 |
| Methane | | 29 |
| Methanethiol | Methyl mercaptan | 20 |
| Methanoic acid | Formic acid | 3 |

| Names | Synonyms | RGN |
|---|---|---|
| Methanol | Methyl alcohol | 4 |
| Methomyl | Lannate* | 9, 20 |
| Methoxyethylmercuric chloride | Agallolaretan* | 24 |
| Methyl acetate | | 13 |
| Methyl acetone | | 101 |
| Methyl acetylene | Methyl butyne | 28 |
| Methyl acrylate | | 13, 103 |
| Methyl alcohol | Methanol | 4 |
| Methyl aluminum sesquibromide | | 105, 107 |
| Methyl aluminum sesquichloride | | 105, 107 |
| Methylamine | Aminomethane | 7 |
| Methyl amyl acetate | | 13 |
| N-Methyl aniline | | 7 |
| Methyl aziridine | Propyleneimine | 7 |
| Methyl benzene | Toluene | 16 |
| Methyl bromide | Bromomethane | 17 |
| Methyl butadiene | Isoprene | 28, 103 |
| Methyl butane | Isopentane | 29 |
| Methyl butene | | 28 |
| Methyl butyl ether | | 14 |
| Methyl t-butyl ketone | | 19 |
| Methyl butyne | Isopropyl acetylene | 28 |
| Methyl butyrate | | 13 |
| Methyl chloride | Chloromethane | 17 |
| Methyl chlorocarbonate | Methyl chloroformate | 13, 17 |
| Methyl chloroform | | 17 |
| Methyl chloroformate | Methyl chlorocarbonate | 13, 17 |
| Methyl chloromethyl ether | CMME | 14, 17 |
| Methyl cyanide | Acetonitrile | 26 |
| Methyl cyclohexane | | 29 |
| Methyl dichloroarsine | | 24 |
| Methyl dichlorosilane | | 107 |
| Methylene chloride | Dichloromethane | 17 |
| Methylene diisocyanate | | 18, 107 |
| 4,4-Methylene bis(2-chloroaniline) | | 7, 17 |
| Methyl ethyl chloride | | 17 |
| Methyl ethyl ether | | 14 |
| Methyl ethyl ketone | Butanone | 19 |
| Methyl ethyl ketone peroxide | | 30 |
| Methyl ethyl pyridine | | 7 |
| Methyl formate | | 13 |
| Methyl hydrazine | Monomethyl hydrazine | 8 |
| Methyl iodide | | 17 |
| Methyl isobutyl ketone | | 19 |
| Methyl isocyanate | | 18, 107 |
| Methyl isopropenyl ketone | | 19 |
| Methyl magnesium bromide | | 105, 107 |
| Methyl magnesium chloride | | 105, 107 |
| Methyl magnesium iodide | | 105, 107 |
| Methyl mercaptan | Methanethiol | 20 |

| Names | Synonyms | RGN |
|---|---|---|
| Methyl methacrylate | | 13, 103 |
| Methyl naphthalene | | 16 |
| Methyl parathion | | 32 |
| Methyl pentanoate | Methyl valerate | 13 |
| Methyl propionate | | 13 |
| Methyl n-propyl ketone | | 19 |
| Methyl styrene | | 28, 103 |
| Methyl sulfide | Dimethyl sulfide | 20 |
| Methyl trichlorosilane | | 107 |
| Methyl valerate | Methyl pentanoate | 13 |
| Methyl vinyl ketone | Butene-2-one | 19 |
| Methyl yellow | Dimethylamino azobenzene | 7, 8 |
| Mevinphos | Phosdrin* | 32 |
| Mexacarbate | Dowco-139* | 9 |
| Mineral spirits | | 101 |
| Mintacol* | Paraoxon | 32 |
| Mipcin* | | 9 |
| Mobam* | | 9 |
| Mocap* | | 32 |
| Molybdenum | | 22, 23, 24 |
| Molybdenum anhydride | Molybdenum trioxide | 24 |
| Molybdenum sulfide | | 24, 33, 105 |
| Molybdenum trioxide | Molybdenum anhydride | 24 |
| Molybdic acid | | 24 |
| Monochloroacetone | Chloroacetone | 17, 19 |
| Monochloroacetic acid | Chloroacetic acid | 3, 17 |
| Monocrotophos | Azodrin* | 32 |
| Monoethanol amine | | 4, 7 |
| Monofluorophosphoric acid | | 1 |
| Monoisopropanolamine | | 4, 7 |
| Monomethyl hydrazine | Methyl hydrazine | 8 |
| Morpholine | | 7 |
| Municipal solid waste | Refuse | 101 |
| Muriatic acid | Hydrochloric acid | 1 |
| Nabam | | 12 |
| Nack | Sodium-potassium alloy | 21, 107 |
| Nak | Sodium-potassium alloy | 21, 107 |
| Naptha | | 101 |
| Naphthalene | | 16 |
| Naphthol | | 31 |
| Naphthylamine | | 7 |
| Naphthyl mercaptan | | 20 |
| Naphtite | Trinitronaphthalene | 27, 102 |
| Nemagon* | Dibromochloropropane | 17 |
| Neohexane | Dimethyl butane | 29 |
| 4-NBP | Nitrobiphenyl | 27 |
| Niacide* | | 12 |
| Nialate | Ethion | 32 |
| Nickel | | 22, 24 |
| Nickel acetate | | 24 |

| Names | Synonyms | RGN |
|---|---|---|
| Nickel antimonide | | 24, 107 |
| Nickel arsenate | Nickelous arsenate | 24 |
| Nickel arsenite | Nickelous arsenite | 24 |
| Nickel carbonyl | Nickel tetracarbonyl | 24 |
| Nickel chloride | Nickelous chloride | 24 |
| Nickel cyanide | | 11, 24 |
| Nickel nitrate | Nickelous nitrate | 24, 104 |
| Nickelous arsenate | Nickel arsenate | 24 |
| Nickelous arsenite | Nickel arsenite | 24 |
| Nickelous chloride | Nickel chloride | 24 |
| Nickelous nitrate | Nickel nitrate | 24, 104 |
| Nickel selenide | | 24 |
| Nickel subsulfide | | 24, 33, 105 |
| Nickel sulfate | | 24 |
| Nickel tetracarbonyl | Nickel carbonyl | 24 |
| Nitraniline | Nitroaniline | 7, 27 |
| Nitric acid | | 2 |
| Nitroaniline | Nitraniline | 7, 27 |
| Nitrobenzene | Nitrobenzol | 27 |
| Nitrobenzol | Nitrobenzene | 27 |
| Nitrobiphenyl | 4-NBP | 27 |
| Nitrocalcity | Calcium nitrate | 104 |
| Nitrocellulose | Cellulose nitrate, gun cotton | 27, 102 |
| Nitrochlorobenzene | Chloronitrobenzene | 17, 27 |
| Nitrogen dioxide | | 104 |
| Nitromannite | Mannitol hexanitrate | 27, 102 |
| Nitrogen mustard | | 7, 17 |
| Nitrogen tetroxide | | 104 |
| Nitroglycerin | Trinitroglycerin | 27, 102 |
| Nitrohydrochloric acid | | 2 |
| Nitrophenol | | 27, 31 |
| Nitropropane | | 27 |
| Nitrosodimethylamine | Dimethylnitrosiamine | 7, 27 |
| Nitrosoguanidine | | 27, 102 |
| Nitrostarch | Starch nitrate | 27, 102 |
| Nitroxylene | Nitroxylol, Dimethylnitrobenzene | 27 |
| Nitroxylos | Nitroxylene, Dimethylnitrobenzene | 27 |
| N-Nitrosodimethylamine | Dimethylnitrosoamine | 7, 27 |
| Nonyl phenol | | 31 |
| Nonyl trichlorosilane | | 107 |
| Nonane | | 29 |
| Nonene | | 28 |
| Nonanone | | 19 |
| Nonanal | | 5 |
| Nonanol | | 4 |
| Octadecyl trichlorosilane | | 107 |
| Octadecyne | | 28 |
| Octamethylpyrophosphoramide | Schradan | 6, 32 |
| Octanal | | 5 |
| Octane | | 29 |

| Names | Synonyms | RGN |
|---|---|---|
| Octanone | | 19 |
| Octanol | | 4 |
| Octene | | 28 |
| Octyl peroxide | Caprylyl peroxide | 30 |
| Octyl trichlorosilane | | 107 |
| Oil of bergamot | | 101 |
| Oil of vitriol | Sulfuric acid | 1 |
| Oleum | Sulfuric acid | 2, 24 |
| Orris root | | 101 |
| Orthozenol | o-Phenyl phenol | 31 |
| Osmium | | 23, 24 |
| Osmium amine nitrate | | 24, 104 |
| Osmium amine perchlorate | | 24, 104 |
| Oxamyl | | 9 |
| Oxalic acid | | 3 |
| Oxygen difluoride | | 104, 107 |
| PCB | Polychlorinated biphenyl | 17 |
| Paper | | 101 |
| Paraoxon | Mintacol* | 32 |
| Parathion | | 32 |
| Paris green | Copper acetoarsenite | 24 |
| PETD | Polyram combi* | 12 |
| PETN | Pentaerythrityl tetranitrate, Pentaerythritol tetranitrate | 27, 102 |
| Pentaborane | | 105 |
| Pentachlorophenol | | 17, 31 |
| Pentaerythritol tetranitrate | Pentaerythrityl tetranitrate, PETN | 27, 102 |
| Pentamethyl benzene | | 16 |
| Pentane | | 29 |
| Pentanethiol | Amyl mercaptan | 20 |
| Pentanal | Valeraldehyde | 5 |
| Pentanone | | 19 |
| Pentene | Amylene | 28 |
| Pentylamine | | 7 |
| Pentyne | | 28 |
| Peracetic acid | Peroxyacetic acid | 3, 30 |
| Perbromic acid | | 2 |
| Perchloric acid | | 2 |
| Perchloroethylene | Tetrachloroethylene | 17 |
| Perchloromethyl mercaptan | Trichloromethylsulfenylchloride | 17, 20 |
| Perchlorous acid | | 2 |
| Perchloryl fluoride | | 104 |
| Periodic acid | | 2 |
| Permonosulfuric acid | | 1 |
| Peroxyacetic acid | Peracetic acid | 3, 30 |
| PETD | Polyram combi* | 12 |
| Petroleum naptha | | 101 |
| Petroleum oil | | 101 |
| Phenanthrene | | 16 |
| Phenarsazine chloride | Diphenylamine chloroarsine | 7, 24 |

| Names | Synonyms | RGN |
|---|---|---|
| Phenol | Carbolic acid | 31 |
| Phenyl acetic acid | | 3 |
| Phenyl acetonitrile | | 26 |
| Phenyl acetylene | | 16 |
| Phenylaniline | Diphenylamine | 7 |
| Phenylbenzene | Diphenyl | 16 |
| Phenylbutane | Butylbenzene | 16 |
| Phenylchloromethyl ketone | Chloroacetophenone | 17, 19 |
| Phenyl dichloroarsine | | 24 |
| Phenylene diamine | Diaminobenzene | 7 |
| Phenylethane | Ethylbenzene | 16 |
| Phenyl hydrazine hydrochloride | | 8 |
| o-Phenyl phenol | Orthozenol, Dowicide 1 | 31 |
| Phenyl trichlorosilane | | 107 |
| Phenyl valerylnitrile | | 26 |
| Phenylpropane | Propylbenzene | 16 |
| Phloroglucinol | | 31 |
| Phorate | Thimet* | 32 |
| Phosdrin* | Mevinphos | 32 |
| Phosphamidon | Dimecron* | 32 |
| Phosphine | Hydrogen phosphide | 105 |
| Phospholan | Cyolan* | 20, 32 |
| Phosphonium iodide | | 105, 107 |
| Phosphoric acid | | 1 |
| Phosphoric anhydride | Phosphorus pentoxide | 107 |
| Phosphoric sulfide | Phosphorus pentasulfide | 33, 105, 107 |
| Phosphorus (Amorphous red) | | 105, 107 |
| Phosphorus (White-Yellow) | | 105 |
| Phosphorus heptasulfide | | 33, 105 |
| Phosphorus oxybromide | Phosphoryl bromide | 104, 107 |
| Phosphorus oxychloride | Phosphoryl chloride | 104, 107 |
| Phosphorus pentachloride | Phosphoric chloride | 107 |
| Phosphorus pentasulfide | Phosphoric sulfide | 33, 105, 107 |
| Phosphorus pentoxide | Phosphoric anhydride | 107 |
| Phosphorus sesquisulfide | Tetraphosphorus trisulfide | 33, 105, 107 |
| Phosphorus tribromide | | 107 |
| Phosphorus trichloride | | 107 |
| Phosphorus trisulfide | | 33, 105, 107 |
| Phosphoryl bromide | Phosphorus oxybromide | 104, 107 |
| Phosphoryl chloride | Phosphorus oxychloride | 104, 107 |
| Phthalic acid | | 3 |
| Picramide | Trinitroaniline | 7, 27, 102 |
| Picric acid | Trinitrophenol | 27, 31, 102 |
| Picridine | | 7 |
| Picryl chloride | Chlorotrinitrobenzene | 17, 27, 102 |
| Piperidine | | 7 |
| Pirimicarb | | 9 |
| Polyglycol ether | | 14 |
| Polyamide resin | | 101 |
| Polybrominated biphenyl | | 17 |

| Names | Synonyms | RGN |
|---|---|---|
| Polybutene | | 28 |
| Polychlorinated biphenyls | PCB, Askarel, Arochlor*, Chlorextol, Inerteen | 17 |
| Polychlorinated triphenyls | | 17 |
| Polethylene | | 101 |
| Polyester resin | | 101 |
| Polymeric oil | | 101 |
| Polyphenyl polymethylisocyanate | | 18, 107 |
| Polypropylene | | 28, 101 |
| Polyram combi* | PETD | 12 |
| Polysulfide polymer | | 20, 101 |
| Polystyrene | | 101 |
| Polyurethane | | 101 |
| Polyvinyl acetate | | 101 |
| Polyvinyl chloride | | 101 |
| Polyvinyl nitrate | | 27, 102 |
| Potasan | | 32 |
| Potassium | | 21, 107 |
| Potassium acid fluoride | Potassium fluoride | 15 |
| Potassium aluminate | | 10 |
| Potassium arsenate | | 24 |
| Potassium arsenite | | 24 |
| Potassium bifluoride | Potassium fluoride | 15 |
| Potassium bichromate | Potassium dichromate | 24, 104 |
| Potassium bromate | | 104 |
| Potassium butoxide | | 10 |
| Potassium cyanide | | 11 |
| Potassium dichloroisocyanurate | | 104 |
| Potassium dichromate | Potassium bichromate | 24, 104 |
| Potassium dinitrobenzfuroxan | | 27, 102 |
| Potassium fluoride | Potassium acid fluoride | 15 |
| Potassium hydride | | 105, 107 |
| Potassium hydroxide | Caustic potash | 10 |
| Potassium nitrate | Saltpeter | 102, 104 |
| Potassium nitride | | 25 |
| Potassium nitrite | | 104 |
| Potassium oxide | | 107 |
| Potassium perchlorate | | 104 |
| Potassium permanganate | | 24, 104 |
| Potassium peroxide | | 104, 107 |
| Potassium sulfide | | 33, 105 |
| Promecarb | | 9 |
| Propanal | Propionaldehyde | 5 |
| Propane | | 29 |
| Propanethiol | Propyl mercaptan | 20 |
| Propanoic acid | Propionic acid | 3 |
| Propanol | Propyl alcohol | 4 |
| Propargyl bromide | | 17 |
| Propargyl chloride | | 17 |
| 2-Propen-1-ol | Allyl alcohol | 4 |

| Names | Synonyms | RGN |
|---|---|---|
| Propiolactone | | 13 |
| Propionaldehyde | Propanal | 5 |
| Propionamide | | 6 |
| Propionic acid | Propanoic acid | 3 |
| Propionitrile | | 26 |
| Propyl acetate | | 13 |
| Propyl alcohol | Propanol | 4 |
| Propylamine | | 7 |
| Propyl benzene | Phenyl propane | 16 |
| Propylene dichloride | Dichloropropane | 17 |
| Propylene glycol | | 4 |
| Propylene glycol monomethyl ether | | 4, 14 |
| Propylene oxide | | 34, 103 |
| Propyleneimine | Methyl aziridine | 7 |
| Propyl ether | | 14 |
| Propyl formate | | 13 |
| Propyl mercaptan | Propanethiol | 20 |
| Propyl Trichlorosilane | | 107 |
| Prothoate | Fostion* | 32 |
| Pseudocumene | 1,2,4 trimethylbenzene | 16 |
| Pyridine | | 7 |
| Pyrogallol | | 31 |
| Pyrosulfuryl chloride | Disulfuryl chloride | 107 |
| Pyroxylin | Collodion | 27 |
| Quinone | Benzoquinone | 19 |
| Raney nickel | | 22 |
| RDX | Cyclotrimethylene trinitramine | 27, 102 |
| Refuse | Municipal solid waste | 101 |
| Resins | | 101 |
| Resorcinol | | 31 |
| Rubidium | | 21 |
| Salicylated mercury | Mercuric salicylate | 24 |
| Saligenin | | 31 |
| Saltpeter | Potassium nitrate | 102, 104 |
| Schradan | Octamethyl pyrophosphoramide, OMPA | 6, 32 |
| Selenious acid | Selenous acid | 1, 24 |
| Selenium | | 22, 23, 24 |
| Selenium diethyldithiocarbamate | | 12, 24 |
| Selenium fluoride | | 15, 24 |
| Selenous acid | Selenious acid | 1, 24 |
| Silicochloroform | Trichlorosilane | 107 |
| Silicon tetrachoride | | 107 |
| Silicon tetrafluoride | | 15, 107 |
| Silver acetylide | | 24, 102, 105, 107 |
| Silver azide | | 24, 102 |
| Silver cyanide | | 11, 24 |
| Silver nitrate | | 24, 104 |
| Silver nitride | | 24, 25, 102 |
| Silver styphnate | Silver trinitroresorcinate | 24, 27, 102 |

| Names | Synonyms | RGN |
|---|---|---|
| Silver sulfide | | 24, 33, 105 |
| Silver tetrazene | | 24, 102 |
| Silver trinitroresorcinate | Silver styphnate | 24, 27, 102 |
| Slaked lime | Calcium oxide | 10, 107 |
| Smokeless powder | | 102 |
| Sodamide | Sodium amide | 10, 107 |
| Soda niter | Sodium nitrate | 104 |
| Sodium | | 21, 105, 107 |
| Sodium acid fluoride | Sodium fluoride | 15 |
| Sodium aluminate | | 10, 105 |
| Sodium aluminum hydride | | 105, 107 |
| Sodium amide | Sodamide | 10, 107 |
| Sodium arsenate | | 24 |
| Sodium arsenite | | 24 |
| Sodium azide | | 102 |
| Sodium bichromate | Sodium dichromate | 24, 104 |
| Sodium bifluoride | Sodium fluoride | 15 |
| Sodium bromate | | 104 |
| Sodium cacodylate | Sodium dimethylarsenate | 24 |
| Sodium carbonate | | 10 |
| Sodium carbonate peroxide | | 104 |
| Sodium chlorate | | 104 |
| Sodium chlorite | | 104 |
| Sodium chromate | | 24 |
| Sodium cyanide | | 11 |
| Sodium dichloroisocyanurate | | 104 |
| Sodium dichromate | Sodium bichromate | 24, 104 |
| Sodium dimethylarsenate | Sodium cacodylate | 24 |
| Sodium fluoride | Sodium acid fluoride | 15 |
| Sodium hydride | | 105, 107 |
| Sodium hydroxide | Caustic soda, Lye | 10 |
| Sodium hypochlorite | | 10, 104 |
| Sodium hyposulfite | Sodium thiosulfate | 105 |
| Sodium methylate | Sodium methoxide | 10, 107 |
| Sodium methoxide | Sodium methylate | 10, 107 |
| Sodium molybdate | | 24 |
| Sodium monoxide | Sodium oxide | 10, 107 |
| Sodium nitrate | Soda niter | 104 |
| Sodium nitride | | 25 |
| Sodium nitrite | | 104 |
| Sodium oxide | Sodium monoxide | 10, 107 |
| Sodium pentachlorophenate | | 31 |
| Sodium perchlorate | | 104 |
| Sodium permanganate | | 24, 104 |
| Sodium peroxide | | 104, 107 |
| Sodium phenolsulfonate | | 31 |
| Sodium picramate | | 27, 102 |
| Sodium polysulfide | | 101 |
| Sodium potassium alloy | Nak, Nack | 21, 107 |
| Sodium selenate | | 24 |

| Names | Synonyms | RGN |
|---|---|---|
| Sodium sulfide | | 24, 33, 105 |
| Sodium thiosulfate | | 105 |
| Stannic chloride | Tin tetrachloride | 24, 107 |
| Stannic sulfide | | 33, 105 |
| Starch nitrate | Nitrostarch | 27, 102 |
| Stilbene | Diphenyl ethylene | 16 |
| Stoddard solvent | | 101 |
| Strontium | | 24 |
| Strontium arsenate | | 24 |
| Strontium dioxide | Strontium peroxide | 24, 104 |
| Strontium monosulfide | | 24, 33, 105 |
| Strontium nitrate | | 24, 104 |
| Strontium peroxide | Strontium dioxide | 104 |
| Strontium tetrasulfide | | 24, 33, 105 |
| Styphnic acid | Trinitroresorcinol | 27, 31, 102 |
| Styrene | Vinylbenzene | 16, 28, 103 |
| Succinic acid | | 3 |
| Succinic acid peroxide | | 30 |
| Sulfonyl chloride | Sulfuryl chloride | 107 |
| Sulfonyl flouride | | 107 |
| Sulfotepp | Dithione*, Blada-Fum* | 32 |
| Sulfur chloride | Sulfur monochloride | 107 |
| Sulfur (elemental) | | 101 |
| Sulfuric acid | Oil of Vitriol, Oleum | 2, 107 |
| Sulfuric anhydride | Sulfur trioxide | 104, 107 |
| Sulfur monochloride | Sulfur chloride | 107 |
| Sulfur mustard | | 20 |
| Sulfur oxychloride | Thionyl chloride | 107 |
| Sulfur pentafluoride | | 15, 107 |
| Sulfur trioxide | Sulfuric anhydride | 104, 107 |
| Sulfuryl chloride | Sulfonyl chloride | 107 |
| Sulfuryl fluoride | Sulfonyl fluoride | 107 |
| Supracide* | Ultracide* | 32 |
| Surecide* | Cyanophenphos | 32 |
| Synthetic rubber | | 101 |
| TCDD | Tetrachlorodibenzo-p-dioxin | 14, 17 |
| TEDP | Tetrethyl dithionopyrophosphate | 32 |
| TEL | Tetraethyl lead | 24 |
| TEPA | Tris-(1-aziridinyl) phosphine oxide | 6, 32 |
| TEPP | Tetraethyl pyrophosphate | 32 |
| THF | Tetrahydrofuran | 14 |
| TMA | Trimethylamine | 7 |
| TML | Tetramethyl lead | 24 |
| TNB | Trinitrobenzene | 27, 102 |
| TNT | Trinitrotoluene | 27, 102 |
| Tall oil | | 101 |
| Tallow | | 101 |
| Tar | | 101 |
| Tellurium hexafluoride | | 15, 24 |
| Temik* | Aldicarb | 9, 20 |

| Names | Synonyms | RGN |
|---|---|---|
| Tetraborane | | 105 |
| Tetrachlorodibenzo-p-dioxin | TCDD | 14, 17 |
| Tetrachloroethane | | 17 |
| Tetrachloroethylene | Perchloroethylene | 17 |
| Tetrachloromethane | Carbon tetrachloride | 17 |
| Tetrachlorophenol | | 17, 31 |
| Tetrachloropropyl ether | | 14, 17 |
| Tetradecene | | 28 |
| Tetraethyl dithionopyrophosphate | TEDP | 32 |
| Tetraethyl lead | TEL | 24 |
| Tetraethyl pyrophosphate | TEPP | 32 |
| Tetrahydrofuran | THF | 14 |
| Tetramethylenediamine | | 7 |
| Tetramethyl lead | TML | 24 |
| Tetramethyl succinonitrile | | 26 |
| Tetranitromethane | | 27, 102 |
| Tetraphenyl ethylene | | 16 |
| Tetraphosphorus trisulfide | Phosphorus sesquisulfide | 33, 105, 107 |
| Tetraselenium tetranitride | | 24, 25, 102 |
| Tetrasul | Animert* V-101 | 20 |
| Tetrasulfur tetranitride | | 25, 102 |
| Tetrazene | | 8, 102 |
| Thallium | | 24 |
| Thallium nitride | | 24, 25, 102 |
| Thallium sulfide | | 24, 33, 105 |
| Thallous sulfate | | 24 |
| Thimet* | Phorate | 32 |
| Thionyl chloride | Sulfur oxychloride | 107 |
| Thiocarbonyl chloride | Thiophosgene | 107 |
| Thiodan* | Endosulfan | 17, 20 |
| Thionazin | Zinophos* | 32 |
| Thionyl chloride | Sulfur oxychloride | 107 |
| Thiophosgene | Thiocarbonyl chloride | 107 |
| Thiophosphoryl chloride | | 107 |
| Thiram | | 12 |
| Thorium | | 22, 23, 24 |
| Tin tetrachloride | Stannic chloride | 24, 107 |
| Titanic chloride | Titanium tetrachloride | 24, 107 |
| Titanium | | 22, 23, 24 |
| Titanium sesquisulfide | | 24, 33, 105 |
| Titanium sulfate | | 24 |
| Titanium sulfide | | 24, 33, 105 |
| Titanium tetrachloride | Titanic chloride | 24, 107 |
| TMA | Trimethylamine | 7 |
| TNB | Trinitrobenzene | 27, 102 |
| TNT | Trinitrotoluene | 27, 102 |
| Tolualdehyde | | 5 |
| Toluene | Toluol, Methylbenzene | 16 |
| Toluene diisocyanate | | 18, 107 |
| Toluic acid | | 3 |

| Names | Synonyms | RGN |
|---|---|---|
| Toluidine | Aminotoluene | 7 |
| Toluol | Toluene, Methylbenzene | 16 |
| Topcide* | Benzadox | 6 |
| Tranid* | | 9, 26 |
| Triamphos | Wepsyn* 155 | 6, 32 |
| Tribromomethane | Bromoform | 17 |
| Tri-n-butylaluminum | | 107 |
| Tricadmium dinitride | | 24, 25 |
| Tricalcium dinitride | | 25 |
| Tricesium nitride | | 24, 25 |
| Trichloroacetaldehyde | Chloral hydrate | 5, 17 |
| Trichloroborane | | 107 |
| Trichloroethane | | 17 |
| Trichloroethene | Trichloroethylene | 17 |
| Trichloroisocyanuric acid | | 104 |
| Trichloromethane | Chloroform | 17 |
| Trichloromethyl sulfenyl chloride | Perchloromethyl mercaptan | 17, 20 |
| Trichloronitromethane | Chloropicrin | 17, 27, 102 |
| Trichlorophenoxyacetic acid | | 3, 17 |
| Trichloropropane | | 17 |
| Trichlorosilane | Silicochloroform | 107 |
| Tridecene | | 28 |
| Triethanolamine | | 4, 7 |
| Triethyl aluminum | | 105, 107 |
| Triethyl antimony | Triethylstibine | 24, 105, 107 |
| Triethyl arsine | | 24, 107 |
| Triethyl bismuthine | | 24 |
| Triethylamine | | 7 |
| Triethylene phosphoramide | Tris(1-aziridinyl) phosphine oxide | 6, 32 |
| Triethylene tetraamine | | 7 |
| Triethyl stibine | Triethyl antimony | 24, 105, 107 |
| Trifluoroethane | | 17 |
| Trifluoromethylbenzene | Benzotrifluoride | 17 |
| Triisobutyl aluminum | | 105, 107 |
| Trilead dinitride | | 24, 25, 102 |
| Trimercury dinitride | | 24, 25, 102 |
| Trimethyl aluminum | | 105, 107 |
| Trimethylamine | TMA | 7 |
| Trimethyl antimony | Trimethylstibine | 24, 105 |
| Trimethyl arsine | | 24, 107 |
| 1,2,4-Trimethylbenzene | Pseudocumene | 16 |
| 1,3,5-Trimethylbenzene | Mesitylene | 16 |
| Trimethyl bismuthine | | 24 |
| Trimethyl pentane | Isooctane | 29 |
| Trimethylstibine | Trimethyl antimony | 24, 105, 107 |
| Tri-n-butylborane | | 105, 107 |
| Trinitroaniline | Picramide | 7, 27, 102 |
| Trinitroanisole | Trinitrophenylmethyl ether | 14, 27 |
| Trinitrobenzene | TNB | 27, 102 |

| Names | Synonyms | RGN |
|---|---|---|
| Trinitrobenzoic acid | | 3, 27, 102 |
| Trinitroglycerin | Nitroglycerin | 27, 102 |
| Trinitronaphthalene | Naphtite | 27, 102 |
| Trinitrophenol | Picric acid | 27, 31, 102 |
| Trinitrophenyl methyl ether | Trinitroanisole | 14, 27 |
| Trinitroresorcinol | Styphnic acid | 27, 31, 102 |
| Trinitrotoluene | TNT | 27, 102 |
| Trioctyl aluminum | | 105, 107 |
| Triphenyl ethylene | | 16 |
| Triphenyl methane | | 16 |
| Tripropylamine | | 7 |
| Tripropyl stibine | | 24, 107 |
| Trisilyl arsine | | 24, 107 |
| Tris-(1-aziridinyl) phosphine oxide | TEPA, Triethylene phosphoramide | 6, 32 |
| Trithion | | 32 |
| Trithorium tetranitride | | 24, 25 |
| Trivinyl stibine | | 24, 107 |
| Tsumacide* | | 9 |
| Tungstic acid | | 24 |
| Turpentine | | 101 |
| UDMH | Dimethyl hydrazine | 8 |
| Ultracide* | Supracide* | 32 |
| Undecene | | 28 |
| Unisolve | | 101 |
| Uranium nitrate | Uranyl nitrate | 24, 104 |
| Uranium sulfide | | 24, 33, 105 |
| Uranyl nitrate | Uranium nitrate | 24, 104 |
| Urea formaldehyde | | 5 |
| Urea nitrate | | 27, 102, 104 |
| VC | Vinylidene chloride | 17, 103 |
| Valeraldehyde | Pentanal | 5 |
| Valeramide | | 6 |
| Valeric acid | | 3 |
| Vanadic acid anhydride | Vanadium pentoxide | 24 |
| Vanadium oxytrichloride | | 24 |
| Vanadium pentoxide | Vanadic acid anhydride | 24 |
| Vanadium sulfate | Vanadyl sulfate | 24 |
| Vanadium tetroxide | | 24 |
| Vanadium trichloride | | 24, 107 |
| Vanadium trioxide | | 24 |
| Vanadyl sulfate | Vanadium sulfate | 24 |
| Vapona* | DDVP | 32 |
| Vinyl acetate | | 13, 103 |
| Vinyl azide | | 102 |
| Vinylbenzene | Styrene | 16, 28, 103 |
| Vinyl chloride | | 17, 103 |
| Vinyl cyanide | | 26, 103 |
| Vinyl ethyl ether | | 14 |
| Vinyl isopropyl ether | | 17 |

| Names | Synonyms | RGN |
|---|---|---|
| Vinylidene chloride | VC | 17, 103 |
| Vinyl toluene | | 28, 103 |
| Vinyl trichlorosilane | | 107 |
| VX | | 20, 32 |
| Water | | 106 |
| Waxes | | 101 |
| Wepsyn* 155 | Triamiphos | 6, 32 |
| Wood | | 101 |
| Zectran* | Dowco 139* | 9 |
| Zinc | | 22, 23, 24 |
| Zinc acetylide | | 24, 105, 107 |
| Zinc ammonium nitrate | | 24, 104 |
| Zinc arsenate | | 24 |
| Zinc arsenite | | 24 |
| Zinc chloride | | 24 |
| Zinc dioxide | Zinc peroxide | 24, 102, 104, 107 |
| Zinc ethyl | Diethyl zinc | 24, 105, 107 |
| Zinc cyanide | | 11, 24 |
| Zinc fluoborate | | 24, 15 |
| Zinc nitrate | | 24, 104 |
| Zinc permanganate | | 24, 104 |
| Zinc peroxide | Zinc dioxide | 24, 102, 104, 107 |
| Zinc phosphide | | 24, 107 |
| Zinc salts of dimethyl dithiocarbamic acid | | 12, 24 |
| Zinc sulfate | | 24 |
| Zinc sulfide | | 24, 33, 105 |
| Zineb* | | 12, 24 |
| Zinophos* | Thioazin | 20 |
| Ziram* | | 12, 24 |
| Zirconium | | 22, 23, 24 |
| Zirconium chloride | Zirconium tetrachloride | 24 |
| Zirconium picramate | | 24, 104 |
| Zirconium tetrachloride | Zirconium chloride | 24 |

# APPENDIX K

# MACDERMID COMPATIBILITY TEST RESULTS

III (20) Chrome not compatible.

To: John Miele, Cherrie Gillis, Frank Cruice

cc: Norris Shake

From: Mary Jane Senechal

Date: February 18, 1990

Subject: Waste Compatibility

At a recent meeting, we discussed the possibility of storing chromic acid waste with the solder conditioner, solder stripper and etchants in the main berm. Cherrie sent me a copy of EPA-600/2-80-076 which is a method of determining waste storage compatibilities. I used this method to determine if we could accomplish what is necessary with a single berm.

The results showed that the chromic acid would be compatible with solder conditioner but <u>not</u> with etchants (oxidizing mineral acid + caustics/caustics + toxic metals) nor solder stripper (oxidizing mineral acids + fluorides). This means that we should prepare to segregate the material in some fashion within the main berm or make plans to find a new storage area for this material.

Mary Jane

cc: J Miele
B. Schwerkhr
HRP

2/15/90

cc: Jerry Post
Ray Koehler
John Miele
Pete Panourgias
Jim Tunnicliff
Dod Dodge
8/22/88 Dan Agresta

III (20)

TO: Cherrie Gillis

cc: Gary Larson

DATE: March 21, 1985

FROM: Donald Ferrier / Bob Ardzijauskas

SUBJECT: RECYCLABLE MATERIAL STORAGE FOR NEW WAREHOUSE

As requested by Cherrie Gillis, we have tested the recyclable materials' reactivity in case of a spill. The materials to be stored are:

9066 (chromic acid/water)
7595 (solder stripper)
7526/33 (solder conditioner)
Ammoniacal etchant (copper/ammonia)

per MJ 2/19/90 - we will have to segregate chrome

50 mls of each sample was mixed in all possible combinations and reactions noted.

| Combination | Reaction |
|---|---|
| 7595, etchant | Foam to twice liquid volume; 20°F. temperature rise; thick blue precipitate formed. |
| 7595, 7526 | No gassing; no temperature rise; white precipitate formed. |
| Etchant, 7526 | No gassing; no temperature rise; thick blue precipitate formed. |
| 9066, 7526 | No apparent reaction. |
| 9066, 7595 | Foam to twice liquid volume; no temperature rise; no precipitate. |
| 9066, etchant* | Mild reaction; 100°F. temperature rise; thick precipitate. |
| 9066, 7595, etchant | Foam to twice liquid volume; 75°F. temperature rise. |

* Best to keep separate if possible or be on guard.

(Cont'd)

| Combination | Reaction |
|---|---|
| 9066, 7526, etchant * | Foam to twice liquid volume; 100°F. temperature rise; thick precipitate. |
| Etchant, 7595, 7526 | Slight reaction; 10°F. temperature rise; thick precipitate. |
| 9066, 7526, 7595, etchant * | Foam to twice liquid volume; 100°F. temperature rise; thick precipitate |

No samples gave off any objectionable odors.

* From this information, we do not advise storing the etchant near the 9066 because of the heat generated. They should not drain to the same trench in case of a spill. The other recyclable materials are safe to store together:

Etchant, 7526, 7595

9066 in a separate area

DF/BA:pcp
3/21/85

Donald Ferrier

Robert Aidzjanskas

# APPENDIX L

## WATERBURY FIRE EXTINGUISHER COMPANY'S QUALIFICATIONS

U.S. Department
of Transportation

**Research and
Special Programs
Administration**

400 Seventh Street, S.W.
Washington, D.C. 20590

July 12, 1989

Mr. John J. Hoban
President
Waterbury Fire Extinguisher Company
P.O. Box 3155
Waterbury, Connecticut 06705

Dear Mr. Hoban:

The Approvals Branch has reviewed your application for renewal of your registration as a cylinder requalification facility and the recommendation of Arrowhead Industrial Services and reissues registration number A050 to your facility at 17 Dunbar Street, Waterbury, Connecticut. This number applies to this location only and is valid for a period of five years from this date based upon maintenance of equipment and personnel capability.

In addition to the requalification of cylinders under the provisions of Section 173.34 of Title 49, Code of Federal Regulations, 49 CFR, the following conditions must be met:

1. You must notify this office of any change in address, management, equipment or testing personnel within twenty days ofthe change.

2. Testing must be performed by, or in the presence of, a designated hydrostatic test operator who has been observed by the Independent Inspection Agency or who has been added to your file by addition under condition number one (1) above.

3. A copy of this registration must be maintained adjacent to the testing apparatus.

4. The second copy of this registration must be signed by the facility manager and returned within 20 days from this date.

Sincerely,

Christine E. Whitney

for James Enoch Jones
Chief, Approvals Branch
Exemptions and Approvals Division
Office of Hazardous Materials
Transportation

Enclosure

18 COLONIAL WOODS DRIVE
WEST ORANGE, NEW JERSEY 07052

RECOMMENDATION FOR APPROVAL

INSPECTION OF TEST/RETEST FACILITY, SECTION 173.34 (e)(1) OF TITLE 49CFR

FIRM NAME WATERBURY FIRE EXTINGUISHER CO. A050

ADDRESS 17 Dunbar Street

Waterbury, CT ZIP 06705

TELEPHONE NUMBER (203) 755-6132

RESPONSIBLE PERSON John Hoban

TITLE Owner COMPANY SYMBOL A050

WE HAVE MADE AN INSPECTION OF THE ABOVE NAMED FACILITY(IES) AND RECOMMEND approval FOR REGISTRATION.

WE HAVE FOUND THE NAMED OPERATOR(S) IN THE APPLICATION AND OUR INSPECTION REPORT TO BE satisfactory AND RECOMMEND approval.

COMMENTS:

DATE OF INSPECTION 28 June 1989 INSP. BY T. F. Vassallo

ARROWHEAD INDUSTRIAL SERVICES, INC.

L.S. T F Vassallo

THIS FACILITY DUE FOR RE-INSPECTION JUNE 1994

# APPENDIX M

# INSPECTION LOGS

HUNTINGDON AVENUE SECURITY FENCE AND GATES
MONTHLY INSPECTION LOG BY -MAINTENANCE MANAGER

Entire perimeter fence, including all gates and locks, to be inspected monthly for integrity, corrosion, hinge and lock operation and unnecessary openings. Records to be retained for 3 years.

| DATE/TIME | PROBLEMS OBSERVED (SPECIFY LOCATION) | REMEDIAL ACTION TO BE TAKEN. BY WHOM AND WHEN? | DATE COMPLETED | TIME | INITIALS |
|---|---|---|---|---|---|
| Jan: | | | | | |
| Feb: | | | | | |
| Mar: | | | | | |
| Apr: | | | | | |
| May: | | | | | |
| Jun: | | | | | |
| Jul: | | | | | |
| Aug: | | | | | |
| Sep: | | | | | |
| Oct: | | | | | |
| Nov: | | | | | |
| Dec: | | | | | |

Figure 7.1 cont.

Container Loading/Unloading Area

5/89

## HUNTINGDON AVENUE
## SHIPPING/RECEIVING - INSPECTION CHECKLIST

RCRA/CR WASTES ONLY

OK = / Problem = X*

| Time | Date | Initials | Area Checked For | | Damaged Container |
|---|---|---|---|---|---|
| | | | Leaks | Spills | |
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*State problem and how rectified and date.

RETAIN FOR 3 YEARS

- Tank Storage -

M RMID:

41930 = Cu Etchant D-002

HUNTINGDON AVENUE
RECLAIM LOG BOOK (BULK)
ETCH

*WHEN MACDERMID TRANSHIPS,
WE ACT AS NEW GENERATOR

| | | | | | | DISCREPANCY | SO2 | |
|---|---|---|---|---|---|---|---|---|
| RECEIVER'S INITIALS | RECEIVING DATE | MANIFEST # | CUSTOMER NAME | TYPE MATERIAL | MANIFEST QUANTITY (LIQUID) | ACTUAL QTY UNLOADED | TANK NUMBER 1, 2 OR 3 | QC TES |
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MACDERMID: BULK SPENT ETHANT
RUNNING LOG INVENTORY - DAILY



TANK:____ Volume in Gallon

| Date | Volume 7:00 AM | Ini-tial | Adds (+) | Used (-) | Volume 3:00 PM | Ini-tial | Adds (+) | Used (-) | Volume 11:00 PM | Ini-tial |
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# MACDERMID: BULK SPENT ETHANT
# RUNNING LOG INVENTORY - DAILY

TANK: 1 Volume in Gallon

| Date | Volume 7:00 AM | Ini-tial | Adds (+) | Used (-) | Volume 3:00 PM | Ini-tial | Adds (+) | Used (-) | Volume 11:00 PM | Ini-tial |
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MACDERMID: BULK SPENT ETHANT
RUNNING LOG INVENTORY - DAILY

TANK: 2 Volume in Gallon

| Date | Volume 7:00 AM | Ini-tial | Adds (+) | Used (-) | Volume 3:00 PM | Ini-tial | Adds (+) | Used (-) | Volume 11:00 PM | Ini-tial |
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MACDERMID: BULK SPENT ETHANT
RUNNING LOG INVENTORY - DAILY



TANK: 3 Volume in Gallon

| Date | Volume 7:00 AM | Initial | Adds (+) | Used (-) | Volume 3:00 PM | Initial | Adds (+) | Used (-) | Volume 11:00 PM | Initial |
|---|---|---|---|---|---|---|---|---|---|---|
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MACDERMID: BULK SPENT ETHANT
RUNNING LOG INVENTORY - DAILY

7/88

TANK: 4* Volume in Gallon

*When In Use

| Date | Volume 7:00 AM | Initial | Adds (+) | Used (-) | Volume 3:00 PM | Initial | Adds (+) | Used (-) | Volume 11:00 PM | Initial |
|---|---|---|---|---|---|---|---|---|---|---|
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# MACDERMID: BULK SPENT ETCHANT

## TANK LEVEL - CAPACITY

## Daily (In-Use) Inspection

**Inspect Working Condition**
**Non-Overflow***
OK = ✓ No = X

| | Tank 1 | | Tank 2 | | Tank 3 | | Initials of | |
|---|---|---|---|---|---|---|---|---|
| Date | Volume Gl | Valve | Volume Gl | Valve | Volume Gl | Valve | Inspector | Comments |
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***If gage not working properly, write in here date, problem and how fixed.**

Inspection Sheet

Satellite Areas

Location: HUNTINGDON - QC

OK = Problem = X*

| TIME | DATE | INITIALS | PAN CHECKED FOR | | CONTAINER | | WASTE LABELS |
|---|---|---|---|---|---|---|---|
| | | | CONDITION | SPILLS | BUNG CLOSED | CONDITION | |
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*State problem and how rectified and date.

FLAMMABLE BERM - PILOT

WEEKLY

CONTAINER STORAGE AREA INSPECTION LOG SHEET - FLAMMABLE LIQUID STORAGE WASTES

MACDERMID:

ACCEPTABLE: Y = Yes
N = No

Department: _____

| | INSPECTOR'S INITIALS* | | | | | |
|---|---|---|---|---|---|---|
| | * | * | * | * | * | |
| | DATE: | DATE: | DATE: | DATE: | DATE: | |
| | TIME: | TIME: | TIME: | TIME: | TIME: | COMMENTS |
| Stack - 2 High - Sagging, Sway | | | | | | |
| Sealing of Containers - Bungs closed | | | | | | |
| Labeling of Containers (Waste Labels, ID and date furnished) | | | | | | |
| Containers (Corrosion, leakage, structural defects) | | | | | | |
| Storage Incompatible material | | | | | | |
| Pallets Damaged (e.g. broken wood, warping, nails missing) | | | | | | |
| Base or Foundation (Cracks, spalling, uneven settlement) | | | | | | |
| Bermed Area (Structural conditions, trenches, sump flow unobstructed) | | | | | | |
| Fire Extinguishers (Charged) | | | | | | |
| Sprinkler System (Water pressure, leaks, damaged) | | | | | | |
| Emergency Eyewash/Shower (Water pressure, leaking, draining) | | | | | | |

Give date and how problem was rectified:

**MACDERMID: COMBUSTIBLE BERM - RECLAIM - GEAR STREET**

**CONTAINER STORAGE AREA INSPECTION LOG SHEET - WEEKLY**

Department: _____

Acceptable: Y = Yes
N = No

| ITEM/TYPE OF PROBLEMS | INSPECTOR'S INITIALS* | | | | | |
|---|---|---|---|---|---|---|
| | * | * | * | * | * | |
| | DATE: | DATE: | DATE: | DATE: | DATE: | |
| Container placement and stacking - aisle space - height of stacks | TIME: | TIME: | TIME: | TIME: | TIME: | OBSERVATIONS SEE BELOW |
| Sealing of Containers - Open lids, torn linings | | | | | | |
| Labeling of Containers Improper Identification, date missing | | | | | | |
| Containers (Corrosion, leakage, structural defeats | | | | | | |
| Storage Area Leaks, spills | | | | | | |
| Pallets Damaged (e.g. broken wood, warping, nails missing) | | | | | | |
| Base or Foundation (Cracks, spalling, erosion, wet spots, uneven settlement) | | | | | | |
| Curbing for Container Storage Area - Cracks, Deterioration | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |

Give date and how problem rectified:

MACDERMID: BULK ETCH TANK STORAGE AREA/RECYCLING AREA
AND ANCILLARY EQUIPMENT
WEEKLY INSPECTION LOG SHEET

MACDERMID

ACCEPTABLE: Y = YES
N = NO

Department: _____

| ITEM/TYPES OF PROBLEMS | INSPECTOR'S INITIAL * | | | | | |
|---|---|---|---|---|---|---|
| | * | * | * | * | * | |
| | DATE: | DATE: | DATE: | DATE: | DATE: | |
| | TIME: | TIME: | TIME: | TIME: | TIME: | COMMENTS |
| Tank Shell - Cracks, corrosion, discoloration, bulges, buckles | | | | | | |
| Base of Foundation - Cracks, spalling, uneven settlement, erosion, wet spots, sealant: deterioration | | | | | | |
| Warning Signs - Damaged, missing | | | | | | |
| Pipes/Fittings - leaks, corrosion, deterioration | | | | | | |
| Valves - loss of metal thickness, leaks, corrosion | | | | | | |
| Etch Tank Level Gages - Working order | | | | | | |
| Drainage System - Clean/Free evidence of spilled material | | | | | | |
| Level - Tank filled to capacity unexpected volume loss | | | | | | |
| Concrete Block Wall - Cracks, sealant deterioration | | | | | | |
| Area around tank - spotting indicating leaks (D) | | | | | | |
| Sludge press, air, pressure gauge, pipes/valves/fittings - loss of metal thickness, leaks, corrosion, deterioration | | | | | | |
| Warning light shut off for overfill - sludge holding tank - light in good working condition | | | | | | |

High Level Alarm (Working Order)

***Give date and how problem rectified:

MACDERMID: METAL HYDROXIDE SLUDGE WASTE AREA - DRY MATERIAL
WEEKLY INSPECTION LOG SHEET

MACDERMID

ACCEPTABLE: Y = YES
N = NO

Department: _____

| ITEM/TYPES OF PROBLEMS | INSPECTOR'S INITIAL * | | | | | |
|---|---|---|---|---|---|---|
| | * | * | * | * | * | |
| | DATE: | DATE: | DATE: | DATE: | DATE: | |
| | TIME: | TIME: | TIME: | TIME: | TIME: | COMMENTS |
| Base of Foundation (including sealer) - cracks, spalling, uneven settlement, erosion wet spots, sealant: deterioration | | | | | | |
| Sludge Press Air Pressure Gauge Pipes/Valves/Fittings - Loss of metal thickness, leaks, corrosion, or deterioration | | | | | | |
| 26 $yd^3$ Roll-Off Container - Liner in place, sludge free of liquid | | | | | | |
| Warning Light Shut-off For OVerfill-Sludge Holding Tanks - Light good working condition | | | | | | |
| Mobile Drainage System Catch Excess $H_2O$ From Press - Clear/Free | | | | | | |
| Filter Press: Material should be Cake - Condition | | | | | | |
| Sludge Holding Tanks - Leaks, valves | | | | | | |
| | | | | | | |

***Give date and how problem rectified: _____

MACDERMID: WAREHOUSE - RECLAIM

CONTAINER STORAGE AREA INSPECTION LOG SHEET- WEEKLY

ACCEPTABLE: Y = YES
N = NO

MACDERMID

Department: _____

| Item/Types of Problems | INSPECTOR'S INITIAL * | | | | | |
|---|---|---|---|---|---|---|
| | * | * | * | * | * | |
| | DATE: | DATE: | DATE: | DATE: | DATE: | |
| | TIME: | TIME: | TIME: | TIME: | TIME: | COMMENTS |
| 1. Container Placement and Stacking - aisle space, height of stacks | | | | | | |
| 2. Racks in good condition - sagging, sway | | | | | | |
| 3. Sealing of Containers - Open lids, torn lining | | | | | | |
| 4. Labeling of Containers - improper identification, date missing | | | | | | |
| 5. Containers - Corrosion, leakage, structural defects | | | | | | |
| 6. Storage Pallets - 3rd level and above strapped | | | | | | |
| 7. Storage Area - leaks, spills sump flow, unobstructed | | | | | | |
| 8. Pallets - Damaged (e.g. broken wood, warping) | | | | | | |
| 9. Base of container and storage area and foundation - Cracks, spalling, uneven settlement, wet spots | | | | | | |
| 10. Racks: Drum Inspection for Leads, etc. Row B01, B02, B03, B04, B05, level 1-5 | | | | | | |
| 11. Curbing for Container Storage Area - Cracks, deterioration | | | | | | |
| 12. High Level Alarm in Sump (working order) | | | | | | |

Give date and how problem was rectified: _____

* Problem + how solved: _____

# MACDERMID: BULK LOADING/UNLOADING AREA
## WEEKLY INSPECTION LOG SHEET

MACDERMID:

ACCEPTABLE: Y = Yes
N = No

Department: _____

INSPECTOR'S INITIALS*

| ITEM/TYPES OF PROBLEMS | * | * | * | * | * | |
|---|---|---|---|---|---|---|
| | DATE: | DATE: | DATE: | DATE: | DATE: | |
| | TIME: | TIME: | TIME: | TIME: | TIME: | COMMENTS |
| Base of Foundation - Cracks, spalling, uneven settlement, erosion, wet spots, sealant: deterioration | | | | | | |
| Pipes/Valves/Fittings - Loss of metal thickness, leaks, corrosion or deterioration | | | | | | |
| Level Gages - Working order | | | | | | |
| Loading/Unloading Area - Spills (D) | | | | | | |
| Drainage System - Sump Drains : clear/ free evidence of spilled material | | | | | | |
| Dike - cracks, deterioration | | | | | | |
| Cinder Block Wall - Cracks, sealant deterioration | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |

Give date and how problem rectified:

## WEEKLY INSPECTION LOG SHEETS

### EMERGENCY EQUIPMENT/SECURITY DEVICES

Company: _____ DATE: From: _____

Inspector's Name: _____ To: _____

Inspector's Title: _____

SAFETY AND EMERGENCY EQUIPMENT

D - Daily; M - Monthly

| ITEM | TYPES OF PROBLEMS | DATE/TIME OF INSPECTION | ACCEPT. | UNACCEPT. | OBSERVATIONS | DATE AND NATURE OF REPAIRS AND REMEDIAL ACTION |
|---|---|---|---|---|---|---|
| Fire Alarm System | Power failure, audible alarm | | | | | |
| Absorbent Material | Out of Stock | | | | | |
| Emergency Shower and Eye Wash | Water pressure, leaking, drainage | | | | | |
| Water and Air Pumps | Power, clogging | | | | | |
| Goggles and Protective Glasses | Broken or dirty equipment | | | | | |
| Fire Extinguishers (M) | Needs recharging | | | | | |
| Rubber Gloves | Out of stock | | | | | |
| Telephone System/ Beepers/Paging (D) | Power failure | | | | | |
| Walkie-Talkies | Power, voice test | | | | | |
| First aid equipment and supplies (M) | Items out of stock or inoperative | | | | | |
| Shovels | Condition/Out of Stock | | | | | |
| Chemical Suits | Out of Stock/ wear and tear | | | | | |

## WEEKLY INSPECTION LOG SHEETS

EMERGENCY EQUIPMENT/SECURITY DEVICES

Company: _____ DATE: From: _____

Inspector's Name: _____ To: _____

Inspector's Title: _____

SAFETY AND EMERGENCY EQUIPMENT

D - Daily; M - Monthly

| ITEM | TYPES OF PROBLEMS | DATE/TIME OF INSPECTION | ACCEPT. | UNACCEPT. | OBSERVATIONS | DATE AND NATURE OF REPAIRS AND REMEDIAL ACTION |
|---|---|---|---|---|---|---|
| Scott Air Pack | Air delivery system, air quantity in reserve | | | | | |
| [illegible] | [illegible] | | | | | |
| Respirators/Cartridges | Out of Stock | | | | | |
| Sprinkler System (M) | Loss of water pressure, signal to security service | | | | | |
| Facility Fence | Corrosion, damage to chain-link fence | | | | | |
| Gate | Corrosion, damage to chain-link fence | | | | | |
| Warning Signs | Damage, missing | | | | | |
| High Level Alarms (M) | Signal to ADT, audible alarm | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |

# APPENDIX N

# SUBGRADE STRENGTH EVALUATIONS

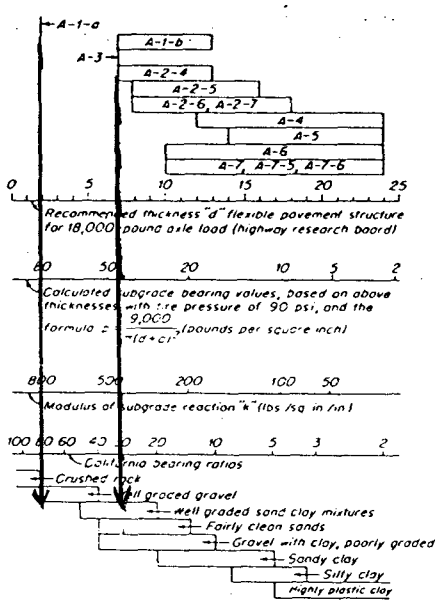



Fig. 5-2 Approximate correlation of subgrade strength evaluations.

On the basis of these recommended total thicknesses, subgrade bearing values have been calculated as indicated by the second scale from the top. These values were arrived at by using the 45-deg-cone method of pressure distribution previously discussed, with an assumed tire pressure of 90 psi, and the principle that the total load $P$ (in this case 9,000 lb) is supported by a unit subgrade pressure $p$ on an area $\pi(a + d)^2$, where $a$ is the radius of tire-contact area and $d$ is the depth from the surface of the wearing course to the subgrade.

There is not at present final agreement as to standard methods of measurement of subgrade moduli, but for purposes of discussion here and later in the design of rigid pavements, the modulus of subgrade reaction is taken to be 10 times the bearing value of the subgrade for 0.1-in. deflection. These values are indicated on the third scale of Fig. 5-2.

It will be seen from the figure that only soil groups A-1-a and A-3 are definitely evaluated as to flexible-pavement requirements. The other groups are spread over a considerable range of strength characteristics, primarily because of such physical influences and construction factors as moisture content as affected by good or poor drainage, frost action, degree of compaction as compared with maximum density at optimum moisture content, and the amount of subgrade stabilization done with the use of such materials as calcium chloride, portland cement, and bituminous products. The use of granular materials so far as possible, attainment of optimum density during construction, and maintenance of uniform

**Table 5-1 Recommended thicknesses of highway-pavement courses for 18,000-lb axle loads**

| BPR soil classification: | Thickness, in. | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | A-1-a | A-1-b | A-3 | A-2-4 | A-2-5 | A-2-6 | A-2-7 | A-4 | A-5 | A-6 | A-7<br>A-7-5<br>A-7-6 |
| Wearing course | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Base course | 0 | 5 | 5 | 5 | 6[a] | 6[a] | 6[a] | 8[a] | 8[a] | 8 | 8[a] |
| Sub-base | 0[b] | 0–6 | 0[c] | 0–6[c] | 0–8[b] | 0–10[d,e] | 0–10[d,e] | 2–14[f,g] | 4–14[f,e] | 0–14[d,e] | 0–14[d,e] |
| Total thickness | 2 | 7–13 | 7 | 7–13 | 8–16 | 8–18 | 8–18 | 12–24 | 14–24 | 10–24 | 10–24 |

[a] Soil-cement bases on A-2-5, A-2-6, and A-2-7 soils may be made 5 in. thick, and those on A-4, A-5, A-7-5, and A-7-6 soils may be 6 in. thick.

[b] No sub-base is required over A-1-a and A-2-5 soils where frost action is absent and the water table is low. In areas subject to severe frost action or where the water table is near the surface, the maximum thickness should be used.

[c] In the case of fine-grained A-2-4 and A-3 soils, it is often necessary to modify the upper layer of the subgrade by admixture to a depth of several inches with binder soil, stone screenings, or bituminous materials to produce a stable surface upon which to place the granular base course.

[d] On A-6 and A-7 soils no sub-base is required where the water table is permanently below the elevation from which moisture may reach the base by capillarity. The maximum thickness is required where the water table is high and for A-6 soils where frost conditions are severe.

[e] Soils of groups A-2-6, A-2-7, A-4, A-5, A-6, A-7-5, and A-7-6 are highly capillary and rapidly lose supporting power when saturated. When pavements are placed in cuts over such soils, the maximum thickness of sub-base should be employed.

[f] On A-4 and A-5 soils a sub-base course of the minimum thickness specified, consisting of stone screenings or similar material, is desirable to produce a firm support upon which to place the overlying granular course. The maximum thickness is required only in areas subject to severe frost or where the water table is close to the surface.

# APPENDIX 0

# STATE AND NPDES PERMITS

# STATE OF CONNECTICUT
## DEPARTMENT OF ENVIRONMENTAL PROTECTION

PERMIT

State # 83-096
DEP/WPC 151-028

MacDermid, Inc.
526 Huntingdon Avenue
Waterbury, CT 06720

Attention: F. Ray Koehler, Corporate Industrial Engineer

Re: DEP/WPC-151-028
City of Waterbury
Naugatuck River Watershed

Gentlemen:

This PERMIT is issued in accordance with Section 22a-430 of Chapter 446k of the Connecticut General Statutes, as amended. The Commissioner of Environmental Protection (hereinafter "the Commissioner") has found that the system installed for the treatment of the discharge will protect the waters of the state from pollution.

The Commissioner, acting under Section 22a-430 hereby permits MacDermid, Inc. to discharge treated chemical manufacturing wastewater and laboratory plating wastewater from the facility at 526 Huntingdon Avenue, Waterbury in accordance with the following conditions:

1) The wastewater shall be collected, pretreated and discharged in accordance with the plans and specifications approved by the Commissioner on February 9, 1978.

2) The discharges described in this permit shall not exceed and shall otherwise conform to the specific terms and general conditions specified herein:

A) Discharge Serial No. 001 (batch treatment system)
Description - Chemical Manufacturing wastewater (code 501030Z)
Discharge Location - City of Waterbury Sewerage System (DEP/WPC 151-001)
Average Daily Flow - 60,000 gallons per day

| Parameter | Code | Maximum Daily Concentration | Average Monthly Concentration |
|---|---|---|---|
| Chromium, Hexavalent | 108 | 0.2 mg/l | 0.1 mg/l |
| Chromium, Total | 109 | 2.0 mg/l | 1.0 mg/l |
| Copper | 111 | 2.0 mg/l | 1.0 mg/l |
| Iron | 113 | 5.0 mg/l | 3.0 mg/l |
| Nickel | 119 | 2.0 mg/l | 1.0 mg/l |
| Tin | 124 | 4.0 mg/l | 2.0 mg/l |
| Zinc | 127 | 2.0 mg/l | 1.0 mg/l |
| Cyanide, Amenable | 504 | 0.2 mg/l | 0.1 mg/l |
| Fluoride | 506 | 30.0 mg/l | 20.0 mg/l |
| Total Suspended Solids | 614 | 30.0 mg/l | 20.0 mg/l |

1. Record the total flow (code 626) and number of hours of operation (code 629) for the day of composite sample collection.

B) Discharge Serial No. 002

| Parameter | Code | Minimum Frequency of Sampling | Sample Type |
|---|---|---|---|
| Copper | 111 | Monthly | Daily Composite |
| Ammonia Nitrogen | 201 | Monthly | Daily Composite |
| pH | 609 | Monthly | Range during composite |

1. Record the total flow (code 626) and number of hours of operation (code 629) for the day of composite sample collection.

5) The treatment facilities or any part thereof shall not be bypassed at any time without the prior written approval of the Commissioner unless such bypass is unavoidable to prevent loss of life, personal injury or severe property damage. If any part of the waste treatment or collection facilities becomes inoperative at any time, the Water Compliance Unit shall be notified immediately during normal business hours (8:30 a.m. to 4:30 p.m. Monday through Friday), or on the next business day if the incident occurs outside these hours. A written report shall follow giving the cause of the problem, duration and corrective measures taken.

6) The disposal of screenings, sludges and other solids or oils and other liquid chemical wastes shall be at locations approved in accordance with the provisions of Chapter 446k of the Connecticut General Statutes or to waste haulers licensed under Chapter 446k of the Connecticut General Statutes.

7) Process controls or such other means or facilities as approved by the Commissioner on February 9, 1978 shall be maintained to insure that no discharge of untreated or partially treated wastewater will occur during a failure of the primary power source.

This permit is issued under Section 22a-430 and shall expire on February 18, 1990.

The permit shall be subject to all the Section 22a-430 General Conditions dated April 27, 1979 which are hereby incorporated into this permit, except as superceded by the following definitions:

A. "Average Monthly Concentration" means the average concentration of all Daily Composite samples taken in a particular month.

B. "Maximum Daily Concentration" means the maximum concentration allowed in a Daily Composite sample.

C. "Daily Composite" means a composite sample taken over a full operating day for as long as the discharge exists on that day.

D. "Composite" means a mixture of aliquot samples collected at regular intervals over a time period, proportional to flow or the sampling interval (for constant volume samples), or a sample collected continuously, proportional to flow over the same time period.

1. The pH of the discharge shall not be less than 6.0 or greater than 9.5. (code 609)

2. The maximum daily concentrations specified above shall not be exceeded by more than a factor of 1.5 at any time as determined by a grab sample.

B) Discharge Serial No. 002 (second, third and fourth washes from etchant recovery)
Description - Chemical manufacturing wastewater (code 501030Y)
Discharge Location - City of Waterbury Sewerage System (DEP/WPC-151-001)
Average Daily Flow - 4,000 gallons per day
Maximum Daily Flow - 10,500 gallons (one treated batch)
Maximum Frequency of Discharge - three times per week

| Parameter | Code | Maximum Daily Concentration | Average Monthly Concentration |
|---|---|---|---|
| Copper | 111 | 2.0 mg/l | 1.0 mg/l |

1. The pH of the discharge shall not be less than 6.0 or greater than 9.5. (code 609)

2. The maximum daily concentrations specified above shall not be exceeded by more than a factor of 1.5 at any time as determined by a grab sample.

3) This permit authorizes the discharge of wastewater as described in paragraph 2 above and in the permit application submitted by MacDermid, Inc. on June 19, 1983. The discharge of any such pollutants in quantities or concentrations greater than those so authorized, or the discharge of any other pollutant in a quantity or concentration which has or may have an adverse impact on the receiving sewerage facilities or the operation thereof is prohibited.

4) The discharges shall be monitored and results reported to the Director of Water Compliance by the 10th of each month according to the following schedule:

A) Discharge Serial No. 001

| Parameter | Code | Minimum Frequency of Sampling | Sample Type |
|---|---|---|---|
| Chromium, Hexavalent | 108 | Weekly | Daily Composite |
| Chromium, Total | 109 | Weekly | Daily Composite |
| Copper | 111 | Weekly | Daily Composite |
| Iron | 113 | Weekly | Daily Composite |
| Nickel | 119 | Weekly | Daily Composite |
| Tin | 124 | Weekly | Daily Composite |
| Zinc | 127 | Weekly | Daily Composite |
| Ammonia Nitrogen | 201 | Monthly | Daily Composite |
| Total Residual Chlorine | 503 | Monthly | Range during composite |
| Cyanide, Amenable | 504 | Weekly | Daily Composite |
| Cyanide, Total | 505 | Monthly | Daily Composite |
| Fluoride | 506 | Weekly | Daily Composite |
| Free Residual Chlorine | 510 | Monthly | Range during composite |
| pH | 609 | Weekly | Daily Composite |
| Total Suspended Solids | 614 | Weekly | Daily Composite |

The Commissioner reserves the right to make appropriate revisions to the permit in order to establish any appropriate effluent limitations, schedules of compliance or other provisions which may be authorized under the Clean Water Act in order to bring all discharges not in compliance with the Clean Water Act.

Entered as a permit of the Commissioner on February 18, 1985.

Stanley J. Pac
COMMISSIONER

State Application No. 83-096

# STATE OF CONNECTICUT
## DEPARTMENT OF ENVIRONMENTAL PROTECTION

NPDES PERMIT

MacDermid Incorporated
526 Huntingdon Avenue
Waterbury, CT 06708

Attention: Reginald H. Post, Vice President
Manufacturing

Re: DEP/WPC-151-028
City of Waterbury
Naugatuck River Watershed

Gentlemen:

This permit is authorized to be issued by Chapter 446k, Connecticut General Statutes and Section 402(b), Federal Water Pollution Control Act, as amended, 33 USC 1251, et. seq., and pursuant to an approval dated September 26, 1973, by the Administrator of the United States Environmental Protection Agency for the State of Connecticut to administer an N.P.D.E.S. permit program.

The Commissioner of Environmental Protection (hereinafter "the Commissioner") has found that the discharge will not cause pollution of the waters of the state.

The Commissioner, acting under Section 22a-430 hereby permits MacDermid Incorporated to discharge non-contact cooling water in accordance with the following conditions:

1) The wastewaters shall be discharged in accordance with the application for discharge permit filed with the Water Compliance Unit on June 29, 1983.

2) The discharge described in this permit shall not exceed and shall otherwise conform to the specific terms and general conditions specified herein:

A) Discharge Serial No. 001
Description - Non-contact cooling water (code 1/C)
Receiving Stream - Naugatuck River via storm drains
(basin code 6900)
Present/Future Water Quality Standard - C/B
Average Daily Flow - 25,000 gallons per day
Maximum Temperature - 120 degrees F.

1) The pH of the discharge shall not be less than 6.0 or greater than 9.5. (code 609)
2) The discharge shall not contain a visible oil sheen, foam or floating solids.
3) The discharge shall not cause visible discoloration of the receiving waters.
4) The temperature of the discharge shall not increase the temperature of the receiving stream above 85 degrees F. or raise the normal temperature of the receiving stream more than 4 degrees F.

3) Not discharge any new pollutant not authorized by this permit which has or may have an adverse impact on the receiving waters.

4) The discharge shall be monitored and results reported to the Director of Water Compliance by the 10th of of August according to the following schedule:

A) Discharge Serial No. 001

| Parameter | Code | Minimum Frequency of Sampling | Sample Type |
|---|---|---|---|
| Temperature | 609 | Annually | Grab |
| pH | 612 | Annually | Grab |

1) Record the total flow for the day of grab sample collection
2) The report shall include a detailed explanation of any violations of the limitations specified in paragraph 2 above.

5) The disposal of screenings, sludges and other solids or oils and other liquid chemical wastes shall be at locations approved in accordance with the provisions of Chapter 446k of the Connecticut General Statues or to waste haulers licensed under Chapter 446k of the Connecticut General Statutes.

This permit shall be considered as the permit required by Section 402 of the Federal Water Pollution Control Act and Section 22a-430 of the Connecticut General Statutes and shall expire on January 20, 1989.

The permit shall be subject to all the NPDES General Conditions dated April 27, 1979 which are hereby incorporated into this permit.

Entered as a permit of the Commissioner on January 20, 1984.

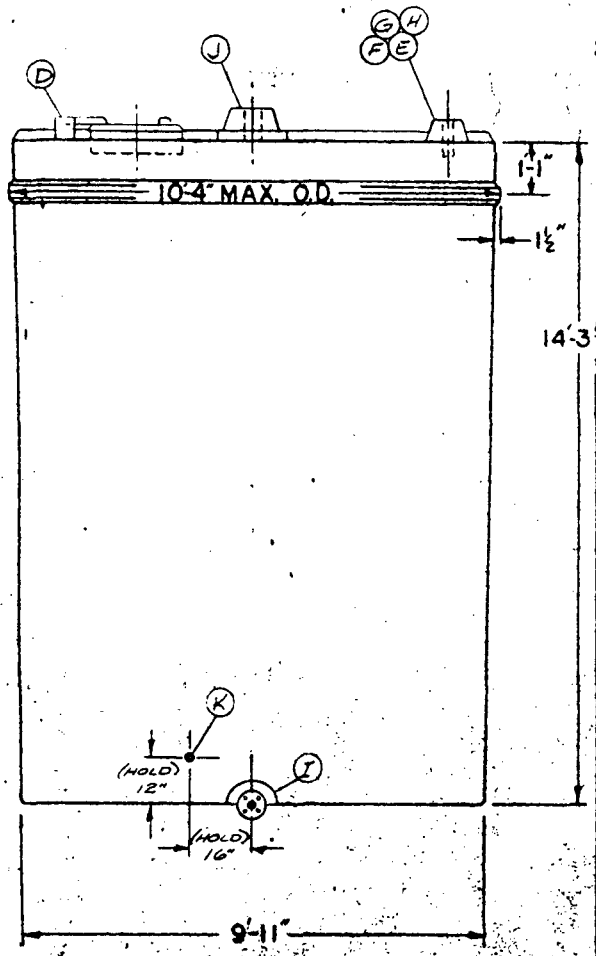
Stanley J. Pac
Stanley J. Pac
COMMISSIONER

NPDES No. CT 0024988

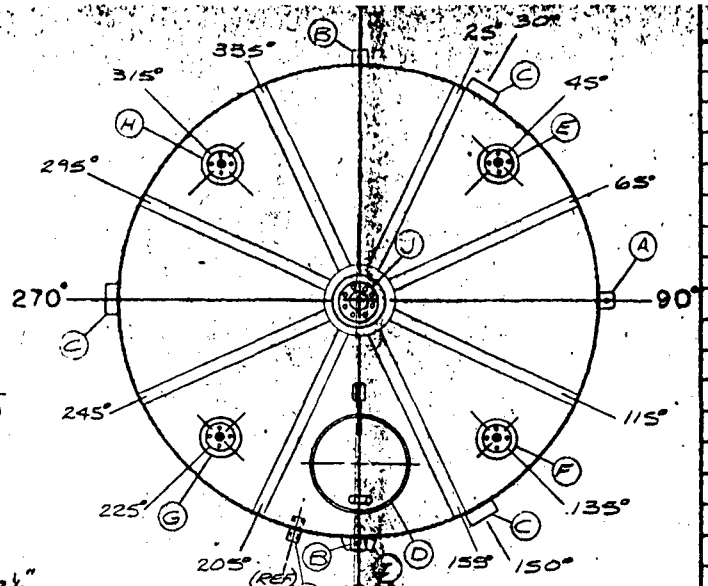
# APPENDIX P

# FRP TANKS SPECIFICATIONS

FIBERGLAS




ELEVATION ONLY




FITTING ORIENTATION

SCALE ½" = 1'

CUSTOMER: MAC DERMID, INC.

DESTINATION: WATERBURY, CT

(E.G.) SERVICE (TANK MAX. S.G. 1.3) MAC DERMIDE SPENT "CONTINUE ETCH", S.G. 1.12 @ 100°F.

| QUANTITY | MODEL | NOM. CAPACITY | APPROX. WEIGHT |
|---|---|---|---|
| 1 | 108 MACFS | 8414 GAL. | 1585 LBS |

## MODIFICATIONS & NOTES

SURFACE MAT: 20 MIL "C" GLASS

LINER RESIN: S) DERAKANE 411

WIND RESIN: ISOPHTHALIC

INSULATION:

EXTERIOR RESIN: ISOPHTHALIC W/UV ABSORBER

GEL COAT:

RIBS: 1-SHOWN ON SHELL WALL

E) FLAT RIBBED TOP

TANK HAS NOT BEEN EVALUATED FOR SEISMIC CONDITIONS

## ACCESSORIES

| MK. | ITEM | NO. | SIZE | DEGREE | RADIUS | HEIGHT |
|---|---|---|---|---|---|---|
| A | LIFT LUG (C.S.) | 2 | | 90° | | 1-TOP 1-BOT |
| B | LIFT LUG (C.S.) | 2 | | 0°, 180° | | 2-TOP |
| C | HOLD DOWN LUG (C.S.) | 3 | | 30°, 150°, 270° | | BOT. |
| D | MW HGD W/COVER | 1 | 24" | 180° | 3'-6" | TOP |
| E | FLG. NOZ CONE GUS | 1 | 2" | 45° | 4'-2" | TOP |
| F | FLG NOZ CONE GUS | 1 | 2" | 135° | 4'-2" | TOP |
| G | FLG. NOZ CONE GUS | 1 | 2" | 225° | 4'-2" | TOP |
| H | FLG NOZ CONE GUS | 1 | 2" | 315° | 4'-2" | TOP |
| I | FLG. SIDE BOT DR | 1 | 2" | 180° | | BOT |
| J | FLG. NOZ CONE GUS (FLUSH INSIDE) | 1 | 4" | | CTR. | TOP |
| K | THRD CPLG (FRP) | 1 | 1" | SHOWN | | 12" |
| L | | | | | | |
| M | | | | | | |
| N | | | | | | |
| O | | | | | | |
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DRAWING STATUS

| NO. | REVISION | DATE |
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| 1 | FAB. JD. | [illegible] |

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DRAWING NO. HA 39690

C-22-11279-R1

S.G. (93.24) - 93.34 = Cu Content

| S.G. | Cu Content | S.G. | Cu Content |
|---|---|---|---|
| 1.150 | 13.9 | 1.189 | 17.5 |
| 1.151 | 14.0 | 1.190 | 17.6 |
| 1.152 | 14.1 | 1.191 | 17.7 |
| 1.153 | 14.2 | 1.192 | 17.8 |
| 1.154 | 14.3 | 1.193 | 17.9 |
| 1.155 | 14.4 | 1.194 | 18.0 |
| 1.156 | 14.4 | 1.195 | 18.1 |
| 1.157 | 14.5 | 1.196 | 18.2 |
| 1.158 | 14.6 | 1.197 | 18.3 |
| 1.159 | 14.7 | 1.198 | 18.4 |
| 1.160 | 14.8 | 1.199 | 18.5 |
| 1.161 | 14.9 | 1.200 | 18.6 |
| 1.162 | 15.0 | 1.201 | 18.7 |
| 1.163 | 15.1 | 1.202 | 18.8 |
| 1.164 | 15.2 | 1.203 | 18.8 |
| 1.165 | 15.3 | 1.204 | 18.9 |
| 1.166 | 15.4 | 1.205 | 19.0 |
| 1.167 | 15.5 | 1.206 | 19.1 |
| 1.168 | 15.6 | 1.207 | 19.2 |
| 1.169 | 15.7 | 1.208 | 19.3 |
| 1.170 | 15.8 | 1.209 | 19.4 |
| 1.171 | 15.8 | 1.210 | 19.5 |
| 1.172 | 15.9 | 1.211 | 19.6 |
| 1.173 | 16.0 | 1.212 | 19.7 |
| 1.174 | 16.1 | 1.213 | 19.8 |
| 1.175 | 16.2 | 1.214 | 19.9 |
| 1.176 | 16.3 | 1.215 | 19.9 |
| 1.177 | 16.4 | 1.216 | 20.0 |
| 1.178 | 16.5 | 1.217 | 20.1 |
| 1.179 | 16.6 | 1.218 | 20.2 |
| 1.180 | 16.7 | 1.219 | 20.3 |
| 1.181 | 16.8 | 1.220 | 20.4 |
| 1.182 | 16.9 | 1.221 | 20.5 |
| 1.183 | 17.0 | 1.222 | 20.6 |
| 1.184 | 17.1 | 1.223 | 20.7 |
| 1.185 | 17.1 | 1.224 | 20.8 |
| 1.186 | 17.2 | 1.225 | 20.8 |
| 1.187 | 17.3 | 1.226 | 20.9 |
| 1.188 | 17.4 | 1.227 | 21.0 |

# APPENDIX Q

# CHAIN-OF-CUSTODY

HRP Associates, Inc.
167 New Britain Avenue
Plainville, Connecticut 06062

Sheet ____ of ____

# CHAIN OF CUSTODY RECORD

| Place & Address Of Collection | Samplers Name (Signature) |
|---|---|
| | Assistant(Witness)(Signature) |
| | Job Number |

| Sample Number | Sample Location | Type Container | Total Volume | Preservative | Date | Time | Sample Type Water | Soil | Air | Waste | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|
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| Relinquished By(Signature) | Received By(Signature) | Date | Time |
|---|---|---|---|
| Relinquished By(Signature) | Received By(Signature) | Date | Time |
| Relinquished By(Signature) | Received By(Signature) | Date | Time |

Name & Address Of Laboratory

## ANALYSIS REQUIRED
SAMPLE IDENTIFICATION ☒

| Parameters | Sample Number | | | | | | | | | | Parameters | Sample Number | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Al | | | | | | | | | | | $NO_2$-N | | | | | | | | | | |
| As | | | | | | | | | | | (Ortho) $PO_4$-P | | | | | | | | | | |
| Ba | | | | | | | | | | | (Total) $PO_4$-P | | | | | | | | | | |
| Ca | | | | | | | | | | | Oil & Grease | | | | | | | | | | |
| Cd | | | | | | | | | | | Phenols | | | | | | | | | | |
| $Cr^{+6}$ | | | | | | | | | | | $CN^-$-A | | | | | | | | | | |
| Cr-T | | | | | | | | | | | $CN^-$-T | | | | | | | | | | |
| Cu | | | | | | | | | | | TKN | | | | | | | | | | |
| Fe-D | | | | | | | | | | | Organic-N | | | | | | | | | | |
| Fe-T | | | | | | | | | | | TOC | | | | | | | | | | |
| Pb | | | | | | | | | | | pH | | | | | | | | | | |
| Mg | | | | | | | | | | | STD Water | | | | | | | | | | |
| Mn-D | | | | | | | | | | | Fecal Coliform | | | | | | | | | | |
| Mn-T | | | | | | | | | | | Fecal Strep. | | | | | | | | | | |
| Na | | | | | | | | | | | Total Coliform | | | | | | | | | | |
| Hg | | | | | | | | | | | Flouride | | | | | | | | | | |
| Ni | | | | | | | | | | | Chloride | | | | | | | | | | |
| Ag | | | | | | | | | | | 8010 | | | | | | | | | | |
| Se | | | | | | | | | | | 8020 | | | | | | | | | | |
| V. | | | | | | | | | | | 8060 | | | | | | | | | | |
| Zn | | | | | | | | | | | 8015 | | | | | | | | | | |
| TSS | | | | | | | | | | | TOX | | | | | | | | | | |
| TDS | | | | | | | | | | | | | | | | | | | | | |
| TS | | | | | | | | | | | | | | | | | | | | | |
| Sp Cond. | | | | | | | | | | | | | | | | | | | | | |
| $NO_3$-N | | | | | | | | | | | | | | | | | | | | | |
| Remarks | | | | | | | | | | | | | | | | | | | | | |

# APPENDIX R

# APPENDIX IX ANALYTICAL METHODS

## APPENDIX IX—GROUND-WATER MONITORING LIST [1]

### GROUND-WATER MONITORING LIST [1]

| Common name [2] | CAS RN [3] | Chemical abstracts service index name [4] | Suggested methods [5] | PQL (μg/L) [6] |
|---|---|---|---|---|
| Acenaphthene | 83-32-9 | Acenaphthylene, 1,2-dihydro- | 8100 | 200 |
| | | | 8270 | 10 |
| Acenaphthylene | 208-96-8 | Acenaphthylene | 8100 | 200 |
| | | | 8270 | 10 |
| Acetone | 67-64-1 | 2-Propanone | 8240 | 100 |
| Acetophenone | 98-86-2 | Ethanone, 1-phenyl- | 8270 | 10 |
| Acetonitrile; Methyl cyanide | 75-05-8 | Acetonitrile | 8015 | 100 |
| 2-Acetylaminofluorene; 2-AAF | 53-96-3 | Acetamide, N-9H-fluoren-2-yl- | 8270 | 10 |
| Acrolein | 107-02-8 | 2-Propenal | 8030 | 5 |
| | | | 8240 | 5 |
| Acrylonitrile | 107-13-1 | 2-Propenenitrile | 8030 | 5 |
| | | | 8240 | 5 |
| Aldrin | 309-00-2 | 1,4:5,8-Dimethanonaphthalene, 1,2,3,4,10,10-hexachloro- 1,4,4a,5,8,8a-hexahydro-(1α,4α,4aβ,5α,8α,8aβ)- | 8080 | 0.05 |
| | | | 8270 | 10 |
| Allyl chloride | 107-05-1 | 1-Propene, 3-chloro- | 8010 | 5 |
| | | | 8240 | 100 |
| 4-Aminobiphenyl | 92-67-1 | [1,1'-Biphenyl]-4-amine | 8270 | 10 |
| Aniline | 62-53-3 | Benzenamine | 8270 | 10 |
| Anthracene | 120-12-7 | Anthracene | 8100 | 200 |
| | | | 8270 | 10 |
| Antimony | (Total) | Antimony | 6010 | 300 |
| | | | 7040 | 2,000 |
| | | | 7041 | 30 |
| Aramite | 140-57-8 | Sulfurous acid, 2-chloroethyl 2-[4-(1,1-dimethylethyl)phenoxy]-1-methylethyl ester. | 8270 | 10 |
| Arsenic | (Total) | Arsenic | 6010 | 500 |
| | | | 7060 | 10 |
| | | | 7061 | 20 |
| Barium | (Total) | Barium | 6010 | 20 |
| | | | 7080 | 1,000 |
| Benzene | 71-43-2 | Benzene | 8020 | 2 |
| | | | 8240 | 5 |
| Benzo[a]anthracene; Benzanthracene. | 56-55-3 | Benz[a]anthracene | 8100 | 200 |
| | | | 8270 | 10 |
| Benzo[b]fluoranthene | 205-99-2 | Benz[e]acephenanthrylene | 8100 | 200 |
| | | | 8270 | 10 |
| Benzo[k]fluoranthene | 207-08-9 | Benzo[k]fluoranthene | 8100 | 200 |
| | | | 8270 | 10 |
| Benzo[ghi]perylene | 191-24-2 | Benzo[ghi]perylene | 8100 | 200 |
| | | | 8270 | 10 |
| Benzo[a]pyrene | 50-32-8 | Benzo[a]pyrene | 8100 | 200 |
| | | | 8270 | 10 |
| Benzyl alcohol | 100-51-6 | Benzenemethanol | 8270 | 20 |
| Beryllium | (Total) | Beryllium | 6010 | 3 |
| | | | 7090 | 50 |
| | | | 7091 | 2 |
| alpha-BHC | 319-84-6 | Cyclohexane, 1,2,3,4,5,6-hexachloro-,(1α,2α,3β,4α,5β,6β)- | 8080 | 0.05 |
| | | | 8250 | 10 |
| beta-BHC | 319-85-7 | Cyclohexane, 1,2,3,4,5,6-hexachloro-,(1α,2β,3α,4β,5α,6β)- | 8080 | 0.05 |
| | | | 8250 | 40 |
| delta-BHC | 319-86-8 | Cyclohexane, 1,2,3,4,5,6-hexachloro-,(1α,2α,3α,4β,5α,6β)- | 8080 | 0.1 |
| | | | 8250 | 30 |
| gamma-BHC; Lindane | 58-89-9 | Cyclohexane, 1,2,3,4,5,6-hexachloro-,(1α,2α,3β,4α,5α,6β)- | 8080 | 0.05 |
| | | | 8250 | 10 |
| Bis(2-chloroethoxy)methane | 111-91-1 | Ethane, 1,1'-[methylenebis (oxy)]bis[2-chloro- | 8270 | 10 |
| Bis(2-chloroethyl)ether | 111-44-4 | Ethane, 1,1'-oxybis[2-chloro- | 8270 | 10 |
| Bis(2-chloro-1-methylethyl) ether; 2,2'-Di- chlorodiisopropyl ether. | 108-60-1 | Propane, 2,2'-oxybis[1-chloro- | 8010 | 100 |
| | | | 8270 | 10 |

GROUND-WATER MONITORING LIST [1]—Continued

| Common name [2] | CAS RN [3] | Chemical abstracts service index name [4] | Suggested methods [5] | PQL (μg/L) [6] |
|---|---|---|---|---|
| Bis(2-ethylhexyl) phthalate | 117-81-7 | 1,2-Benzenedicarboxylic acid, bis(2-ethylhexyl)ester. | 8060 | 20 |
| | | | 8270 | 10 |
| Bromodichloromethane | 75-27-4 | Methane, bromodichloro- | 8010 | 1 |
| | | | 8240 | 5 |
| Bromoform; Tribromomethane | 75-25-2 | Methane, tribromo- | 8010 | 2 |
| | | | 8240 | 5 |
| 4-Bromophenyl phenyl ether | 101-55-3 | Benzene, 1-bromo-4-phenoxy- | 8270 | 10 |
| Butyl benzyl phthalate; Benzyl butyl phthalate | 85-68-7 | 1,2-Benzenedicarboxylic acid, butyl phenylmethyl ester. | 8060 | 5 |
| | | | 8270 | 10 |
| Cadmium | (Total) | Cadmium | 6010 | 40 |
| | | | 7130 | 50 |
| | | | 7131 | 1 |
| Carbon disulfide | 75-15-0 | Carbon disulfide | 8240 | 5 |
| Carbon tetrachloride | 56-23-5 | Methane, tetrachloro- | 8010 | 1 |
| | | | 8240 | 5 |
| Chlordane | 57-74-9 | 4,7-Methano-1H-indene, 1,2,4,5,6,7,8,8-octachloro-2,3,3a,4,7,7a-hexahydro-. | 8080 | 0.1 |
| | | | 8250 | 10 |
| p-Chloroaniline | 106-47-8 | Benzenamine, 4-chloro- | 8270 | 20 |
| Chlorobenzene | 108-90-7 | Benzene, chloro- | 8010 | 2 |
| | | | 8020 | 2 |
| | | | 8240 | 5 |
| Chlorobenzilate | 510-15-6 | Benzeneacetic acid, 4-chloro-α-(4-chlorophenyl)-α-hydroxy-, ethyl ester. | 8270 | 10 |
| p-Chloro-m-cresol | 59-50-7 | Phenol, 4-chloro-3-methyl- | 8040 | 5 |
| | | | 8270 | 20 |
| Chloroethane; Ethyl chloride | 75-00-3 | Ethane, chloro- | 8010 | 5 |
| | | | 8240 | 10 |
| Chloroform | 67-66-3 | Methane, trichloro- | 8010 | 0.5 |
| | | | 8240 | 5 |
| 2-Chloronaphthalene | 91-58-7 | Naphthalene, 2-chloro- | 8120 | 10 |
| | | | 8270 | 10 |
| 2-Chlorophenol | 95-57-8 | Phenol, 2-chloro- | 8040 | 5 |
| | | | 8270 | 10 |
| 4-Chlorophenyl phenyl ether | 7005-72-3 | Benzene, 1-chloro-4-phenoxy- | 8270 | 10 |
| Chloroprene | 126-99-8 | 1,3-Butadiene, 2-chloro- | 8010 | 50 |
| | | | 8240 | 5 |
| Chromium | (Total) | Chromium | 6010 | 70 |
| | | | 7190 | 500 |
| | | | 7191 | 10 |
| Chrysene | 218-01-9 | Chrysene | 8100 | 200 |
| | | | 8270 | 10 |
| Cobalt | (Total) | Cobalt | 6010 | 70 |
| | | | 7200 | 500 |
| | | | 7201 | 10 |
| Copper | (Total) | Copper | 6010 | 60 |
| | | | 7210 | 200 |
| m-Cresol | 108-39-4 | Phenol, 3-methyl- | 8270 | 10 |
| o-Cresol | 95-48-7 | Phenol, 2-methyl- | 8270 | 10 |
| p-Cresol | 106-44-5 | Phenol, 4-methyl- | 8270 | 10 |
| Cyanide | 57-12-5 | Cyanide | 9010 | 40 |
| 2,4-D; 2,4-Dichlorophenoxyacetic acid. | 94-75-7 | Acetic acid, (2,4-dichlorophenoxy)- | 8150 | 10 |
| 4,4'-DDD | 72-54-8 | Benzene 1,1'-(2,2-dichloroethylidene)bis[4-chloro- | 8080 | 0.1 |
| | | | 8270 | 10 |
| 4,4'-DDE | 72-55-9 | Benzene, 1,1'-(dichloroethenylidene)bis[4-chloro- | 8080 | 0.05 |
| | | | 8270 | 10 |
| 4,4'-DDT | 50-29-3 | Benzene, 1,1'-(2,2,2-trichloroethylidene)bis[4-chloro-. | 8080 | 0.1 |
| | | | 8270 | 10 |
| Diallate | 2303-16-4 | Carbamothioic acid, bis(1-methylethyl)- , S- (2,3-dichloro-2-propenyl) ester. | 8270 | 10 |
| Dibenz[a,h]anthracene | 53-70-3 | Dibenz[a,h]anthracene | 8100 | 200 |
| | | | 8270 | 10 |
| Dibenzofuran | 132-64-9 | Dibenzofuran | 8270 | 10 |
| Dibromochloromethane; Chlorodibromomethane | 124-48-1 | Methane, dibromochloro- | 8010 | 1 |
| | | | 8240 | 5 |
| 1,2-Dibromo-3-chloropropane; DBCP. | 96-12-8 | Propane, 1,2-dibromo-3-chloro- | 8010 | 100 |
| | | | 8240 | 5 |
| | | | 8270 | 10 |

GROUND-WATER MONITORING LIST [1]—Continued

| Common name [2] | CAS RN [3] | Chemical abstracts service index name [4] | Suggested methods [5] | PQL (μg/L) [6] |
|---|---|---|---|---|
| 1,2-Dibromoethane; Ethylene dibromide. | 106-93-4 | Ethane, 1,2-dibromo- | 8010 | 10 |
| | | | 8240 | 5 |
| Di-n-butyl phthalate | 84-74-2 | 1,2-Benzenedicarboxylic acid, dibutyl ester | 8060 | 5 |
| | | | 8270 | 10 |
| o-Dichlorobenzene | 95-50-1 | Benzene, 1,2-dichloro- | 8010 | 2 |
| | | | 8020 | 5 |
| | | | 8120 | 10 |
| | | | 8270 | 10 |
| m-Dichlorobenzene | 541-73-1 | Benzene, 1,3-dichloro- | 8010 | 5 |
| | | | 8020 | 5 |
| | | | 8120 | 10 |
| | | | 8270 | 10 |
| p-Dichlorobenzene | 106-46-7 | Benzene, 1,4-dichloro- | 8010 | 2 |
| | | | 8020 | 5 |
| | | | 8120 | 15 |
| | | | 8270 | 10 |
| 3,3'-Dichlorobenzidine | 91-94-1 | [1,1'-Biphenyl]-4,4'-diamine, 3,3'-dichloro- | 8270 | 20 |
| trans-1,4-Dichloro-2-butene | 110-57-6 | 2-Butene, 1,4-dichloro-, (E)- | 8240 | 5 |
| Dichlorodifluoromethane | 75-71-8 | Methane, dichlorodifluoro- | 8010 | 10 |
| | | | 8240 | 5 |
| 1,1-Dichloroethane | 75-34-3 | Ethane, 1,1-dichloro- | 8010 | 1 |
| | | | 8240 | 5 |
| 1,2-Dichloroethane; Ethylene dichloride. | 107-06-2 | Ethane, 1,2-dichloro- | 8010 | 0.5 |
| | | | 8240 | 5 |
| 1,1-Dichloroethylene; Vinylidene chloride. | 75-35-4 | Ethene, 1,1-dichloro- | 8010 | 1 |
| | | | 8240 | 5 |
| trans-1,2-Dichloroethylene | 156-60-5 | Ethene, 1,2-dichloro-, (E)- | 8010 | 1 |
| | | | 8240 | 5 |
| 2,4-Dichlorophenol | 120-83-2 | Phenol, 2,4-dichloro- | 8040 | 5 |
| | | | 8270 | 10 |
| 2,6-Dichlorophenol | 87-65-0 | Phenol, 2,6-dichloro- | 8270 | 10 |
| 1,2-Dichloropropane | 78-87-5 | Propane, 1,2-dichloro- | 8010 | 0.5 |
| | | | 8240 | 5 |
| cis-1,3-Dichloropropene | 10061-01-5 | 1-Propene, 1,3-dichloro-, (Z)- | 8010 | 20 |
| | | | 8240 | 5 |
| trans-1,3-Dichloropropene | 10061-02-6 | 1-Propene, 1,3-dichloro-, (E)- | 8010 | 5 |
| | | | 8240 | 5 |
| Dieldrin | 60-57-1 | 2,7:3,6-Dimethanonaphth[2,3-b]oxirene, 3,4,5,6,9,9-hexachloro-1a,2,2a,3,6,6a,7,7a-octahydro-, (1aα,2β,2aα,3β,6β,6aα,7β,7aα)- | 8080 | 0.05 |
| | | | 8270 | 10 |
| Diethyl phthalate | 84-66-2 | 1,2-Benzenedicarboxylic acid, diethyl ester | 8060 | 5 |
| | | | 8270 | 10 |
| O,O-Diethyl O-2-pyrazinyl phosphorothioate; Thionazin | 297-97-2 | Phosphorothioic acid, O,O-diethyl O-pyrazinyl ester. | 8270 | 10 |
| Dimethoate | 60-51-5 | Phosphorodithioic acid, O,O-dimethyl S-[2-(methylamino)-2-oxoethyl] ester. | 8270 | 10 |
| p-(Dimethylamino)azobenzene | 60-11-7 | Benzenamine, N,N-dimethyl-4-(phenylazo)- | 8270 | 10 |
| 7,12-Dimethylbenz[a]anthracene | 57-97-6 | Benz[a]anthracene, 7,12-dimethyl- | 8270 | 10 |
| 3,3'-Dimethylbenzidine | 119-93-7 | [1,1'-Biphenyl]-4,4'-diamine, 3,3'-dimethyl- | 8270 | 10 |
| alpha, alpha-Dimethylphenethylamine. | 122-09-8 | Benzeneethanamine, α,α-dimethyl- | 8270 | 10 |
| 2,4-Dimethylphenol | 105-67-9 | Phenol, 2,4-dimethyl- | 8040 | 5 |
| | | | 8270 | 10 |
| Dimethyl phthalate | 131-11-3 | 1,2-Benzenedicarboxylic acid, dimethyl ester | 8060 | 5 |
| | | | 8270 | 10 |
| m-Dinitrobenzene | 99-65-0 | Benzene, 1,3-dinitro- | 8270 | 10 |
| 4,6-Dinitro-o-cresol | 534-52-1 | Phenol, 2-methyl-4,6-dinitro- | 8040 | 150 |
| | | | 8270 | 50 |
| 2,4-Dinitrophenol | 51-28-5 | Phenol, 2,4-dinitro- | 8040 | 150 |
| | | | 8270 | 50 |
| 2,4-Dinitrotoluene | 121-14-2 | Benzene, 1-methyl-2,4-dinitro- | 8090 | 0.2 |
| | | | 8270 | 10 |
| 2,6-Dinitrotoluene | 606-20-2 | Benzene, 2-methyl-1,3-dinitro- | 8090 | 0.1 |
| | | | 8270 | 10 |
| Dinoseb; DNBP; 2-sec-Butyl-4,6-dinitrophenol | 88-85-7 | Phenol, 2-(1-methylpropyl)-4,6-dinitro- | 8150 | 1 |
| | | | 8270 | 10 |
| Di-n-octyl phthalate | 117-84-0 | 1,2-Benzenedicarboxylic acid, dioctyl ester | 8060 | 30 |
| | | | 8270 | 10 |

GROUND-WATER MONITORING LIST [1]—Continued

| Common name [2] | CAS RN [3] | Chemical abstracts service index name [4] | Suggested methods [5] | PQL (μg/L) [6] |
|---|---|---|---|---|
| 1,4-Dioxane | 123-91-1 | 1,4-Dioxane | 8015 | 150 |
| Diphenylamine | 122-39-4 | Benzenamine, N-phenyl- | 8270 | 10 |
| Disulfoton | 298-04-4 | Phosphorodithioic acid, O,O-diethyl S-[2-(ethylthio)ethyl]ester | 8140<br>8270 | 2<br>10 |
| Endosulfan I | 959-98-8 | 6,9-Methano-2,4,3-benzodioxathiepin, 6,7,8,9,10,10-hexachloro-1,5,5a,6,9,9a-hexahydro-, 3-oxide, (3α,5aβ,6α,9α,9aβ)-. | 8080<br>8250 | 0.1<br>10 |
| Endosulfan II | 33213-65-9 | 6,9-Methano-2,4,3-benzodioxathiepin, 6,7,8,9,10,10-hexachloro- 1,5,5a,6,9,9a-hexahydro-, 3-oxide, (3α,5aα,6β,9β,9aα)- | 8080 | 0.05 |
| Endosulfan sulfate | 1031-07-8 | 6,9-Methano-2,4,3-benzodioxathiepin, 6,7,8,9,10,10-hexachloro- 1,5,5a,6,9,9a-hexahydro-, 3,3-dioxide. | 8080<br>8270 | 0.5<br>10 |
| Endrin | 72-20-8 | 2,7:3,6-Dimethanonaphth[2,3-b]oxirene, 3,4,5,6,9,9-hexachloro-1a,2,2a,3,6,6a,7,7a-octahydro-, (1aα, 2β,2aβ,3α,6α, 6aβ,7β,7aα)- | 8080<br>8250 | 0.1<br>10 |
| Endrin aldehyde | 7421-93-4 | 1,2,4-Methenocyclopenta[cd]pentalene-5-carboxaldehyde, 2,2a,3,3,4,7-hexachlorodecahydro-, (1α,2β,2aβ,4β,4aβ,5β,6aβ,6bβ,7R*)- | 8080<br>8270 | 0.2<br>10 |
| Ethylbenzene | 100-41-4 | Benzene, ethyl- | 8020<br>8240 | 2<br>5 |
| Ethyl methacrylate | 97-63-2 | 2-Propenoic acid, 2-methyl-, ethyl ester | 8015<br>8240<br>8270 | 10<br>5<br>10 |
| Ethyl methanesulfonate | 62-50-0 | Methanesulfonic acid, ethyl ester | 8270 | 10 |
| Famphur | 52-85-7 | Phosphorothioic acid, O-[4-[(dimethylamino)sulfonyl]phenyl]-O,O-dimethyl ester. | 8270 | 10 |
| Fluoranthene | 206-44-0 | Fluoranthene | 8100<br>8270 | 200<br>10 |
| Fluorene | 86-73-7 | 9H-Fluorene | 8100<br>8270 | 200<br>10 |
| Heptachlor | 76-44-8 | 4,7-Methano-1H-indene, 1,4,5,6,7,8,8-heptachloro-3a,4,7,7a-tetrahydro- | 8080<br>8270 | 0.05<br>10 |
| Heptachlor epoxide | 1024-57-3 | 2,5-Methano-2H-indeno[1,2-b]oxirene, 2,3,4,5,6,7,7-heptachloro-1a,1b,5,5a,6,6a,-hexahydro-, (1aα,1bβ,2α,5α,5aβ,6β,6aα) | 8080<br>8270 | 1<br>10 |
| Hexachlorobenzene | 118-74-1 | Benzene, hexachloro- | 8120<br>8270 | 0.5<br>10 |
| Hexachlorobutadiene | 87-68-3 | 1,3-Butadiene, 1,1,2,3,4,4-hexachloro- | 8120<br>8270 | 5<br>10 |
| Hexachlorocyclopentadiene | 77-47-4 | 1,3-Cyclopentadiene, 1,2,3,4,5,5-hexachloro- | 8120<br>8270 | 5<br>10 |
| Hexachloroethane | 67-72-1 | Ethane, hexachloro- | 8120<br>8270 | 0.5<br>10 |
| Hexachlorophene | 70-30-4 | Phenol, 2,2'-methylenebis[3,4,6-trichloro- | 8270 | 10 |
| Hexachloropropene | 1888-71-7 | 1-Propene, 1,1,2,3,3,3-hexachloro- | 8270 | 10 |
| 2-Hexanone | 591-78-6 | 2-Hexanone | 8240 | 50 |
| Indeno(1,2,3-cd)pyrene | 193-39-5 | Indeno[1,2,3-cd]pyrene | 8100<br>8270 | 200<br>10 |
| Isobutyl alcohol | 78-83-1 | 1-Propanol, 2-methyl- | 8015 | 50 |
| Isodrin | 465-73-6 | 1,4,5,8-Dimethanonaphthalene,1,2,3,4,10,10-hexachloro-1,4,4a,5,8,8a hexahydro-(1α,4α,4aβ,5β,8β,8aβ)-. | 8270 | 10 |
| Isophorone | 78-59-1 | 2-Cyclohexen-1-one, 3,5,5-trimethyl- | 8090<br>8270 | 60<br>10 |
| Isosafrole | 120-58-1 | 1,3-Benzodioxole, 5-(1-propenyl)- | 8270 | 10 |
| Kepone | 143-50-0 | 1,3,4-Metheno-2H-cyclobuta- [cd]pentalen-2-one, 1,1a,3,3a,4,5,5,5a,5b,6-decachlorooctahydro- | 8270 | 10 |
| Lead | (Total) | Lead | 6010<br>7420<br>7421 | 40<br>1,000<br>10 |
| Mercury | (Total) | Mercury | 7470 | 2 |
| Methacrylonitrile | 126-98-7 | 2-Propenenitrile, 2-methyl- | 8015<br>8240 | 5<br>5 |
| Methapyrilene | 91-80-5 | 1,2,Ethanediamine, N,N-dimethyl-N'-2-pyridinyl-N'-(2-thienylmethyl)-. | 8270 | 10 |

GROUND-WATER MONITORING LIST [1]—Continued

| Common name [2] | CAS RN [3] | Chemical abstracts service index name [4] | Suggested methods [5] | PQL (µg/L) [6] |
|---|---|---|---|---|
| Methoxychlor | 72-43-5 | Benzene, 1,1'-(2,2,2,trichloroethylidene)bis[4-methoxy-. | 8080 | 2 |
| | | | 8270 | 10 |
| Methyl bromide; Bromomethane | 74-83-9 | Methane, bromo- | 8010 | 20 |
| | | | 8240 | 10 |
| Methyl chloride; Chloromethane | 74-87-3 | Methane, chloro- | 8010 | 1 |
| | | | 8240 | 10 |
| 3-Methylcholanthrene | 56-49-5 | Benz[j]aceanthrylene, 1,2-dihydro-3-methyl- | 8270 | 10 |
| Methylene bromide; Dibromomethane. | 74-95-3 | Methane, dibromo- | 8010 | 15 |
| | | | 8240 | 5 |
| Methylene chloride; Dichloromethane. | 75-09-2 | Methane, dichloro- | 8010 | 5 |
| | | | 8240 | 5 |
| Methyl ethyl ketone; MEK | 78-93-3 | 2-Butanone | 8015 | 10 |
| | | | 8240 | 100 |
| Methyl iodide; Iodomethane | 74-88-4 | Methane, iodo- | 8010 | 40 |
| | | | 8240 | 5 |
| Methyl methacrylate | 80-62-6 | 2-Propenoic acid, 2-methyl-, methyl ester | 8015 | 2 |
| | | | 8240 | 5 |
| Methyl methanesulfonate | 66-27-3 | Methanesulfonic acid, methyl ester | 8270 | 10 |
| 2-Methylnaphthalene | 91-57-6 | Naphthalene, 2-methyl- | 8270 | 10 |
| Methyl parathion; Parathion methyl | 298-00-0 | Phosphorothioic acid, O,O-dimethyl O-(4-nitrophenyl) ester. | 8140 | 0.5 |
| | | | 8270 | 10 |
| 4-Methyl-2-pentanone; Methyl isobutyl ketone. | 108-10-1 | 2-Pentanone, 4-methyl- | 8015 | 5 |
| | | | 8240 | 50 |
| Naphthalene | 91-20-3 | Naphthalene | 8100 | 200 |
| | | | 8270 | 10 |
| 1,4-Naphthoquinone | 130-15-4 | 1,4-Naphthalenedione | 8270 | 10 |
| 1-Naphthylamine | 134-32-7 | 1-Naphthalenamine | 8270 | 10 |
| 2-Naphthylamine | 91-59-8 | 2-Naphthalenamine | 8270 | 10 |
| Nickel | (Total) | Nickel | 6010 | 50 |
| | | | 7520 | 400 |
| o-Nitroaniline | 88-74-4 | Benzenamine, 2-nitro- | 8270 | 50 |
| m-Nitroaniline | 99-09-2 | Benzenamine, 3-nitro- | 8270 | 50 |
| p-Nitroaniline | 100-01-6 | Benzenamine, 4-nitro- | 8270 | 50 |
| Nitrobenzene | 98-95-3 | Benzene, nitro- | 8090 | 40 |
| | | | 8270 | 10 |
| o-Nitrophenol | 88-75-5 | Phenol, 2-nitro- | 8040 | 5 |
| | | | 8270 | 10 |
| p-Nitrophenol | 100-02-7 | Phenol, 4-nitro- | 8040 | 10 |
| | | | 8270 | 50 |
| 4-Nitroquinoline 1-oxide | 56-57-5 | Quinoline, 4-nitro-, 1-oxide | 8270 | 10 |
| N-Nitrosodi-n-butylamine | 924-16-3 | 1-Butanamine, N-butyl-N-nitroso- | 8270 | 10 |
| N-Nitrosodiethylamine | 55-18-5 | Ethanamine, N-ethyl-N-nitroso- | 8270 | 10 |
| N-Nitrosodimethylamine | 62-75-9 | Methanamine, N-methyl-N-nitroso- | 8270 | 10 |
| N-Nitrosodiphenylamine | 86-30-6 | Benzenamine, N-nitroso-N-phenyl- | 8270 | 10 |
| N-Nitrosodipropylamine; Di-n-propylnitrosamine. | 621-64-7 | 1-Propanamine, N-nitroso-N-propyl- | 8270 | 10 |
| N-Nitrosomethylethylamine | 10595-95-6 | Ethanamine, N-methyl-N-nitroso- | 8270 | 10 |
| N-Nitrosomorpholine | 59-89-2 | Morpholine, 4-nitroso- | 8270 | 10 |
| N-Nitrosopiperidine | 100-75-4 | Piperidine, 1-nitroso- | 8270 | 10 |
| N-Nitrosopyrrolidine | 930-55-2 | Pyrrolidine, 1-nitroso- | 8270 | 10 |
| 5-Nitro-o-toluidine | 99-55-8 | Benzenamine, 2-methyl-5-nitro- | 8270 | 10 |
| Parathion | 56-38-2 | Phosphorothioic acid, O,O-diethyl-O-(4-nitrophenyl) ester | 8270 | 10 |
| Polychlorinated biphenyls; PCBs | See Note 7 | 1,1'-Biphenyl, chloro derivatives | 8080 | 50 |
| | | | 8250 | 100 |
| Polychlorinated dibenzo-p-dioxins; PCDDs. | See Note 8 | Dibenzo[b,e][1,4]dioxin, chloro derivatives | 8280 | 0.01 |
| Polychlorinated dibenzofurans; PCDFs. | See Note 9 | Dibenzofuran, chloro derivatives | 8280 | 0.01 |
| Pentachlorobenzene | 608-93-5 | Benzene, pentachloro- | 8270 | 10 |
| Pentachloroethane | 76-01-7 | Ethane, pentachloro- | 8240 | 5 |
| | | | 8270 | 10 |
| Pentachloronitrobenzene | 82-68-8 | Benzene, pentachloronitro- | 8270 | 10 |
| Pentachlorophenol | 87-86-5 | Phenol, pentachloro- | 8040 | 5 |
| | | | 8270 | 50 |
| Phenacetin | 62-44-2 | Acetamide, N-(4-ethoxyphenyl) | 8270 | 10 |
| Phenanthrene | 85-01-8 | Phenanthrene | 8100 | 200 |
| | | | 8270 | 10 |

GROUND-WATER MONITORING LIST [1]—Continued

| Common name [2] | CAS RN [3] | Chemical abstracts service index name [4] | Suggested methods [5] | PQL (μg/L) [6] |
|---|---|---|---|---|
| Phenol | 108-95-2 | Phenol | 8040 | 1 |
| | | | 8270 | 10 |
| p-Phenylenediamine | 106-50-3 | 1,4-Benzenediamine | 8270 | 10 |
| Phorate | 298-02-2 | Phosphorodithioic acid, O,O-diethyl S-[(ethylthio)methyl] ester | 8140 | 2 |
| | | | 8270 | 10 |
| 2-Picoline | 109-06-8 | Pyridine, 2-methyl- | 8240 | 5 |
| | | | 8270 | 10 |
| Pronamide | 23950-58-5 | Benzamide, 3,5-dichloro-N-(1,1-dimethyl-2-propynyl)-. | 8270 | 10 |
| Propionitrile; Ethyl cyanide | 107-12-0 | Propanenitrile | 8015 | 60 |
| | | | 8240 | 5 |
| Pyrene | 129-00-0 | Pyrene | 8100 | 200 |
| | | | 8270 | 10 |
| Pyridine | 110-86-1 | Pyridine | 8240 | 5 |
| | | | 8270 | 10 |
| Safrole | 94-59-7 | 1,3-Benzodioxole, 5-(2-propenyl)- | 8270 | 10 |
| Selenium | (Total) | Selenium | 6010 | 750 |
| | | | 7740 | 20 |
| | | | 7741 | 20 |
| Silver | (Total) | Silver | 6010 | 70 |
| | | | 7760 | 100 |
| Silvex; 2,4,5-TP | 93-72-1 | Propanoic acid, 2-(2,4,5-trichlorophenoxy)- | 8150 | 2 |
| Styrene | 100-42-5 | Benzene, ethenyl- | 8020 | 1 |
| | | | 8240 | 5 |
| Sulfide | 18496-25-8 | Sulfide | 9030 | 10,000 |
| 2,4,5-T; 2,4,5-Trichlorophenoxyacetic acid. | 93-76-5 | Acetic acid, (2,4,5-trichlorophenoxy)- | 8150 | 2 |
| 2,3,7,8-TCDD; 2,3,7,8-Tetrachlorodibenzo-p-dioxin | 1746-01-6 | Dibenzo[b,e][1,4]dioxin, 2,3,7,8-tetrachloro- | 8280 | 0.005 |
| 1,2,4,5-Tetrachlorobenzene | 95-94-3 | Benzene, 1,2,4,5-tetrachloro- | 8270 | 10 |
| 1,1,1,2-Tetrachloroethane | 630-20-6 | Ethane, 1,1,1,2-tetrachloro- | 8010 | 5 |
| | | | 8240 | 5 |
| 1,1,2,2-Tetrachloroethane | 79-34-5 | Ethane, 1,1,2,2-tetrachloro- | 8010 | 0.5 |
| | | | 8240 | 5 |
| Tetrachloroethylene; Perchloroethylene; Tetrachloroethene. | 127-18-4 | Ethene, tetrachloro- | 8010 | 0.5 |
| | | | 8240 | 5 |
| 2,3,4,6-Tetrachlorophenol | 58-90-2 | Phenol, 2,3,4,6-tetrachloro- | 8270 | 10 |
| Tetraethyl dithiopyrophosphate; Sulfotepp. | 3689-24-5 | Thiodiphosphoric acid ($[(HO)_2P(S)]_2O$), tetraethyl ester | 8270 | 10 |
| Thallium | (Total) | Thallium | 6010 | 400 |
| | | | 7840 | 1,000 |
| | | | 7841 | 10 |
| Tin | (Total) | Tin | 7870 | 8,000 |
| Toluene | 108-88-3 | Benzene, methyl- | 8020 | 2 |
| | | | 8240 | 5 |
| o-Toluidine | 95-53-4 | Benzenamine, 2-methyl- | 8270 | 10 |
| Toxaphene | 8001-35-2 | Toxaphene | 8080 | 2 |
| | | | 8250 | 10 |
| 1,2,4-Trichlorobenzene | 120-82-1 | Benzene, 1,2,4-trichloro- | 8270 | 10 |
| 1,1,1-Trichloroethane; Methylchloroform. | 71-55-6 | Ethane, 1,1,1-trichloro- | 8240 | 5 |
| 1,1,2-Trichloroethane | 79-00-5 | Ethane, 1,1,2-trichloro- | 8010 | 0.2 |
| | | | 8240 | 5 |
| Trichloroethylene; Trichloroethene | 79-01-6 | Ethene, trichloro- | 8010 | 1 |
| | | | 8240 | 5 |
| Trichlorofluoromethane | 75-69-4 | Methane, trichlorofluoro- | 8010 | 10 |
| | | | 8240 | 5 |
| 2,4,5-Trichlorophenol | 95-95-4 | Phenol, 2,4,5-trichloro- | 8270 | 10 |
| 2,4,6-Trichlorophenol | 88-06-2 | Phenol, 2,4,6-trichloro- | 8040 | 5 |
| | | | 8270 | 10 |
| 1,2,3-Trichloropropane | 96-18-4 | Propane, 1,2,3-trichloro- | 8010 | 10 |
| | | | 8240 | 5 |
| O,O,O-Triethyl phosphorothioate | 126-68-1 | Phosphorothioic acid, O,O,O-triethyl ester | 8270 | 10 |
| sym-Trinitrobenzene | 99-35-4 | Benzene, 1,3,5-trinitro- | 8270 | 10 |
| Vanadium | (Total) | Vanadium | 6010 | 80 |
| | | | 7910 | 2,000 |
| | | | 7911 | 40 |
| Vinyl acetate | 108-05-4 | Acetic acid, ethenyl ester | 8240 | 5 |

GROUND-WATER MONITORING LIST [1]—Continued

| Common name [2] | CAS RN [3] | Chemical abstracts service index name [4] | Suggested methods [5] | PQL (μg/L) [6] |
|---|---|---|---|---|
| Vinyl chloride | 75-01-4 | Ethene, chloro- | 8010 | 2 |
| | | | 8240 | 10 |
| Xylene (total) | 1330-20-7 | Benzene, dimethyl- | 8020 | 5 |
| | | | 8240 | 5 |
| Zinc | (Total) | Zinc | 6010 | 20 |
| | | | 7950 | 50 |

[1] The regulatory requirements pertain only to the list of substances; the right hand columns (Methods and PQL) are given for informational purposes only. See also footnotes 5 and 6.

[2] Common names are those widely used in government regulations, scientific publications, and commerce; synonyms exist for many chemicals.

[3] Chemical Abstracts Service registry number. Where "Total" is entered, all species in the ground water that contain this element are included.

[4] CAS index names are those used in the 9th Cumulative Index.

[5] Suggested Methods refer to analytical procedure numbers used in EPA Report SW-846 "Test Methods for Evaluating Solid Waste", third edition, November 1986. Analytical details can be found in SW-846 and in documentation on file at the agency. CAUTION: The methods listed are representative SW-846 procedures and may not always be the most suitable method(s) for monitoring an analyte under the regulations.

[6] Practical Quantitation Limits (PQLs) are the lowest concentrations of analytes in ground waters that can be reliably determined within specified limits of precision and accuracy by the indicated methods under routine laboratory operating conditions. The PQLs listed are generally stated to one significant figure. CAUTION: The PQL values in many cases are based only on a general estimate for the method and not on a determination for individual compounds; PQLs are not a part of the regulation.

[7] Polychlorinated biphenyls (CAS RN 1336-36-3); this category contains congener chemicals, including constituents of Aroclor-1016 (CAS RN 12674-11-2), Aroclor-1221 (CAS RN 11104-28-2), Aroclor-1232 (CAS RN 11141-16-5), Aroclor-1242 (CAS RN 53469-21-9), Aroclor-1248 (CAS RN 12672-29-6), Aroclor-1254 (CAS RN 11097-69-1), and Aroclor-1260 (CAS RN 11096-82-5). The PQL shown is an average value for PCB congeners.

[8] This category contains congener chemicals, including tetrachlorodibenzo-p-dioxins (see also 2,3,7,8-TCDD), pentachlorodibenzo-p-dioxins, and hexachlorodibenzo-p-dioxins. The PQL shown is an average value for PCDD congeners.

[9] This category contains congener chemicals, including tetrachlorodibenzofurans, pentachlorodibenzofurans, and hexachlorodibenzofurans. The PQL shown is an average value for PCDF congeners.

[52 FR 25947, July 9, 1987]

# APPENDIX S

# STATISTICAL ANALYSIS

CHAPTER NINE

SAMPLING PLAN

## 9.1 DESIGN AND DEVELOPMENT

The initial -- and perhaps most critical -- element in a program designed to evaluate the physical and chemical properties of a solid waste is the plan for sampling the waste. It is understandable that analytical studies, with their sophisticated instrumentation and high cost, are often perceived as the dominant element in a waste characterization program. Yet, despite that sophistication and high cost, analytical data generated by a scientifically defective sampling plan have limited utility, particularly in the case of regulatory proceedings.

This section of the manual addresses the development and implementation of a scientifically credible sampling plan for a solid waste and the documentation of the chain of custody for such a plan. The information presented in this section is relevant to the sampling of any solid waste, which has been defined by the EPA in its regulations for the identification and listing of hazardous wastes to include solid, semisolid, liquid, and contained gaseous materials. However, the physical and chemical diversity of those materials, as well as the dissimilarity of storage facilities (lagoons, open piles, tanks, drums, etc.) and sampling equipment associated with them, preclude a detailed consideration of any specific sampling plan. Consequently, because the burden of responsibility for developing a technically sound sampling plan rests with the waste producer, it is advisable that he/she seek competent advice before designing a plan. This is particularly true in the early developmental stages of a sampling plan, at which time at least a basic understanding of applied statistics is required. Applied statistics is the science of employing techniques that allow the uncertainty of inductive inferences (general conclusions based on partial knowledge) to be evaluated.

### 9.1.1 Development of Appropriate Sampling Plans

An appropriate sampling plan for a solid waste must be responsive to both regulatory and scientific objectives. Once those objectives have been clearly identified, a suitable sampling strategy, predicated upon fundamental statistical concepts, can be developed. The statistical terminology associated with those concepts is reviewed in Table 9-1; Student's "t" values for use in the statistics of Table 9-1 appear in Table 9-2.

#### 9.1.1.1 Regulatory and Scientific Objectives

The EPA, in its hazardous waste management system, has required that certain solid wastes be analyzed for physical and chemical properties. It is mostly chemical properties that are of concern, and, in the case of a number of chemical contaminants, the EPA has promulgated levels (regulatory thresholds) that cannot be equaled or exceeded. The regulations pertaining to the management of hazardous wastes contain three references regarding the

TABLE 9-1. BASIC STATISTICAL TERMINOLOGY APPLICABLE TO SAMPLING PLANS FOR SOLID WASTES

| Terminology | Symbol | Mathematical equation | (Equation) |
|---|---|---|---|
| • Variable (e.g., barium or endrin) | $x$ | — | |
| • Individual measurement of variable | $x_i$ | — | |
| • Mean of all possible measurements of variable (population mean) | $\mu$ | $\mu = \frac{\sum_{i=1}^{N} x_i}{N}$, with N = number of possible measurements | (1) |
| • Mean of measurements generated by sample (sample mean) | $\bar{x}$ | <u>Simple random sampling and systematic random sampling</u> | |
| | | $\bar{x} = \frac{\sum_{i=1}^{n} x_i}{n}$, with n = number of sample measurements | (2a) |
| | | <u>Stratified random sampling</u> | |
| | | $\bar{x} = \sum_{k=1}^{r} W_k \bar{x}_k$, with $\bar{x}_k$ = stratum mean and $W_k$ = fraction of population represented by Stratum k (number of strata [k] range from 1 to r) | (2b) |
| • Variance of sample | $s^2$ | <u>Simple random sampling and systematic random sampling</u> | |
| | | $s^2 = \frac{\sum_{i=1}^{n} x_i^2 - (\sum_{i=1}^{n} x_i)^2/n}{n - 1}$ | (3a) |
| | | <u>Stratified random sampling</u> | |
| | | $s^2 = \sum_{k=1}^{r} W_k s_k^2$, with $s_k^2$ = stratum variance and $W_k$ = fraction of population represent by Stratum k (number of strata [k] ranges from 1 to r) | (3b) |

TABLE 9-1. (Continued)

| Terminology | Symbol | Mathematical equation | (Equation) |
|---|---|---|---|
| • Standard deviation of sample | s | $s = \sqrt{s^2}$ | (4) |
| • Standard error (also standard error of mean and standard deviation of mean) of sample | $s_{\bar{x}}$ | $s_{\bar{x}} = \frac{s}{\sqrt{n}}$ | (5) |
| • Confidence interval for $\mu$[a] | CI | $CI = \bar{X} \pm t_{.20}\, s_{\bar{X}}$, with $t_{.20}$ obtained from Table 2 for appropriate degrees of freedom | (6) |
| • Regulatory threshold[a] | RT | Defined by EPA (e.g., 100 ppm for barium in elutriate of EP toxicity) | (7) |
| • Appropriate number of samples to collect from a solid waste (financial constraints not considered) | n | $n = \frac{t^2_{.20} s^2}{\Delta^2}$, with $\Delta = RT - \bar{x}$ | (8) |
| • Degrees of freedom | df | $df = n - 1$ | (9) |
| • Square root transformation | --- | $X_i + 1/2$ | (10) |
| • Arcsin transformation | --- | Arcsin p; if necessary, refer to any text on basic statistics; measurements must be converted to percentages (p) | (11) |

[a]The upper limit of the CI for $\mu$ is compared with the applicable regulatory threshold (RT) to determine if a solid waste contains the variable (chemical contaminant) of concern at a hazardous level. The contaminant of concern is not considered to be present in the waste at a hazardous level if the upper limit of the CI is less than the applicable RT. Otherwise, the opposite conclusion is reached.

TABLE 9-2. TABULATED VALUES OF STUDENT'S "t" FOR EVALUATING SOLID WASTES

| Degrees of freedom (n-1)[a] | Tabulated "t" value[b] |
|---|---|
| 1 | 3.078 |
| 2 | 1.886 |
| 3 | 1.638 |
| 4 | 1.533 |
| 5 | 1.476 |
| 6 | 1.440 |
| 7 | 1.415 |
| 8 | 1.397 |
| 9 | 1.393 |
| 10 | 1.372 |
| 11 | 1.363 |
| 12 | 1.356 |
| 13 | 1.350 |
| 14 | 1.345 |
| 15 | 1.341 |
| 16 | 1.337 |
| 17 | 1.333 |
| 18 | 1.330 |
| 19 | 1.328 |
| 20 | 1.325 |
| 21 | 1.323 |
| 22 | 1.321 |
| 23 | 1.319 |
| 24 | 1.318 |
| 25 | 1.316 |
| 26 | 1.315 |
| 27 | 1.314 |
| 28 | 1.313 |
| 29 | 1.311 |
| 30 | 1.310 |
| 40 | 1.303 |
| 60 | 1.296 |
| 120 | 1.289 |
| | 1.282 |

[a]Degrees of freedom (df) are equal to the number of samples (n) collected from a solid waste less one.

[b]Tabulated "t" values are for a two-tailed confidence interval and a probability of 0.20 (the same values are applicable to a one-tailed confidence interval and a probability of 0.10).

sampling of solid wastes for analytical properties. The first reference, which occurs throughout the regulations, requires that representative samples of waste be collected and defines representative samples as exhibiting average properties of the whole waste. The second reference, which pertains just to petitions to exclude wastes from being listed as hazardous wastes, specifies that enough samples (but in no case less than four samples) be collected over a period of time sufficient to represent the variability of the wastes. The third reference, which applies only to ground water monitoring systems, mandates that four replicates (subsamples) be taken from each ground water sample intended for chemical analysis and that the mean concentration and variance for each chemical constituent be calculated from those four subsamples and compared with background levels for ground water. Even the statistical test to be employed in that comparison is specified (Student's t-test).

The first of the above-described references addresses the issue of sampling accuracy, and the second and third references focus on sampling variability or, conversely, sampling precision (actually the third reference relates to analytical variability, which, in many statistical tests, is indistinguishable from true sampling variability). Sampling accuracy (the closeness of a sample value to its true value) and sampling precision (the closeness of repeated sample values) are also the issues of overriding importance in any scientific assessment of sampling practices. Thus, from both regulatory and scientific perspectives, the primary objectives of a sampling plan for a solid waste are twofold: namely, to collect samples that will allow measurements of the chemical properties of the waste that are both accurate and precise. If the chemical measurements are sufficiently accurate and precise, they will be considered reliable estimates of the chemical properties of the waste.

It is now apparent that a judgment must be made as to the degree of sampling accuracy and precision that is required to estimate reliably the chemical characteristics of a solid waste for the purpose of comparing those characteristics with applicable regulatory thresholds. Generally, high accuracy and high precision are required if one or more chemical contaminants of a solid waste are present at a concentration that is close to the applicable regulatory threshold. Alternatively, relatively low accuracy and low precision can be tolerated if the contaminants of concern occur at levels far below or far above their applicable thresholds. However, a word of caution is in order. Low sampling precision is often associated with considerable savings in analytical, as well as sampling, costs and is clearly recognizable even in the simplest of statistical tests. On the other hand, low sampling accuracy may not entail cost savings and is always obscured in statistical tests (i.e., it cannot be evaluated). Therefore, although it is desirable to design sampling plans for solid wastes to achieve only the minimally required precision (at least two samples of a material are required for any estimate of precision), it is prudent to design the plans to attain the greatest possible accuracy.

The roles that inaccurate and imprecise sampling can play in causing a solid waste to be inappropriately judged hazardous are illustrated in Figure 9-1. When evaluating Figure 9-1, several points are worthy of consideration. Although a sampling plan for a solid waste generates a mean concentration ($\bar{X}$) and standard deviation (s, a measure of the extent to which individual sample concentrations are dispersed around $\bar{X}$) for each chemical contaminant of concern, it is not the variation of individual sample concentrations that is of ultimate concern, but rather the variation that characterizes $\bar{X}$ itself. That measure of dispersion is termed the standard deviation of the mean (also, the standard error of the mean or standard error) and is designated as $s_{\bar{X}}$. Those two sample values, $\bar{X}$ and $s_{\bar{X}}$, are used to estimate the interval (range) within which the true mean ($\mu$) of the chemical concentration probably occurs, under the assumption that the individual concentrations exhibit a normal (bell-shaped) distribution. For the purposes of evaluating solid wastes, the probability level (confidence interval) of 80% has been selected. That is, for each chemical contaminant of concern, a confidence interval (CI) is described within which $\mu$ occurs if the sample is representative, which is expected of about 80 out of 100 samples. The upper limit of the 80% CI is then compared with the appropriate regulatory threshold. If the upper limit is less than the threshold, the chemical contaminant is not considered to be present in the waste at a hazardous level; otherwise, the opposite conclusion is drawn. One last point merits explanation. Even if the upper limit of an estimated 80% CI is only slightly less than the regulatory threshold (the worst case of chemical contamination that would be judged acceptable), there is only a 10% (not 20%) chance that the threshold is equaled or exceeded. That is because values of a normally distributed contaminant that are outside the limits of an 80% CI are equally distributed between the left (lower) and right (upper) tails of the normal curve. Consequently, the CI employed to evaluate solid wastes is, for all practical purposes, a 90% interval.

#### 9.1.1.2 Fundamental Statistical Concepts

The concepts of sampling accuracy and precision have already been introduced, along with some measurements of central tendency ($\bar{X}$) and dispersion (standard deviation [s] and $s_{\bar{X}}$) for concentrations of a chemical contaminant of a solid waste. The utility of $\bar{X}$ and $s_{\bar{X}}$ in estimating a confidence interval that probably contains the true mean ($\mu$) concentration of a contaminant has also been described. However, it was noted that the validity of that estimate is predicated upon the assumption that individual concentrations of the contaminant exhibit a normal distribution.

Statistical techniques for obtaining accurate and precise samples are relatively simple and easy to implement. Sampling accuracy is usually achieved by some form of random sampling. In random sampling, every unit in the population (e.g., every location in a lagoon used to store a solid waste) has a theoretically equal chance of being sampled and measured. Consequently, statistics generated by the sample (e.g., $\bar{X}$ and, to a lesser degree, $s_{\bar{X}}$) are unbiased (accurate) estimators of true population parameters (e.g., the CI for $\mu$). In other words, the sample is representative of the population. One of the commonest methods of selecting a random sample is to divide the

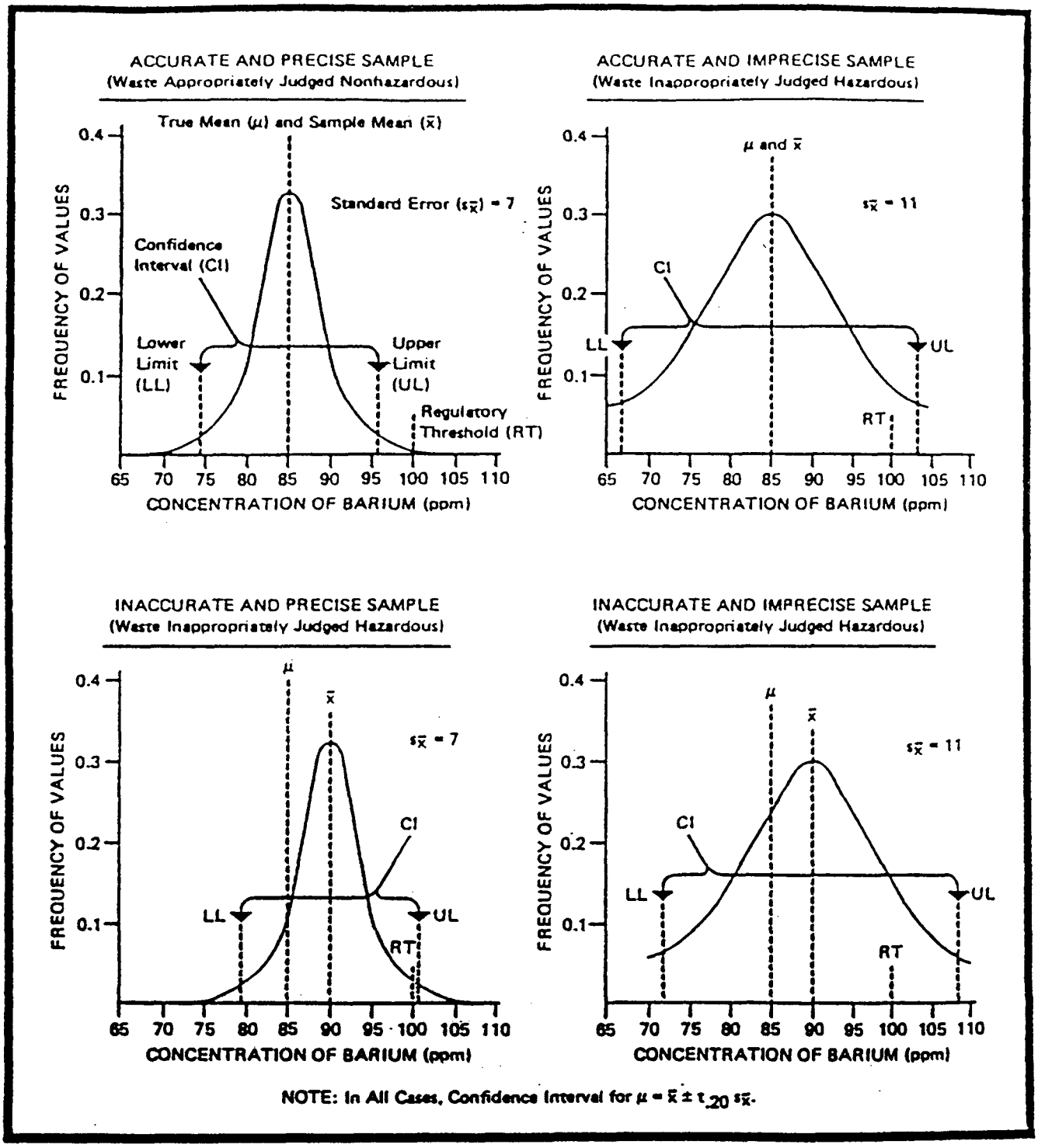



Figure 9-1.—Important theoretical relationships between sampling accuracy and precision and regulatory objectives for a chemical contaminant of a solid waste that occurs at a concentration marginally less than its regulatory threshold. In this example, barium is the chemical contaminant. The true mean concentration of barium in the elutriate of the EP toxicity test is 85 ppm, as compared to a regulatory threshold of 100 ppm. The upper limit of the confidence interval for the true mean concentration, which is estimated from the sample mean and standard error, must be less than the regulatory threshold if barium is judged to be present in the waste at a nonhazardous level.

population by an imaginary grid, assign a series of consecutive numbers to the units of the grid, and select the numbers (units) to be sampled through the use of a random-numbers table (such a table can be found in any text on basic statistics). It is important to emphasize that a haphazardly selected sample is not a suitable substitute for a randomly selected sample. That is because there is no assurance that a person performing undisciplined sampling will not consciously or subconsciously favor the selection of certain units of the population, thus causing the sample to be unrepresentative of the population.

Sampling precision is most commonly achieved by taking an appropriate number of samples from the population. As can be observed from the equation for calculating $s_{\bar{x}}$, precision increases ($s_{\bar{x}}$ and the CI for $\mu$ decrease) as the number of samples (n) increases, although not in a 1:1 ratio. For example, a 100% increase in the number of samples from two to four causes the CI to decrease by approximately 62% (about 31% of that decrease is associated with the critical upper tail of the normal curve). However, another 100% increase in sampling effort from four to eight samples results in only an additional 39% decrease in the CI. Another technique for increasing sampling precision is to maximize the physical size (weight or volume) of the samples that are collected. That has the effect of minimizing between-sample variation and, consequently, decreasing $s_{\bar{x}}$. Increasing the number or size of samples taken from a population, in addition to increasing sampling precision, has the secondary effect of increasing sampling accuracy.

In summary, reliable information concerning the chemical properties of a solid waste is needed for the purpose of comparing those properties with applicable regulatory thresholds. If chemical information is to be considered reliable, it must be accurate and sufficiently precise. Accuracy is usually achieved by incorporating some form of randomness into the selection process for the samples that generate the chemical information. Sufficient precision is most often obtained by selecting an appropriate number of samples.

There are a few ramifications of the above-described concepts that merit elaboration. If, for example, as in the case of semiconductor etching solutions, each batch of a waste is completely homogeneous with regard to the chemical properties of concern and that chemical homogeneity is constant (uniform) over time (from batch to batch), a single sample collected from the waste at an arbitrary location and time would theoretically generate an accurate and precise estimate of the chemical properties. However, most wastes are heterogeneous in terms of their chemical properties. If a batch of waste is randomly heterogeneous with regard to its chemical characteristics and that random chemical heterogeneity remains constant from batch to batch, accuracy and appropriate precision can usually be achieved by simple random sampling. In that type of sampling, all units in the population (essentially all locations or points in all batches of waste from which a sample could be collected) are identified, and a suitable number of samples is randomly selected from the population. More complex stratified random sampling is appropriate if a batch of waste is known to be nonrandomly heterogeneous in terms of its chemical properties and/or nonrandom chemical heterogeneity is known to exist from batch to batch. In such cases, the population is stratified to isolate the known sources of nonrandom chemical heterogeneity.

After stratification, which may occur over space (locations or points in a batch of waste) and/or time (each batch of waste), the units in each stratum are numerically identified, and a simple random sample is taken from each stratum. As previously intimated, both simple and stratified random sampling generate accurate estimates of the chemical properties of a solid waste. The advantage of stratified random sampling over simple random sampling is that, for a given number of samples and a given sample size, the former technique often results in a more precise estimate of chemical properties of a waste (a lower value of $s_{\bar{x}}$) than the latter technique. However, greater precision is likely to be realized only if a waste exhibits substantial nonrandom chemical heterogeneity and stratification efficiently "divides" the waste into strata that exhibit maximum between-strata variability and minimum within-strata variability. If that does not occur, stratified random sampling can produce results that are less precise than in the case of simple random sampling. Therefore, it is reasonable to select stratified random sampling over simple random sampling only if the distribution of chemical contaminants in a waste is sufficiently known to allow an intelligent identification of strata and at least two or three samples can be collected in each stratum. If a strategy employing stratified random sampling is selected, a decision must be made regarding the allocation of sampling effort among strata. When chemical variation within each stratum can be estimated with a great degree of detail, samples should be optimally allocated among strata, i.e., the number of samples collected from each stratum should be directly proportional to the chemical variation encountered in the stratum. When detailed information concerning chemical variability within strata is not available, samples should be proportionally allocated among strata, i.e., sampling effort in each stratum should be directly proportional to the size of the stratum.

Simple random sampling and stratified random sampling are types of probability sampling, which, because of a reliance upon mathematical and statistical theories, allows an evaluation of the effectiveness of sampling procedures. Another type of probability sampling is systematic random sampling, in which the first unit to be collected from a population is randomly selected, but all subsequent units are taken at fixed space or time intervals. An example of systematic random sampling is the sampling of a waste lagoon along a transect in which the first sampling point on the transect is 1 m from a randomly selected location on the shore and subsequent sampling points are located at 2-m intervals along the transect. The advantages of systematic random sampling over simple random sampling and stratified random sampling are the ease with which samples are identified and collected (the selection of the first sampling unit determines the remainder of the units) and, sometimes, an increase in precision. In certain cases, for example, systematic random sampling might be expected to be a little more precise than stratified random sampling with one unit per stratum because samples are distributed more evenly over the population. As will be demonstrated shortly, disadvantages of systematic random sampling are the poor accuracy and precision that can occur when unrecognized trends or cycles occur in the population. For those reasons, systematic random sampling is recommended only when a population is essentially random or contains at most a modest stratification. In such cases, systematic random sampling would be employed for the sake of convenience, with little expectation of an increase in precision over other random sampling techniques.

Probability sampling is contrasted with authoritative sampling, in which an individual who is well acquainted with the solid waste to be sampled selects a sample without regard to randomization. The validity of data gathered in that manner is totally dependent on the knowledge of the sampler and, although valid data can sometimes be obtained, authoritative sampling is not recommended for the chemical characterization of most wastes.

It may now be useful to offer a generalization regarding the four sampling strategies that have been identified for solid wastes. If little or no information is available concerning the distribution of chemical contaminants of a waste, simple random sampling is the most appropriate sampling strategy. As more information is accumulated for the contaminants of concern, greater consideration can be given (in order of the additional information required) to stratified random sampling, systematic random sampling, and, perhaps, authoritative sampling.

The validity of a CI for the true mean ($\mu$) concentration of a chemical contaminant of a solid waste is, as previously noted, based on the assumption that individual concentrations of the contaminant exhibit a normal distribution. This is true regardless of the strategy that is employed to sample the waste. Although there are computational procedures for evaluating the correctness of the assumption of normality, those procedures are meaningful only if a large number of samples are collected from a waste. Because sampling plans for most solid wastes entail just a few samples, one can do little more than superficially examine resulting data for obvious departures from normality (this can be done by simple graphical methods), keeping in mind that even if individual measurements of a chemical contaminant of a waste exhibit a considerably abnormal distribution, such abnormality is not likely to be the case for sample means, which are our primary concern. One can also compare the mean of the sample ($\bar{X}$) with the variance of the sample ($s^2$). In a normally distributed population, $\bar{X}$ would be expected to be greater than $s^2$ (assuming that the number of samples [n] is reasonably large). If that is not the case, the chemical contaminant of concern may be characterized by a Poisson distribution ($\bar{X}$ is approximately equal to $s^2$) or a negative binomial distribution ($\bar{X}$ is less than $s^2$). In the former circumstance, normality can often be achieved by transforming data according to the square root transformation. In the latter circumstance, normality may be realized through use of the arcsine transformation. If either transformation is required, all subsequent statistical evaluations must be performed on the transformed scale.

Finally, it is necessary to address the appropriate number of samples to be employed in the chemical characterization of a solid waste. As has already been emphasized, the appropriate number of samples is the least number of samples required to generate a sufficiently precise estimate of the true mean ($\mu$) concentration of a chemical contaminant of a waste. From the perspective of most waste producers, that means the minimal number of samples needed to demonstrate that the upper limit of the CI for $\mu$ is less than the applicable regulatory threshold (RT). The formula for estimating appropriate sampling effort (Table 9-1, Equation 8) indicates that increased sampling effort is generally justified as $s^2$ or the "$t_{.20}$" value (probable error rate) increases

and as $\Delta(RT - \bar{X})$ decreases. In a well-designed sampling plan for a solid waste, an effort is made to estimate the values of $\bar{X}$ and $s^2$ before sampling is initiated. Such preliminary estimates, which may be derived from information pertaining to similar wastes, process engineering data, or limited analytical studies, are used to identify the approximate number of samples that must be collected from the waste. It is always prudent to collect a somewhat greater number of samples than indicated by preliminary estimates of $\bar{X}$ and $s^2$ since poor preliminary estimates of those statistics can result in an underestimate of the appropriate number of samples to collect. It is usually possible to process and store the extra samples appropriately until analysis of the initially identified samples is completed and it can be determined if analysis of the additional samples is warranted.

#### 9.1.1.3 Basic Sampling Strategies

It is now appropriate to present general procedures for implementing the three previously introduced sampling strategies (simple random sampling, stratified random sampling, and systematic random sampling) and a hypothetical example of each sampling strategy. The hypothetical examples illustrate the statistical calculations that must be performed in most situations likely to be encountered by a waste producer and, also, provide some insight into the efficiency of the three sampling strategies in meeting regulatory objectives.

The following hypothetical conditions are assumed to exist for all three sampling strategies. First, barium, which has an RT of 100 ppm as measured in the EP elutriate test, is the only chemical contaminant of concern. Second, barium is discharged in particulate form to a waste lagoon and accumulates in the lagoon in the form of a sludge, which has built up to approximately the same thickness throughout the lagoon. Third, concentrations of barium are relatively homogeneous along the vertical gradient (from the water-sludge interface to the sludge-lagoon interface), suggesting a highly controlled manufacturing process (little between-batch variation in barium concentrations). Fourth, the physical size of sludge samples collected from the lagoon is as large as practical, and barium concentrations derived from those samples are normally distributed (note that we do not refer to barium levels in the samples of sludge because barium measurements are actually made on the elutriate from EP toxicity tests performed with the samples). Last, a preliminary study of barium levels in the elutriate of four EP toxicity tests conducted with sludge collected from the lagoon several years ago identified values of 86 and 90 ppm for material collected near the outfall (in the upper third) of the lagoon and values of 98 and 104 ppm for material obtained from the far end (the lower two-thirds) of the lagoon.

For all sampling strategies, it is important to remember that barium will be determined to be present in the sludge at a hazardous level if the upper limit of the CI for $\mu$ is equal to or greater than the RT of 100 ppm (Table 9-1, Equations 6 and 7).

#### 9.1.1.3.1 Simple Random Sampling

Simple random sampling (Box 1) is performed by general procedures in which preliminary estimates of $\bar{X}$ and $s^2$, as well as a knowledge of the RT, for each chemical contaminant of a solid waste that is of concern are employed to estimate the appropriate number of samples (n) to be collected from the waste. That number of samples is subsequently analyzed for each chemical contaminant of concern. The resulting analytical data are then used to conclude definitively that each contaminant is or is not present in the waste at a hazardous concentration or, alternatively, to suggest a reiterative process, involving increased sampling effort, through which the presence or absence of hazard can be definitively determined.

In the hypothetical example for simple random sampling (Box 1), preliminary estimates of $\bar{X}$ and $s^2$ indicated a sampling effort consisting of six samples. That number of samples was collected and initially analyzed, generating analytical data somewhat different from the preliminary data ($s^2$ was substantially greater than was preliminarily estimated). Consequently, the upper limit of the CI was unexpectedly greater than the applicable RT, resulting in a tentative conclusion of hazard. However, a reestimation of appropriate sampling effort, based on statistics derived from the six samples, suggested that such a conclusion might be reversed through the collection and analysis of just one more sample. Fortunately, a resampling effort was not required because of the foresight of the waste producer in obtaining three extra samples during the initial sampling effort, which, because of their influence in decreasing the final values of $\bar{X}$, $s_{\bar{X}}$, $t_{.20}$, and, consequently, the upper limit of the CI -- values obtained from all nine samples -- resulted in a definitive conclusion of nonhazard.

#### 9.1.1.3.2 Stratified Random Sampling

Stratified random sampling (Box 2) is conducted by general procedures that are similar to the procedures described for simple random sampling. The only difference is that, in stratified random sampling, values of $\bar{X}$ and $s^2$ are calculated for each stratum in the population and then integrated into overall estimates of those statistics, the standard deviation (s), $s_{\bar{X}}$, and the appropriate number of samples (n) for all strata.

The hypothetical example for stratified random sampling (Box 2) is based on the same nine sludge samples previously identified in the example of simple random sampling (Box 1) so that the relative efficiencies of the two sampling strategies can be fully compared. The efficiency generated through the process of stratification is first evident in the preliminary estimate of n (Step 2 in Boxes 1 and 2), which is six for simple random sampling and four for stratified random sampling. (The lesser value for stratified sampling is the consequence of a dramatic decrease in $s^2$, which more than compensated for a modest increase in $\Delta$.) The most relevant indication of sampling efficiency is the value of $s_{\bar{X}}$, which is directly employed to calculate the CI. In the case of simple random sampling, $s_{\bar{X}}$ is calculated as 2.58 (Step 9 in Box 1), and, for stratified random sampling, $s_{\bar{X}}$ is determined to be 2.35 (Steps 5 and 7 in Box 2). Consequently, the gain in efficiency attributable to stratification is approximately 9% (0.23/2.58).

BOX 1. STRATEGY FOR DETERMINING IF CHEMICAL CONTAMINANTS OF SOLID WASTES ARE PRESENT AT HAZARDOUS LEVELS - SIMPLE RANDOM SAMPLING

| Step | General Procedures |
|---|---|
| 1. | Obtain preliminary estimates of $\bar{X}$ and $s^2$ for each chemical contaminant of a solid waste that is of concern. The two above-identified statistics are calculated by, respectively, Equations 2a and 3a (Table 9-1). |
| 2. | Estimate the appropriate number of samples ($n_1$) to be collected from the waste through use of Equation 8 (Table 9-1) and Table 9-2. Derive individual values of $n_1$ for each chemical contaminant of concern. The appropriate number of samples to be taken from the waste is the greatest of the individual $n_1$ values. |
| 3. | Randomly collect at least $n_1$ (or $n_2 - n_1$, $n_3 - n_2$, etc., as will be indicated later in this box) samples from the waste (collection of a few extra samples will provide protection against poor preliminary estimates of $\bar{X}$ and $s^2$). Maximize the physical size (weight or volume) of all samples that are collected. |
| 4. | Analyze the $n_1$ (or $n_2 - n_1$, $n_3 - n_2$ etc.) samples for each chemical contaminant of concern. Superficially (graphically) examine each set of analytical data for obvious departures from normality. |
| 5. | Calculate $\bar{X}$, $s^2$, the standard deviation (s), and $s_{\bar{X}}$ for each set of analytical data by, respectively, Equations 2a, 3a, 4, and 5 (Table 9-1). |
| 6. | If $\bar{X}$ for a chemical contaminant is equal to or greater than the applicable RT (Equation 7, Table 9-1) and is believed to be an accurate estimator of $\mu$, the contaminant is considered to be present in the waste at a hazardous concentration, and the study is completed. Otherwise, continue the study. In the case of a set of analytical data that does not exhibit obvious abnormality and for which $\bar{X}$ is greater than $s^2$, perform the following calculations with nontransformed data. Otherwise, consider transforming the data by the square root transformation (if $\bar{X}$ is about equal to $s^2$) or the arcsine transformation (if $\bar{X}$ is less than $s^2$) and performing all subsequent calculations with transformed data. Square root and arcsine transformations are defined by, respectively, Equations 10 and 11 (Table 9-1). |
| 7. | Determine the CI for each chemical contaminant of concern by Equation 6 (Table 9-1) and Table 9-2. If the upper limit of the CI is less than the applicable RT (Equations 6 and 7, Table 9-1), the chemical contaminant is not considered to be present in the waste at a hazardous concentration and the study is completed. Otherwise, the opposite conclusion is tentatively reached. |

8. If a tentative conclusion of hazard is reached, reestimate the total number of samples ($n_2$) to be collected from the waste by use of Equation 8 (Table 9-1) and Table 9-2. When deriving $n_2$, employ the newly calculated (not preliminary) values of x and $s^2$. If additional $n_2 - n_1$ samples of waste cannot reasonably be collected, the study is completed, and a definitive conclusion of hazard is reached. Otherwise, collect extra $n_2 - n_1$ samples of waste.

9. Repeat the basic operations described in Steps 3 through 8 until the waste is judged to be nonhazardous or, if the opposite conclusion continues to be reached, until increased sampling effort is impractical.

## Hypothetical Example

Step

1. The preliminary study of barium levels in the elutriate of four EP toxicity tests, conducted with sludge collected from the lagoon several years ago, generated values of 86 and 90 ppm for sludge obtained from the upper third of the lagoon and values of 98 and 104 ppm for sludge from the lower two-thirds of the lagoon. Those two sets of values are not judged to be indicative of nonrandom chemical heterogeneity (stratification) within the lagoon. Therefore, preliminary estimates of $\bar{x}$ and $s^2$ are calculated as:

$$\bar{x} = \frac{\sum_{i=1}^{n} X_i}{n} = \frac{86 + 90 + 98 + 104}{4} = 94.50, \text{ and} \qquad \text{(Equation 2a)}$$

$$s^2 = \frac{\sum_{i=1}^{n} X_i^2 - (\sum_{i=1}^{n} X_i)^2/n}{n - 1} \qquad \text{(Equation 3a)}$$

$$= \frac{35{,}916.00 - 35{,}721.00}{3} = 65.00.$$

2. Based on the preliminary estimates of $\bar{x}$ and $s^2$, as well as the knowledge that the RT for barium is 100 ppm,

$$n_1 = \frac{t^2_{.20} s^2}{\Delta^2} = \frac{(1.638^2)(65.00)}{5.50^2} = 5.77. \qquad \text{(Equation 8)}$$

3. As indicated above, the appropriate number of sludge samples ($n_1$) to be collected from the lagoon is six. That number of samples (plus three extra samples for protection against poor preliminary estimates of $\bar{x}$ and $s^2$) is collected from the lagoon by a single randomization process (Figure 9-2). All samples consist of the greatest volume of sludge that

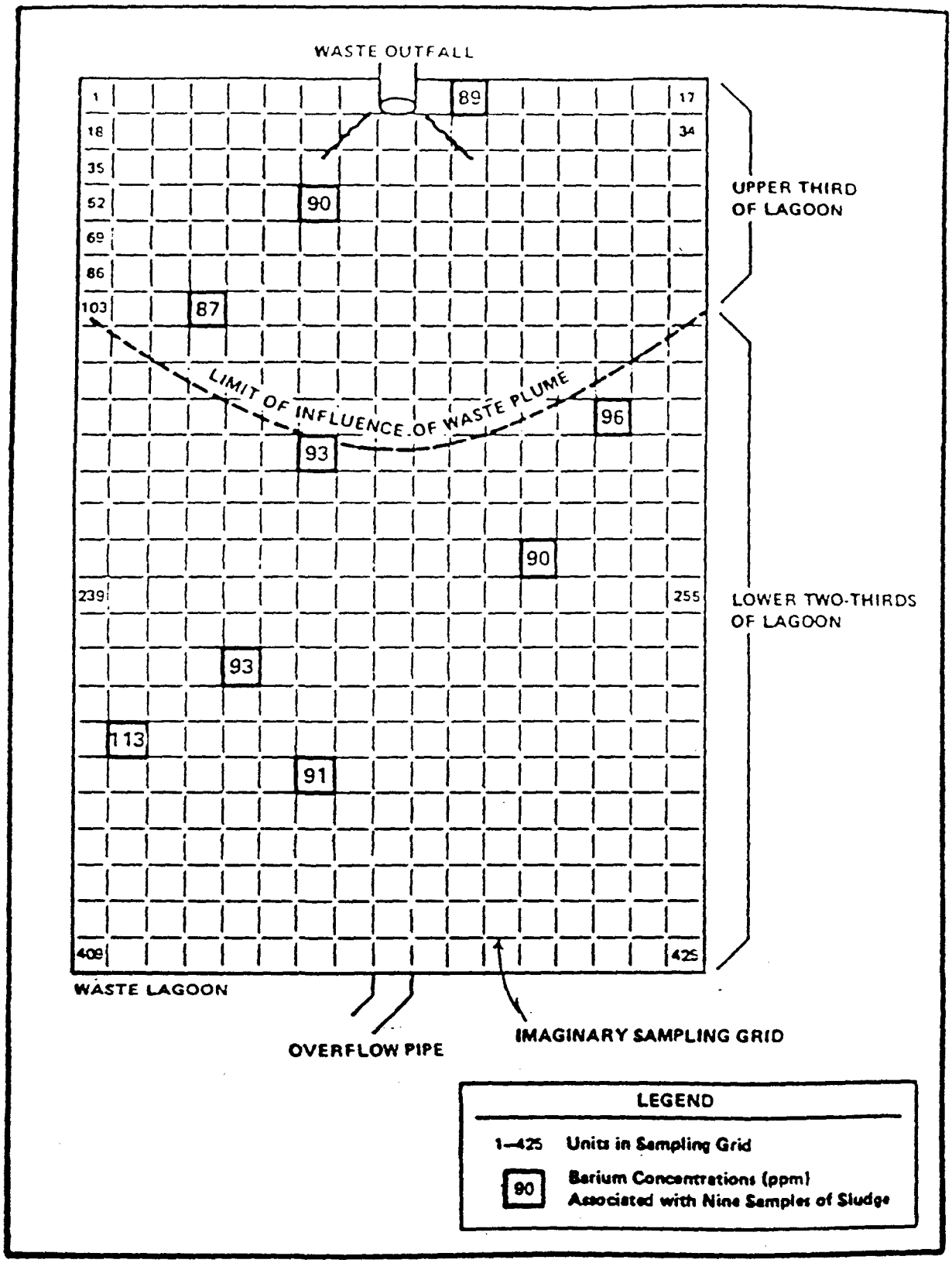



Figure 9-2.—Hypothetical sampling conditions in waste lagoon containing sludge contaminated with barium. Barium concentrations associated with samples of sludge refer to levels measured in the elutriate of EP toxicity tests conducted with the samples.

can be practically collected. The three extra samples are suitably processed and stored for possible later analysis.

4. The six samples of sludge ($n_1$) designated for immediate analysis generate the following concentrations of barium in the EP toxicity test: 89, 90, 87, 96, 93, and 113 ppm. Although the value of 113 ppm appears unusual as compared with the other data, there is no obvious indication that the data are not normally distributed.

5. New values for $\bar{X}$ and $s^2$ and associated values for the standard deviation (s) and $s_{\bar{X}}$ are calculated as:

$$\bar{x} = \frac{\sum_{i=1}^{n} X_i}{n} = \frac{89 + 90 + 87 + 96 + 93 + 113}{6} = 94.67, \qquad \text{(Equation 2a)}$$

$$s^2 = \frac{\sum_{i=1}^{n} X_i^2 - (\sum_{i=1}^{n} X_i)^2/n}{n - 1} \qquad \text{(Equation 3a)}$$

$$= \frac{54,224.00 - 53,770.67}{5} = 90.67,$$

$$s = \sqrt{s^2} = 9.52, \text{ and} \qquad \text{(Equation 4)}$$

$$s_{\bar{X}} = s/\sqrt{n} = 9.52/\sqrt{6} = 3.89. \qquad \text{(Equation 5)}$$

6. The new value for $\bar{X}$ (94.67) is less than the RT (100). In addition, $\bar{X}$ is greater (only slightly) than $s^2$ (90.67), and, as previously indicated, the raw data are not characterized by obvious abnormality. Consequently, the study is continued, with the following calculations performed with nontransformed data.

7. $$CI = \bar{x} \pm t_{.20} s_{\bar{x}} = 94.67 \pm (1.476)(3.89) \qquad \text{(Equation 6)}$$

$$= 94.67 \pm 5.74.$$

**Because the upper limit of the CI (100.41) is greater than the applicable RT (100), it is tentatively concluded that barium is present in the sludge at a hazardous concentration.**

8. n is now reestimated as:

$$n_2 = \frac{t^2_{.20} s^2}{\Delta^2} \frac{(1.476^2)(90.67)}{5.33^2} = 6.95. \qquad \text{(Equation 8)}$$

The value for $n_2$ (approximately 7) indicates that an additional ($n_2 - n_1 = 1$) sludge sample should be collected from the lagoon.

9. The additional sampling effort is not necessary because of the three extra samples that were initially collected from the lagoon. All extra samples are analyzed, generating the following levels of barium for the EP toxicity test: 93, 90, and 91 ppm. Consequently, $\bar{X}$, $s^2$, the standard deviation (s), and $s_{\bar{X}}$ are recalculated as:

$$\bar{x} = \frac{\sum_{i=1}^{n} X_i}{n} = \frac{86 + 90 + \ldots + 91}{9} = 93.56\ , \qquad \text{(Equation 2a)}$$

$$s^2 = \frac{\sum_{i=1}^{n} X_i^2 - (\sum_{i=1}^{n} X_i)^2/n}{n - 1} \qquad \text{(Equation 3a)}$$

$$= \frac{79{,}254.00 - 78{,}773.78}{8} = 60.03,$$

$$s = \sqrt{s^2} = 7.75, \text{ and} \qquad \text{(Equation 4)}$$

$$s_{\bar{X}} = s/\sqrt{n} = 7.75/\sqrt{9} = 2.58. \qquad \text{(Equation 5)}$$

The value for $\bar{X}$ (93.56) is again less than the RT (100), and there is no indication that the nine data points, considered collectively, are abnormally distributed (in particular, $\bar{X}$ is now substantially greater than $s^2$). Consequently, CI, calculated with nontransformed data, is determined to be:

$$CI = \bar{x} \pm t_{.20} s_{\bar{x}} = 93.56 \pm (1.397)(2.58) \qquad \text{(Equation 6)}$$

$$= 93.56 \pm 3.60.$$

The upper limit of the CI (97.16) is now less than the RT of 100. Consequently, it is definitively concluded that barium is not present in the sludge at a hazardous level.

# APPENDIX T

# CLOSURE COST ASSURANCE

MacDermid
INCORPORATED

245 FREIGHT STREET - WATERBURY, CT 06702 - TELEPHONE (203) 575-5700 - TELEX 4436011 - INTL. FAX 203-575-7900 - DOM. FAX 203-575-5630

March 19, 1990

Mr. George Dews
State of Connecticut
Department of Environment Protection
165 Capitol Avenue
Hartford, CT 06106

Dear Mr. Dews:

I am the Chief Financial Officer of MacDermid, Incorporated, 245 Freight Street, Waterbury, Connecticut. This letter is in support of the firm's use of the financial test to demonstrate financial assurance, as specified in Sub Part H of 40 CFR, Parts 264 and 265.

1. This firm is the owner or operator of the following facilities for which financial assurance for closure or post-closure care is demonstrated through the financial test specified in Sub Part H of 40 CFR, Parts 264 and 265. The current closure, and/or post-closure cost estimates covered by the test are shown for each facility:

| FACILITY NAME | TYPE OF FACILITY | CLOSURE COST ESTIMATE |
|---|---|---|
| MacDermid, Inc.<br>245 Freight Street<br>Waterbury, Connecticut | Waste Storage Facility<br>for Hazardous Waste<br>CTD 981062854 | $ 42,500.00 |
| MacDermid, Inc.<br>526 Huntingdon Avenue<br>Waterbury, Connecticut | Waste Storage Facility<br>for Hazardous Waste<br>CTD 00164599 | $484,000.00 |
| | Total | $526,500.00 |

2. This firm guarantees, through the corporate guarantee specified in Sub Part H of 40 CFR, Parts 264 and 265, the closure or post-closure care of the following facilities owned or operated by subsidiaries of this firm. The current cost estimates for the closure or post-closure care so guaranteed are shown for each facility:

None

3. In states where DEP is not administering the financial requirements of Sub Part H of 40 CFR, Parts 264 and 265, this firm, as owner or operator or guarantor, is demonstrating financial assurance for the closure or post-closure care of the following facilities through the use of a test equivalent or substantially equivalent to the financial test specified in Sub Part H of 40 CFR, Parts 264 and 265. The current closure and/or post-closure cost estimates covered by such a test are shown for each facility:

None

**MacDermid**
INCORPORATED

Mr. George Dews
State of Connecticut
Department of Environment Protection
Hartford, CT 06106

March 19, 1990



4. This firm is the owner or operator of the following hazardous waste management facilities for which financial assurance for closure or, if a disposal facility, post-closure care, is not demonstrated to EPA or a state through the financial test or any other financial assurance mechanism specified in Sub Part H of 40 CFR, Parts 264 and 265 or equivalent or substantially equivalent State mechanisms. The current closure and/or post-closure cost estimates not covered by such financial assurance are shown for each facility:

None

This firm is required to file a Form 10-K with the Securities and Exchange Commission (SEC) for the lates fiscal year.

The fiscal year of this firm ends on March 31, 1989. The figures for the following items attached which are marked with an asterisk are derived from this firm's independently audited, year-end financial statements for the latest completed fiscal year, ended March 31, 1989.

I hereby certify that the wording of this letter is identical to the wording specified on 40 CFR 264.151 (f) as such regulations were constituted on the date shown immediately below.

[Signature] Edwin M. Kania

[Name] Edwin M. Kania

[Title] Chief Financial Officer

[Date] March 12, 1990

FJC:mat

Attachments

RECEIVED
MAY - 7 1990
H.R.P. ASSOCIATES, INC.

ATTACHMENT

| | | |
|---|---|---|
| 1. | Sum of current closure and post closure estimates [total of all cost estimates shown in the four paragraphs above]. | $ 526,500 |
| *2. | Total liabilities [if any portion of the closure or post-closure cost estimates is included in total liabilities, you may deduct the amount of that portion from this line and add that amount to lines 3 and 4]. | $52,938,000 |
| *3. | Tangible net worth | $43,810,000 |
| *4. | Net worth | $47,075,000 |
| *5. | Current assets | $57,923,000 |
| *6. | Current liabilities | $44,568,000 |
| *7. | Net working capital [line 5 minus line 6] | $13,355,000 |
| *8. | The sum of net income plus depreciation, depletion and amortization. | $12,035,000 |
| 9. | Total assets in U.S. [required only if less than 90% of firm's assets are located in the U.S.]. | $53,122,000 |

| | | Yes | No |
|---|---|---|---|
| 10. | Is line 3 at least $10 million? | x | |
| 11. | Is line 3 at least 6 times line 1? | x | |
| 12. | Is line 7 at least 6 times line 1? | x | |
| 13. | Are at least 90% of firm's assets located in the U.S.? If not, complete line 14. | | x |
| 14. | Is line 9 at least 6 times line 1? | x | |
| 15. | Is line 2 divided by line 4 less than 2.0? | x | |
| 16. | Is line 8 divided by line 2 greater than 0.1? | x | |
| 17. | Is line 5 divided by line 6 greater than 1.5? | | x |

*Denotes figures derived from March 31, 1989 consolidated financial statements of MacDermid, Incorporated and subsidiaries.

# APPENDIX U

# COVERGE FOR SUDDEN ACCIDENTAL OCCURRENCES

KPMG Peat Marwick

Certified Public Accountants

**Peat Marwick Main & Co.**
One Financial Plaza
Hartford, CT 06103

The Board of Directors
MacDermid, Incorporated:

We have applied certain agreed-upon procedures as discussed below, to the Corrective Action, Closure or Post Closure Care letter dated September 8, 1989 related to a facility located at 526 Huntingdon Avenue, Waterbury, Connecticut, submitted by the Treasurer of MacDermid, Incorporated (the Company) (not included herein), solely to assist you in complying with Subpart H of 40 CFR, Parts 264 and 265. It is understood that this report is solely for your information and the Department of Environment Protection (DEP) of the State of Connecticut and is not to be referred to or distributed for any other purpose to anyone who is not a member of management of the Company or an official with the DEP. Our procedures and findings are as follows:

> Items 2 (Total liabilities), 3 (Tangible net worth), 4 (Net worth), 5 (Current assets), 6 (Current liabilities), 7 (Net working capital) and 8 (The sum of net income plus depreciation, depletion and amortization) which are included on the Corrective Action, Closure or Post Closure Care letter referred to above were agreed to the amounts, or compilation of amounts, included in the consolidated financial statements of the Company as of and for the year ended March 31, 1989.

Because the above procedures do not constitute an audit in accordance with generally accepted auditing standards, we express no opinion on any of the specified amounts referred to above. In connection with the procedures referred to above, no matters came to our attention that caused us to believe that the specified amounts should be adjusted. Had we performed additional procedures, matters might have come to our attention that would have been reported to you. This report relates only to the amounts specified above and does not extend to any financial statements of the Company taken as a whole.

Peat Marwick Main & Co.

September 13, 1989

# APPENDIX V

## LABORATORY RESULTS FOR SURFACE FINISHING CHEMICALS RECEIVED FROM CUSTOMERS AND MACDERMID'S "ON-SITE GENERATED WASTE AND SPOT TEST" SHEETS FOR WASTE STREAMS RECEIVED FROM THE 245 FREIGHT STREET FACILITY

August 2, 1989

MEMO TO: Cherrie Gillis

FROM: Ron Redline

cc: Alan Bares - Mary Jane Senechal - Marie Orsillo

SUBJECT: Fingerprint Sample - Spent Ultra Etch FL 19190: Schedule B
Copper Etchant

COMPANY:

CUSTOMER NUMBER: 001010

| TEST | RESULT | SPECIFICATION |
|---|---|---|
| 1. Appearance | Acceptable | Deep blue liquid @ 75$^{0}$F |
| 2. Specific Gravity | 1.164 | 1.13 minimum |
| 3. pH | 8.26 | 7.5 - 9.5 |
| 4. Copper | 95.8 g/l | 104 g/l minimum |
| 5. Chloride | 5.01 M | 3.6 M minimum |
| 6. Total Alkalinity | 6.02 M | 5.9 - 9.0 M |
| 7. Zinc | 0.200 g/l | 1 g/l maximum |
| 8. Iron | 1 ppm | 20 ppm maximum |
| 9. Tin | 3.5 ppm | 100 ppm maximum |
| 10. Lead | 18 ppm | 100 ppm maximum |
| 11. Nickel | < 0.1 ppm | 5 ppm maximum |
| 12. Others as listed on generator certification | | |

January 24, 1990

MEMO TO: Cherrie Gillis

FROM: Ron Redline

cc: Alan Bares - Mary Jane Senechal - Marie Orsillo

SUBJECT: Fingerprint Sample - Spent Solder Stripper 17507/17595: Schedule C

COMPANY:

CUSTOMER NUMBER: 036031

| TEST | RESULT | SPECIFICATION |
|---|---|---|
| 1. Appearance | Acceptable | Blue, blue-green, light brown liquid @ 75 $^{0}$F |
| 2. Specific Gravity | 1.166 | 1.08 minimum |
| 3. pH | 5.43 | 3.5 - 6.0 |
| 4. Fluoride | 188.0 g/l | 110 g/l minimum |
| 5. Chloride | 125 | 500 ppm maximum |
| 6. Copper | 0.28 g/l | 5 g/l maximum |
| 7. Lead | 70 ppm | 50 ppm maximum |
| 8. Tin | 85.0 g/l | 22.5 g/l minimum |
| 9. Fluoborates | - - - | 5 ppm maximum |
| 10. Iron | < 1 ppm | 100 ppm maximum |
| 11. Nitrates | - - - | 5 ppm maximum |
| 12. Nickel | 16 ppm | 5 ppm maximum |
| 13. Others as listed on generator certification | | |

cc: Dick Hadzic-Hatic
3/1

March 1, 1990

MEMO TO: Cherrie Gillis

FROM: Ron Redline

cc: Alan Bares - Mary Jane Senechal - Marie Orsillo

SUBJECT: Fingerprint Sample - Spent Solder Conditioner 17526/17533: Schedule F

COMPANY:

CUSTOMER NUMBER: 036031

| TEST | RESULT | SPECIFICATION |
|---|---|---|
| 1. Appearance | Acceptable | Yellow to water-white liquid @ 75°F |
| 2. pH | < 1.0 | 2.0 maximum |
| 3. Fluoride | 6.06 | 10 ppm maximum |
| 4. Chloride | 4.77 | 2.0 N minimum |
| 5. Acidity | 1.26 | 0.75 N minimum |
| 6. Sulfates | 1,724 | 1000 ppm maximum |
| 7. Titanium Attack | 1.68 mls/year | 20 mils/year maximum |
| 8. Solder Attack | ------ | |
| 9. Copper | 75 | 2000 ppm maximum |
| 10. Iron | 54 | 100 ppm maximum |
| 11. Nickel | 8 | 5 ppm maximum |
| 12. Fluorborate | ----- | 5 ppm maximum |

cc. Ken Kraus
3/1/90

March 1, 1990

MEMO TO: Cherrie Gillis

FROM: Ron Redline

cc: Alan Bares - Mary Jane Senechal - Marie Orsillo

SUBJECT: Fingerprint Sample - Spent Electroless Coppers 9650, 52, 54; 7960, 900, 400: Schedule I

COMPANY:

CUSTOMER NUMBER: 036031

| TEST | RESULT | SPECIFICATION |
|---|---|---|
| 1. Appearance | Acceptable | Light blue, homogeneous liquid @ 75°F |
| 2. pH | 6.57 | 4 - 5.5 |
| 3. Copper | 3.64 | 1.5 g/l minimum |
| 4. Excess Chelator | 0.103 | 0.045 M minimum |
| 5. Nickel | < 1.0 | 5 ppm maximum |

January 24, 1990

MEMO TO: Cherrie Gillis

FROM: Ron Redline

cc: Alan Bares - Mary Jane Senechal - Marie Orsillo

SUBJECT: Fingerprint Sample - Spent Solvent (19204/16956): Schedule N

NMP

COMPANY:

CUSTOMER NUMBER: 036031

| TEST | RESULT | SPECIFICATION |
|---|---|---|
| 1. Appearance | Acceptable | Uniform liquid with no liquid/liquid phase separation |
| 2. Specific Gravity | 1.032 | 1.017 - 1.037 |
| 3. Refractive Index | 1.4594 | 1.4610 - 1.4690 |
| 4. Water Content | 11.8% | 10% maximum |
| 5. Flash Point | > 140$^0$F | 140$^0$F minimum |
| 6. Chloride | 81 | 200 ppm maximum |
| 7. Copper | 35 ppm | 150 ppm maximum |
| 8. Others as listed on generator certification | | |

WASTE ANALYSIS PLAN

ON-SITE GENERATED WASTES

SECTION
264.13

WASTE Electroless Copper -Non Recyclable TSDF NES REF: NO: 325/K3

SOURCE: Freight St. PC Lab/MF R & D

---

| CHARACTERISTICS | | EQUIPMENT USED TO ANALYZE |
|---|---|---|
| Waste Nos: D002 | | |
| Color: | Light Blue | pH Meter: |
| Odor: | Mild - Formaldehyde | SP.GR:(Hydrometer): |
| pH: | 10 - 12 | Fl. Pt. (Tag CC ASTM D56-64, 1986 |
| Sp. Gr.: | > 1.1 | Gas Chromatgraphy: |
| Fl. Pt.: | None | A.A. Spectrophotometry: |
| Layering: | None | Wet Analysis (Titration): |

Frequency of Sampling: 1/yr or if process changes

Method of Collection: Coliwasa Land-Ban: Yes ____ No X

METALS & CONC: 1 q/litre copper

EC: 9048/9027/MACuDp 52, 70, 20

Similar formulas

| COMPOSITION: | | |
|---|---|---|
| | Formaldehyde < 1% | Copper < 1% |
| | Caustic < 7 | |
| | Water balance | |
| | EDTA < 5 | |

RATIONALE: Used in test plating in P.C. Lab. All materials from MacDermid formulations.

DOT: Non-Regulated / Need CT manifest even tho Not Regulated

Waste No: CR04

GENERATED WASTE - SPOT TEST

WASTE ID NO: 325
(3 digits)

DEPARTMENT: P.C. Lab

DEPT. ACCT. NUMBER WASTE TO BE CHARGED TO: 5262-912

WASTE NAME: Non-Recyclable Electroless Copper -non hazard.

TYPE SAMPLE: GRAB
COMPOSITE
RANDOM

. . . . . .

| CHARACTERISTICS | RESULTS | SPECIFICATIONS |
|---|---|---|
| Odor | Formaldehyde | Formaldehyde |
| Color | Blue | Light Blue to Dark Blue |
| pH | 9.5 | 7 - 12 |
| Sp. Gravity | 1.148 | 1 - 1.3 |
| Flash Point | | |

Metals Run if Applicable

| | | |
|---|---|---|
| Tin | | |
| Lead | | |
| Iron | | |
| Copper | 3.6 g/l | 0.1 to 20 g/l |
| Zinc | | |
| Cadmium | | |
| Other | | |

Solvents:

I certify this waste is within specification of the written waste analysis plan for on-site generated wastes per waste ID number.

Robert A. Jankowski
(Signature)

Date: MAY 3, 1996

# Northeast Solvents Reclamation Corp.

[illegible] STREET, NORTHFIELD, MASS. 01360 (617) 498-1002

WASTE IDENTIFICATION FORM

17879

FOR NORTHEAST SOLVENTS RECLAMATION CORP. USE ONLY

Approval A[illegible] Approved

[illegible]

Comments

[illegible]

Hazardous Waste [illegible] EPA [illegible]

UN/NA Number [illegible] RQ

GENERAL INFORMATION

[illegible]

Telephone No. [illegible]

Authorized Company [illegible]

EPA ID Number [illegible]

## B. DESCRIPTION OF WASTE

Generator's common name for Waste: Electroless Copper - Non Pen

Process Generating Waste: Plating Bath Waste

## C. CHARACTERISTICS OF WASTE

**Color:** Light Blue

**Odor:** ☐ None ☐ Mild ☐ Strong ☐ Describe Formaldehyde

**Physical State at 70°F:** ☐ Solid ☐ Semi-Solid ☒ Liquid ☐ Powder ☐ Liquid With Sludge

pH < 12

**Layers:** ☒ Single Phased ☐ Bilayered ☐ Multilayered

**Specific Gravity at 70°F:** ☐ N/A ☐ <.8 ☐ 1.3-1.6 ☐ .8-1.0 ☐ >1.6 ☒ 1.0-1.3 ☐ exact

**Flash Point:** ☐ <70°F ☐ 70-100°F ☐ 101-140°F ☐ 141-200°F ☐ >200°F ☒ None

**Free Liquids:** ☒ Yes ☐ No Volume 99 %

**pH:** ☐ 0-2 ☐ 2.1-4 ☐ 4.1-6.9 ☐ Neutral (7) ☐ N/A ☐ 7.1-10 ☒ 10.1-12.5 ☐ >12.5 ☐ Exact

## D. CHEMICAL COMPOSITION (MUST ADD TO 100%)

| % | MAJOR CONSTITUENT | % | MINOR CONSTITUENT | PPM | TRACE |
|---|---|---|---|---|---|
| <2 | Copper ? Cu Sulphate / Cu Chloride | | $155/dr | | 16 Model Cuts |
| <2 | Formaldehyde | | $80/pail | | 07 CP or |
| <7 | Caustic (NaOH) | | | | |
| Bal | Water | | | | |
| <5 | Chelator as EDTA | | | | DuPont |

## E. METALS

☐ Total (ppm) ☒ EPA Extraction (mg/L) ☐ None

Arsenic (As) ____ Barium (Ba) ____ Cadmium (Cd) ____ Chromium (Cr +3) ____ Chromium-Hex (Cr +6) ____ Mercury (Hg) ____

Lead (Pb) ____ Silver (Ag) ____ Selenium (Se) ____ Copper (Cu) 1-3 gpc/l Nickel (Ni) ____ Zinc (Zn) ____

Others ____

## F. OTHER COMPONENTS

| | No | Yes | Total ppm |
|---|---|---|---|
| PCB's | ☒ | ☐ | ☐ |
| Cyanides | ☒ | ☐ | ☐ |
| Sulfides | ☒ | ☐ | ☐ |
| Pesticides | ☒ | ☐ | ☐ |
| Phenolics | ☒ | ☐ | ☐ |
| Dioxins | ☒ | ☐ | ☐ |

## G. HAZARDOUS CHARACTERISTICS

1. Infectious or Biological Waste ☐ Yes ☒ No
2. Radioactive ☐ Yes ☒ No
3. Reactivity ☒ None ☐ Pyrophoric ☐ Shock Sensitive ☐ Explosive ☐ Water Reactive ☐ Other

## H. ANTICIPATED VOLUME

Qty. 1 ☐ 5 gal pail ☒ 55 gal drum ☐ 15 gal carboy ☐ 30 gal drum ☐ 85 gal drum ☐ Bulk ☐ Other

per ☐ one time ☐ week ☐ month ☒ quarter ☐ year ☐ Other

## I. SPECIAL HANDLING INFORMATION

Safety glasses, gloves

HAVE YOU ANSWERED ALL OF THE ABOVE QUESTIONS?

J. I hereby certify that all information submitted in this and all attached documents is complete, accurate, and that all known or suspected hazards have been disclosed.

[illegible] — AUTHORIZED SIGNATURE

Corporate Chem. — TITLE

9/6/87 — DATE

APPROVAL COPY

WASTE ANALYSIS PLAN

ON-SITE GENERATED WASTES

SECTION
264.13

---

WASTE Palladium Hydrochloric Acid TSDF PGP REF: NO: 538

SOURCE: AA/Manufacturing

---

CHARACTERISTICS | EQUIPMENT USED TO ANALYZE

Waste Nos: D002

Color: Brown

Odor: Mild

pH: < 2

Sp. Gr.: 1.136

Fl. Pt.: None

Layering: None

pH Meter: ✓

SP.GR:(Hydrometer): ✓

Fl. Pt. (Tag CC ASTM D56-64,1968)

Gas Chromatgraphy:

A.A. Spectrophotometry: ✓

Wet Analysis (Titration): ✓

Frequency of Sampling: 1/yr or if process changes

Method of Collection: Coliwasa

Land-Ban: Yes X No
CA

METALS & CONC: Tin

COMPOSITION:

| | |
|---|---|
| Hydrochloric - Acid | < 10% |
| Palladium Chloride | 0.1% |
| Water | Balance |

RATIONALE: This waste if from MacDermid formulation and the source is from Quality Control Lab, customer samples and from analytic lab. We suspect Hcl palladium chloride in the waste and so we do analysis for those substances.

CA Land Ban

GENERATED WASTE - SPOT TEST

WASTE ID NO: 538
(3 digits)

DEPARTMENT: Analytical Lab

DEPT. ACCT. NUMBER WASTE TO BE CHARGED TO: _____

WASTE NAME: Paddadium

TYPE SAMPLE: GRAB
COMPOSITE
RANDOM

. . . . . .

| CHARACTERISTICS | RESULTS | SPECIFICATIONS |
|---|---|---|
| Odor | Mild | Mild |
| Color | Brown | Brown |
| pH | 0.11 | 2 |
| Sp. Gravity | 1.345 | 1.1-1.2 |
| Flash Point | | N/A |

Metals Run if Applicable

| | | |
|---|---|---|
| Tin | | |
| Lead | | |
| Iron | | |
| Copper | | |
| Zinc | | |
| Cadmium | | |
| Other Palladium | 158/l | 0.18+ |

Solvents:

| | | |
|---|---|---|
| | | N/A |
| | | |
| | | |
| | | |

from QC 5/7/90

I certify this waste is within specification of the written waste analysis plan for on-site generated wastes per waste ID number.

Cherry D. Gulli
(Signature)

Date: 5/7/90

WASTE ANALYSIS PLAN

ON-SITE GENERATED WASTES

SECTION
264.13

WASTE Electrolytic Nickel TSDF WES REF: NO: #377/N4

SOURCE: Service Lab or MF RSCH

| CHARACTERISTICS | | EQUIPMENT USED TO ANALYZE |
|---|---|---|
| Waste Nos: | D002 | |
| Color: | Green | pH Meter: |
| Odor: | Mild | SP.GR:(Hydrometer): |
| pH: | 4-7 | Fl. Pt. (Tag CC ASTM D56-64,1968) |
| Sp. Gr.: | 1.15 | Gas Chromatgraphy: |
| Fl. Pt.: | None | A.A. Spectrophotometry: |
| Layering: | None | Wet Analysis (Titration): |

Frequency of Sampling: 1/yr

Method of Collection: Coliwasa

Land-Ban: Yesxx No___
CA LAND BAN FOR NICKEL/PH

METALS & CONC: Est. 11 oz nickel per gallon

BATH MAY BE COMBINATION OF WATTS OR WOODS
INCLUDING STRIKES

MAY CONTAIN:

COMPOSITION:

| | | | |
|---|---|---|---|
| Nickel Metal 11 oz/gl | | Organics with saccahrin | 1% |
| Nickel Sulphate 30-40% | | Hydrochloric Acid | 6-12% |
| Nickel Chloride 7-12% | | Water | Balance |
| Boric Acid | 608% | | |

RATIONALE: Material analyzed from customer samples.

DOT: Non Regulated Material

GENERATED WASTE - SPOT TEST

WASTE ID NO: 377
(3 digits)

DEPARTMENT: Customer Analytical Lab

DEPT. ACCT. NUMBER WASTE TO BE CHARGED TO: _____

WASTE NAME: Electrolytic Nickel

TYPE SAMPLE: GRAB
COMPOSITE
RANDOM

. . . . . .

| CHARACTERISTICS | RESULTS | SPECIFICATIONS |
|---|---|---|
| Odor | Mild | Mild |
| Color | Green | Green |
| pH | 4.4 | 2 - 7 |
| Sp. Gravity | 1.234 | 1 - 1.3 |
| Flash Point | | |

Metals Run if Applicable

| | | |
|---|---|---|
| Tin | | |
| Lead | | |
| Iron | | |
| Copper | | |
| Zinc | | |
| Cadmium | | |
| Other Nickel | 10.48 oz/gal | 6 - 11 oz/gl. |

Solvents:

| | | |
|---|---|---|
| | | |
| | | |
| | | |
| | | |

I certify this waste is within specification of the written waste analysis plan for on-site generated wastes per waste ID number.

Linda A. Chapman
(Signature)

Date: 5.7.90

# North East Solvents Reclamation Corp.

221 SUTTON STREET • NORTH ANDOVER, MASS 01845 • 508/683-1002

## WASTE IDENTIFICATION FORM

25824
34348

### A. GENERAL INFORMATION

Generator Name: Mac Dermid Inc

Facility Address: 526 Huntingdon Ave
Waterbury, CT

Billing Address: Same

Technical Contact: C Gillis Telephone No. 203-575-7947

Facility E.P.A. I.D. Number: CTD001164599

### FOR NORTHEAST SOLVENTS RECLAMATION CORP. USE ONLY

Approved ☒ Rejected ☐ Approval: N4

Date: 5/12/89

Signature: [illegible]

Comments: Acid-Y

### B. DESCRIPTION OF WASTE

Generator's Common Name for Waste: Electrolytic Nickel (w/Nickel Chloride, Boric Acid) 377

Process Generating Waste: Customer Bath Samples

### C. MANIFEST AND LABELLING INFORMATION

Proper D.O.T. Shipping Name: Waste Corrosive Liquid, NOS (Nickel chloride/Boric Acid)

Hazard Class: Corrosive Material EPA #: D002/[illegible]

UN/NA Number: UN1760 R.Q.: 1000 lb

### D. CHARACTERISTICS OF WASTE

pH will vary depending on bath/solution

**Color:** Green

**Odor:** ☐ None ☒ Mild ☐ Strong ☐ Describe

**Physical State at 70°F:** ☐ Solid ☐ Semi-Solid ☒ Liquid ☐ Powder ☐ Liquid With Sludge

$155.00/hr

**Layers:** ☒ Single Phased ☐ Bilayered ☐ Multilayered

**Specific Gravity at 70°F:** ☐ < .8 ☐ .8-1.0 ☒ 1.0-1.3 ☐ N/A ☐ 1.3-1.6 ☐ > 1.6 ☐ exact

**Flash Point:** ☐ < 70°F ☐ 70-100°F ☐ 101-140°F ☐ 141-200°F ☐ > 200°F ☒ None

**Free Liquids:** ☒ Yes ☐ No Volume 100 %

**pH:** ☒ 0-2 ☐ 2.1-4 ☐ 4.1-6.9 ☐ Neutral (7) ☐ N/A ☐ 7.1-10 ☐ 10.1-12.5 ☐ > 12.5 ☐ Exact

### E. CHEMICAL COMPOSITION (MUST ADD TO 100%)

111-8-111-63403

| % | MAJOR CONSTITUENT | % | MINOR CONSTITUENT | PPM | TRACE |
|---|---|---|---|---|---|
| | May Contain | | | | |
| 1 | Organics including saccharin | | Land Ban pH | | |
| 30-40 | Nickel Sulphate | | | | |
| 7-12 | Nickel Chloride | | CA Hazardous Bam pH + Dioxin | | |
| 6-8 | Boric Acid | | | | |
| 6-12 | Hydrochloric Acid (pH) | | | | |
| Bal | Water | | | | |

### F. METALS

☐ Total (ppm) ☐ EPA Extraction (mg/L) ☐ None

Arsenic (As): Barium (Ba): Cadmium (Cd): Chromium (Cr +3): Chromium-Hex (Cr +6): Mercury (Hg):

Lead (Pb): Silver (Ag): Selenium (Se): Copper (Cu): Nickel (Ni): 11/04/88 Zinc (Zn):

Others:

### G. OTHER COMPONENTS

| | No | Yes | Total ppm |
|---|---|---|---|
| PCB's | ☒ | ☐ | |
| Cyanides | ☒ | ☐ | |
| Sulfides | ☒ | ☐ | |
| Pesticides | ☒ | ☐ | |
| Phenolics | ☒ | ☐ | |
| Dioxins | ☒ | ☐ | |

### H. HAZARDOUS CHARACTERISTICS

1. Infectious or Biological Waste ☐ Yes ☒ No
2. Radioactive ☐ Yes ☒ No
3. Reactivity ☒ None ☐ Pyrophoric ☐ Shock Sensitive ☐ Explosive ☐ Water Reactive ☐ Other

### I. ANTICIPATED VOLUME

Qty: 20

☒ 5 gal pail ☒ 55 gal drum ☐ 15 gal carboy ☐ 30 gal drum ☐ 85 gal drum ☐ Bulk ☐ Other

☐ one time ☐ week ☐ month ☒ quarter ☐ year ☐ Other

### J. SPECIAL HANDLING INFORMATION

Safety goggles - Gloves

HAVE YOU ANSWERED ALL OF THE ABOVE QUESTIONS?

### K.

I hereby certify that all information submitted in this and all attached documents is complete, accurate, and that all known or suspected hazards have been disclosed.

AUTHORIZED SIGNATURE: [signature] TITLE: Compliance Coordinator DATE: 5/8/89

WASTE ANALYSIS PLAN

ON-SITE GENERATED WASTES

SECTION
264.13

---

WASTE Waste Photo Resist TSDF NES REF: NO: N2/#305

SOURCE: Micro/Past Shelflife, non-spc. mfg.

---

| CHARACTERISTICS | | EQUIPMENT USED TO ANALYZE | |
|---|---|---|---|
| Waste Nos: | F003/D002 | | |
| Color: | Reddish | pH Meter: | ✓ |
| Odor: | Strong | SP.GR:(Hydrometer): | ✓ |
| pH: | <2 | Fl. Pt. (Tag CC ASTM D56-64,1968) | ✓ |
| Sp. Gr.: | <1 | Gas Chromatgraphy: | |
| Fl. Pt.: | <100 F | A.A. Spectrophotometry: | |
| Layering: | None | Wet Analysis (Titration): | |

Frequency of Sampling: 1/yr or if process changes

Method of Collection: Coliwasa Land-Ban: Yes XX No ___

METALS & CONC: None

Organics

MAY CONTAIN: Sulphuric Acid from Amberlyst Resin Photoresist used with.

| COMPOSITION: | |
|---|---|
| Cellosolve Acetate | 58-62% |
| Dyglyme | Varies |
| Xylene | 3-7% |
| Resins | 31-39% |
| Water | Balance |

RATIONALE: Known material to MacDermid forumlations.

DOT: RQ Waste Flammable Liquid, Corrosive NOS (Xylene/Sulphuric Acid) Flammable Liquid, UN2924

LABELS: Flammable Liquid/Corrosive

Waste Nos: F003/D002 3/90

GENERATED WASTE - SPOT TEST

WASTE ID NO: 305 (3 digits)

DEPARTMENT: Micro Electronics

DEPT. ACCT. NUMBER WASTE TO BE CHARGED TO: 5151-911

WASTE NAME: Photo Resist

TYPE SAMPLE: GRAB COMPOSITE RANDOM

. . . . . .

| CHARACTERISTICS | RESULTS | SPECIFICATIONS |
|---|---|---|
| Odor | Strong | Strong |
| Color | dark red | Dark Red - Dark Purple |
| pH | 3.44 | < 5 |
| Sp. Gravity | 1.032 | .96 to 1.20 |
| Flash Point | 100°F | < 100 F |

Metals Run if Applicable

| | | |
|---|---|---|
| Tin | | N/A |
| Lead | | |
| Iron | | |
| Copper | | |
| Zinc | | |
| Cadmium | | |
| Other | | |

Solvents:

| | | |
|---|---|---|
| Ethylene Glycol Monoethyl Ether Acetate | 17.8 % | < 70% |
| Propylene Glycol Monomethyl Ether Acetate | 26.9 % | < 70% |

I certify this waste is within specification of the written waste analysis plan for on-site generated wastes per waste ID number.

Steven P. Ocri (Signature)

Date: May 7, 1990

**US EPA New England**
**RCRA Document Management System**
**Image Target Sheet**

**RDMS Document ID #** 100864

**Facility Name:** MACDERMID INC

**Facility ID#:** CTD001164599

**Phase Classification:** R-1B

**Purpose of Target Sheet:**

[ ] **Oversized** (in Site File) [ ] **Oversized** (in Map Drawer)

[ ] **Page(s) Missing** (Please Specify Below)

[ ] **Privileged** [ X ] **Other** (Provide Purpose Below)

CONFIDENTIAL BUSINESS INFORMATION

**Description of Oversized Material, if applicable:**

[ ] **Map** [ ] **Photograph** [ X ] **Other** (Specify Below)

CONFIDENTIAL BUSINESS INFORMATION

*** Please Contact the EPA New England RCRA Records Center to View This Document ***

# North East Solvents Reclamation Corp.

221 SUTTON STREET • NORTH ANDOVER, MASS. 01845 508/683-1002

## WASTE IDENTIFICATION FORM

27222

### A. GENERAL INFORMATION

Generator Name: MacDermid Inc.

Facility Address: 526 Huntingdon Ave
Waterbury, CT 06708

Billing Address: Same

Technical Contact: C. Gillis Telephone No: 203 575 7947

Facility E.P.A. I.D. Number: CTD001164599

### FOR NORTHEAST SOLVENTS RECLAMATION CORP. USE ONLY

Approved [X] Rejected [ ] Approval # E

Date 3/12/90

Signature

Comments Flam-Y

### B. DESCRIPTION OF WASTE

Xylene w/ trace sulfuric (305B)

Generator's Common Name for Waste: Waste PhotoResist

Process Generating Waste: Past Shelf-life, R&D

### C. MANIFEST AND LABELLING INFORMATION

Proper D.O.T. Shipping Name: RQ Waste Flammable Liquid, Corrosive NOS (Xylene/Sulfuric)

Hazard Class: Flamm. Liq EPA # D002/F003

UN/NA Number: UN2924 R.Q. 100

$595.00 Enscor

### D. CHARACTERISTICS OF WASTE

Color: Variable Generally Reddish

Odor: [ ] None [X] Mild [ ] Strong [ ] Describe

Physical State at 70°F: [ ] Solid [X] Liquid [ ] Liquid With Sludge [ ] Semi-Solid [ ] Powder

Layers: [X] Single Phased [ ] Bilayered [ ] Multilayered

Specific Gravity at 70°F: [ ] < .8 [ ] .8-1.0 [X] 1.0-1.3 [ ] N/A [ ] 1.3-1.6 [ ] > 1.6 [ ] exact

Flash Point: [ ] < 70°F [X] 70-100°F [ ] 101-140°F [ ] 141-200°F [ ] > 200°F [ ] None

Free Liquids: [X] Yes [ ] No Volume %

pH: [X] 0-2 [ ] 2.1-4 [ ] 4.1-6.9 [ ] Neutral (7) [ ] N/A [ ] 7.1-10 [ ] 10.1-12.5 [ ] > 12.5 [ ] Exact

### E. CHEMICAL COMPOSITION (MUST ADD TO 100%)

2441-112-63403

| % | MAJOR CONSTITUENT | % | MINOR CONSTITUENT | PPM | TRACE |
|---|---|---|---|---|---|
| 58-62 | Cellosolve Acetate or Propylene Glycol Monomethyl Ether Acetate | | | | |
| 31-39 | Phenolic Resin | | | | |
| 3-7 | Xylene | | | | |
| 2.5 | Butyl Acetate | | | | |
| 2.7 | Diazo | | | | |
| <2 | Sulfuric Acid residue | | | | |

### F. METALS

[ ] Total (ppm) [ ] EPA Extraction (mg/L) [X] None

Arsenic (As) ____ Lead (Pb) ____ Others ____
Barium (Ba) ____ Silver (Ag) ____
Cadmium (Cd) ____ Selenium (Se) ____
Chromium (Cr +3) ____ Copper (Cu) ____
Chromium-Hex (Cr +6) ____ Nickel (Ni) ____
Mercury (Hg) ____ Zinc (Zn) ____

### G. OTHER COMPONENTS

| | No | Yes | Total ppm |
|---|---|---|---|
| PCB's | [X] | [ ] | [ ] |
| Cyanides | [X] | [ ] | [ ] |
| Sulfides | [X] | [ ] | [ ] |
| Pesticides | [X] | [ ] | [ ] |
| Phenolics | [ ] | [X] | [ ] |
| Dioxins | [X] | [ ] | [ ] |

### H. HAZARDOUS CHARACTERISTICS

1. Infectious or Biological Waste [ ] Yes [X] No
2. Radioactive [ ] Yes [X] No
3. Reactivity [X] None [ ] Pyrophoric [ ] Shock Sensitive [ ] Explosive [ ] Water Reactive [ ] Other

### I. ANTICIPATED VOLUME

Qty. 6-12

[ ] 5 gal pail [X] 55 gal drum [ ] 15 gal carboy [ ] 30 gal drum [ ] 85 gal drum [ ] Bulk [ ] Other

[ ] one time [ ] week [ ] month [ ] quarter [X] year [ ] Other

RECEIVED

### J. SPECIAL HANDLING INFORMATION

Safety goggles, gloves

HAVE YOU ANSWERED ALL OF THE ABOVE QUESTIONS?

K. I hereby certify that all information submitted in this and all attached documents is complete, accurate, and that all known or suspected hazards have been disclos

3/9/90

cc: Jon Alperin
Don Berry

WASTE ANALYSIS PLAN

ON-SITE GENERATED WASTES

SECTION
264.13

WASTE Waste Acetone TSDF NES REF: NO: 0/#165

SOURCE: Mfg. and Washouts, AA Lab (Micro Samples)

| CHARACTERISTICS | | EQUIPMENT USED TO ANALYZE | |
|---|---|---|---|
| Waste Nos: | F003, D002 | | |
| Color: | Reddish | pH Meter: | ✓ |
| Odor: | Strong | SP.GR:(Hydrometer): | ✓ |
| pH: | <2 | Fl. Pt. (Tag CC ASTM D56-64,1968) | ✓ |
| Sp. Gr.: | .8 - 1.0 | Gas Chromatgraphy: | |
| Fl. Pt.: | <80 F | A.A. Spectrophotometry: | |
| Layering: | None | Wet Analysis (Titration): | |

Frequency of Sampling: 1/yr or if process changes

Method of Collection: Coliwasa Land-Ban: Yes X No ___

METALS & CONC: None

MAY CONTAIN: Sulphuric Acid from Amberlyst Resin
Photoresist used with.

COMPOSITION:

| | |
|---|---|
| Acetone | 95% |
| Cellosolve Acetate & DMF/H20 | 5% |

SPA Solvent, Photoresist, Water, Dyglyme

RATIONALE: Known material to MacDermid formulation, from MacDermid inventory.

DOT: Waste Flammable Liquid, Corrosive NOS (Acetone/Sulphuric Acid) Flammable Liquid UN2924
Flammable/Corrosive Labels

GENERATED WASTE - SPOT TEST

WASTE ID NO: 165 (3 digits)

DEPARTMENT: Micro Electronics

DEPT. ACCT. NUMBER WASTE TO BE CHARGED TO: 5151-911

WASTE NAME: Acetone

TYPE SAMPLE: GRAB COMPOSITE (RANDOM)

. . . . . .

| CHARACTERISTICS | RESULTS | SPECIFICATIONS |
|---|---|---|
| Odor | Strong | Strong |
| Color | dark red | Slightly Orange-Dark Red |
| pH | 2.11 | <5 |
| Sp. Gravity | 0.933 | .80 - 1.10 |
| Flash Point | 72°F | <80 F |

Metals Run if Applicable

| | | |
|---|---|---|
| Tin | | N/A |
| Lead | | |
| Iron | | |
| Copper | | |
| Zinc | | |
| Cadmium | | |
| Other | | |

Solvents:

| | | |
|---|---|---|
| Ethylene Glycol Monoethyl Ether Acetate | 1.6% | <25% |
| | | |
| Acetone | 67.5% | 60-95% |
| Propylene Glycol Monomethyl Ether Acetate | 3.1% | <25% |

I certify this waste is within specification of the written waste analysis plan for on-site generated wastes per waste ID number.

Steven P. Rossi (Signature)

Date: May 7, 1990

**US EPA New England**
**RCRA Document Management System**
**Image Target Sheet**

**RDMS Document ID #** 100864

**Facility Name:** MACDERMID INC

**Facility ID#:** CTD001164599

**Phase Classification:** R-1B

**Purpose of Target Sheet:**

[ ] **Oversized** (in Site File) [ ] **Oversized** (in Map Drawer)

[ ] **Page(s) Missing** (Please Specify Below)

[ ] **Privileged** [ X ] **Other** (Provide Purpose Below)

CONFIDENTIAL BUSINESS INFORMATION

**Description of Oversized Material, if applicable:**

[ ] **Map** [ ] **Photograph** [ X ] **Other** (Specify Below)

CONFIDENTIAL BUSINESS INFORMATION

*** Please Contact the EPA New England RCRA Records Center to View This Document ***

# North East Solvents Reclamation Corp.

221 SUTTON STREET • NORTH ANDOVER, MASS. 01845 508/683-1002

## WASTE IDENTIFICATION FORM

27222

### A. GENERAL INFORMATION

Generator Name: MacDermid Inc.

Facility Address: 526 Huntingdon Ave
Waterbury, CT 06708

Billing Address: Same

Technical Contact: C. Gillis  Telephone No. 203-575-7947

Facility E.P.A. I.D. Number: CTD001164599

### FOR NORTHEAST SOLVENTS RECLAMATION CORP. USE ONLY

Approved [X]  Rejected [ ]  Approval # 6

Date: 3/12/90

Signature: J Worsley

Comments: ~~ISA-Y~~ Flum-Y

### B. DESCRIPTION OF WASTE

w/ trace sulfuric 165A

Generator's Common Name for Waste: Waste Acetone

Process Generating Waste: Washing out process tanks ©

### C. MANIFEST AND LABELLING INFORMATION

Proper D.O.T. Shipping Name: RQ Waste Flammable Liquid, Corrosive NOS [Acetone/Sulfuric Acid]

Hazard Class: Flamm. Liq  EPA #: D002/F002

UN/NA Number: UN2924  R.Q.: 100

### D. CHARACTERISTICS OF WASTE

595.00 Ensco

**Color:** Redish

**Odor:** [ ] None [ ] Mild [X] Strong [ ] Describe

**Physical State at 70°F:** [ ] Solid [ ] Semi-Solid [X] Liquid [ ] Powder [ ] Liquid With Sludge

**Layers:** [X] Single Phased [ ] Bilayered [ ] Multilayered

**Specific Gravity at 70°F:** [ ] < .8 [X] .8-1.0 [ ] 1.0-1.3 [ ] N/A [ ] 1.3-1.6 [ ] > 1.6 [ ] exact

**Flash Point:** [X] < 70°F [ ] 70-100°F [ ] 101-140°F [ ] 141-200°F [ ] > 200°F [ ] None

**Free Liquids:** [X] Yes [ ] No Volume ____%

**pH:** [X] 0-2 [ ] 2.1-4 [ ] 4.1-6.9 [ ] Neutral (7) [ ] N/A [ ] 7.1-10 [ ] 10.1-12.5 [ ] > 12.5 [ ] Exact

### E. CHEMICAL COMPOSITION (MUST ADD TO 100%)

| % | MAJOR CONSTITUENT | % | MINOR CONSTITUENT | PPM | TRACE |
|---|---|---|---|---|---|
| 95 | Acetone | 5 | Cellosolve acetate, dimethylformamide water | | |
| | | | Sulfuric Acid residue | | |

### F. METALS

[ ] Total (ppm) [ ] EPA Extraction (mg/L) [X] None

Arsenic (As) ____ Lead (Pb) ____ Others ____
Barium (Ba) ____ Silver (Ag) ____
Cadmium (Cd) ____ Selenium (Se) ____
Chromium (Cr +3) ____ Copper (Cu) ____
Chromium-Hex (Cr +6) ____ Nickel (Ni) ____
Mercury (Hg) ____ Zinc (Zn) ____

### G. OTHER COMPONENTS

| | No | Yes | Total ppm |
|---|---|---|---|
| PCB's | [X] | [ ] | [ ] |
| Cyanides | [X] | [ ] | [ ] |
| Sulfides | [X] | [ ] | [ ] |
| Pesticides | [X] | [ ] | [ ] |
| Phenolics | [X] | [ ] | [ ] |
| Dioxins | [X] | [ ] | [ ] |

### H. HAZARDOUS CHARACTERISTICS

1. Infectious or Biological Waste [ ] Yes [X] No
2. Radioactive [ ] Yes [X] No
3. Reactivity [X] None [ ] Pyrophoric [ ] Shock Sensitive [ ] Explosive [ ] Water Reactive [ ] Other

### I. ANTICIPATED VOLUME

Qty. 6-12

[ ] 5 gal pail [X] 55 gal drum [ ] 15 gal carboy [ ] 30 gal drum [ ] 85 gal drum [ ] Bulk [ ] Other

[ ] one time [ ] week [ ] month [ ] quarter [X] year [ ] Other

RECEIVED MAR -7

### J. SPECIAL HANDLING INFORMATION

Safety goggles, gloves

HAVE YOU ANSWERED ALL OF THE ABOVE QUESTIONS?

### K.

I hereby certify that all information submitted in this and all attached documents is complete, accurate, and that all known or suspected hazards have been disclos

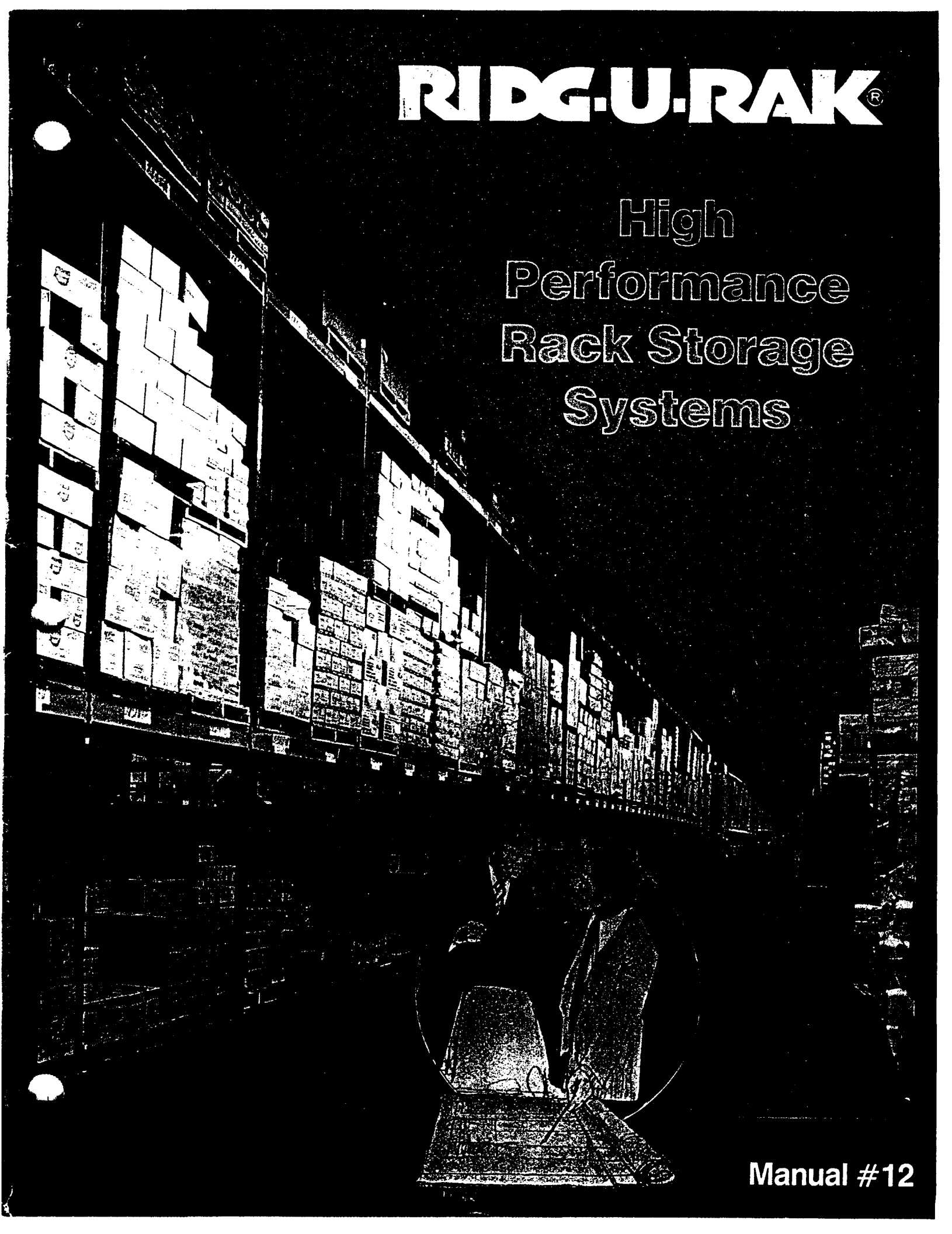
Cherri D Gillis  Compliance Adm  3/9/90

# APPENDIX W

## MAIN CONTAINER STORAGE AREA'S RACK STORAGE SYSTEM SPECIFICATIONS

# RIDG-U-RAK®

# High Performance Rack Storage Systems



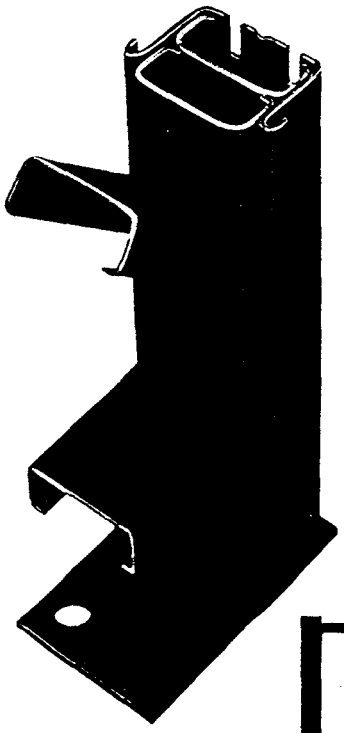
Manual #12

## Capacity Adjustment Chart

Capacities are established using vertical loading and assuming a maximum vertical beam spacing of 60". For other beam spacing, capacities may require an adjustment. See the Capacity Adjustment Chart below.

| Max. Vertical Beam Space | UL 32 | US 32 | UR 32 | UM 32 | UY 32 | UH 32 | UM 33 | UH 33 | UM 43 | UH 43 |
|---|---|---|---|---|---|---|---|---|---|---|
| 36" | 18160 | 23380 | 26980 | 30720 | 35560 | 39160 | 38540 | 50860 | 47900 | 60420 |
| 48" | [illegible] | [illegible] | [illegible] | 27020 | 31800 | 35920 | 31300 | 44220 | 48360 | 55700 |
| 60" | 15000 | 20000 | 23100 | 26100 | 30700 | 35000 | 30200 | 42800 | 42700 | 55000 |
| 72" | 14540 | 19080 | 22120 | 24900 | 29440 | 32260 | 28820 | 41000 | 41860 | 53780 |
| 84" | 13780 | 17920 | 20840 | 23400 | 27780 | 30400 | 27120 | 38800 | 40800 | 52420 |
| 96" | 12860 | 16520 | 19300 | 21600 | 25740 | 28140 | 25080 | 36140 | 39520 | 50760 |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |

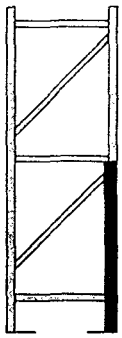
## Ways to Reduce Rack Damage



## Column Sentry II™

Ridg-U-Rak's Column Sentry II reinforcing is a double-thick, double-strength diaphragmed box section that provides exceptional resistance to impact damage of upright rack storage columns.

It's a compact reinforcing method that gives you greater protection and greater strength at an economical price.

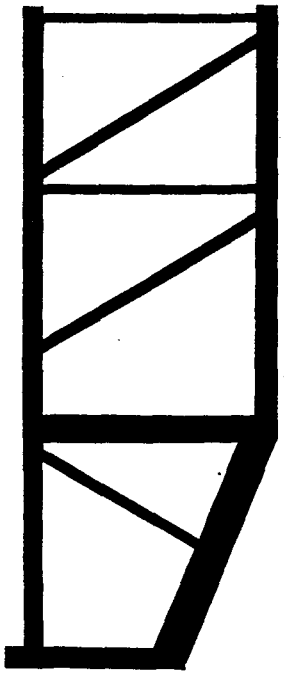


Column Sentry II reinforcing can be applied sparingly and where it's needed most — such as lower leg of front upright. No need for heavy, inflexible, expensive structural components in areas where damage is unlikely to occur.

Standard

Column Sentry I

Column Sentry II



## Slant-bak™ frames

Slanting the frame column back from the aisle isolates column from aisle traffic without a sacrifice in capacity. It increases safety and reduces possibility for damage.

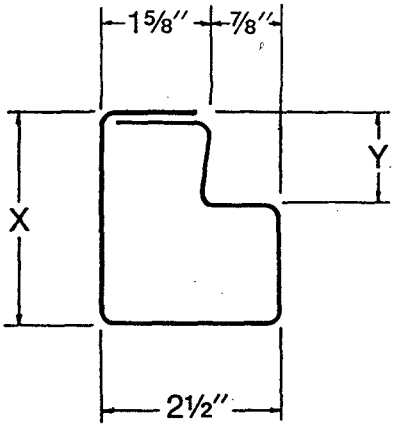
Available for upright frame depths of 36", 42", 44" and 48" — standard heights for slanted sections are 36", 44", 48" and 60". Consult factory for special requirements.

## Beams for column size 32 *(capacity in pounds per pair of beams)*

| PART NUMBER | BEAM LENGTH (inches) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 48 | 54 | 72 | 84 | 92 | 96 | 106 | 108 | 120 | 132 | 144 | 156 |
| SBS32P-200 | 4330 | 3850 | 2240 | 1650 | 1380 | 1260 | 1040 | 1000 | 810 | 670 | 560 | — |
| SBS32P-225 | 5160 | 4590 | 2980 | 2190 | 1830 | 1680 | 1380 | 1330 | 1080 | 890 | 750 | — |
| SBS32P-275 | 6940 | 6170 | 4630 | 3560 | 2970 | 2730 | 2240 | 2150 | 1750 | 1440 | 1210 | — |
| RBS32P-350 | — | — | 5580 | 4780 | 4360 | 4010 | 3290 | 3170 | 2570 | 2120 | 1800 | 1520 |
| RBS32P-400 | — | — | 6620 | 5670 | 5180 | 5000 | 4450 | 4290 | 3470 | 2870 | 2410 | 2060 |
| RBS32P-450 | — | — | 7970 | 6830 | 6240 | 5980 | 5420 | 5320 | 4770 | 3940 | 3310 | 2820 |
| RBS32P-500 | — | — | 9290 | 7960 | 7270 | 6970 | 6310 | 6190 | 5580 | 5070 | 4310 | 3670 |
| RBS32P-550 | — | — | 10710 | 9180 | 8380 | 8030 | 7280 | 7140 | 6430 | 5840 | 5360 | 4670 |
| RBS32P-525 | 13000 | 13000 | 11440 | 9810 | 8960 | 8580 | 7770 | 7630 | 6870 | 6240 | 5660 | — |
| SBS32P-575 | 13000 | 13000 | 13000 | 11920 | 10890 | 10430 | 9450 | 9270 | 8350 | 7590 | 6960 | — |
| SBS32P-650 | 13000 | 13000 | 13000 | 13000 | 13000 | 12560 | 11380 | 11170 | 10050 | 9140 | 8380 | — |
| SBH32P-650 | 19500 | 19500 | 19500 | 19500 | 19500 | 19500 | 17980 | 17650 | 15890 | 14440 | 13240 | — |

## Beams for column sizes 33 and 43 *(capacity in pounds per pair of beams)*

| PART NUMBER | BEAM LENGTH (inches) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 48 | 54 | 72 | 84 | 92 | 96 | 106 | 108 | 120 | 132 | 144 | 156 |
| SBS33P-200 | 4330 | 3850 | 2240 | 1650 | 1380 | 1260 | 1040 | 1000 | 810 | 670 | 560 | — |
| SBS33P-225 | 5160 | 4590 | 2980 | 2190 | 1830 | 1680 | 1380 | 1330 | 1080 | 890 | 750 | — |
| SBS33P-275 | 6940 | 6170 | 4630 | 3560 | 2970 | 2730 | 2240 | 2150 | 1750 | 1440 | 1210 | — |
| RBS33P-350 | — | — | 5580 | 4780 | 4360 | 4010 | 3290 | 3170 | 2570 | 2120 | 1800 | 1520 |
| RBS33P-400 | — | — | 6620 | 5670 | 5180 | 5000 | 4450 | 4290 | 3470 | 2870 | 2410 | 2060 |
| RBS33P-450 | — | — | 7970 | 6830 | 6240 | 5980 | 5420 | 5320 | 4770 | 3940 | 3310 | 2820 |
| RBS33P-500 | — | — | 9290 | 7960 | 7270 | 6970 | 6310 | 6190 | 5580 | 5070 | 4310 | 3670 |
| RBS33P-550 | — | — | 10710 | 9180 | 8380 | 8030 | 7280 | 7140 | 6430 | 5840 | 5360 | 4670 |
| SBS33P-525 | 13000 | 13000 | 11440 | 9810 | 8960 | 8580 | 7770 | 7630 | 6870 | 6240 | 5660 | — |
| SBS33P-575 | 13000 | 13000 | 13000 | 11920 | 10890 | 10430 | 9450 | 9270 | 8350 | 7590 | 6960 | — |
| SBS33P-650 | 13000 | 13000 | 13000 | 13000 | 13000 | 12560 | 11380 | 11170 | 10050 | 9140 | 8380 | — |
| SBH33P-650 | 19500 | 19500 | 19500 | 19500 | 19500 | 19500 | 17980 | 17650 | 15890 | 14440 | 13240 | — |




## Beam Dimensions
**(for column size 32)**

| | | |
|---|---|---|
| RBS32P-350 | 3½ | 1⅝ |
| RBS32P-400 | 4 | 1⅝ |
| RBS32P-450 | 4½ | 1⅝ |
| RBS32P-500 | 5 | 1⅝ |
| RBS32P-550 | 5½ | 1⅝ |
| SBS32P-525 | 5¼ | 1⅝ |
| SBS32P-575 | 5¾ | 1⅝ |
| SBS32P-650 | 6½ | 1⅝ |
| SBH32P-650 | 6½ | 1⅝ |

## Beam Dimensions
**(for column sizes 33 & 43)**

| | | |
|---|---|---|
| RBS33P-350 | 3½ | 1⅝ |
| RBS33P-400 | 4 | 1⅝ |
| RBS33P-450 | 4½ | 1⅝ |
| RBS33P-500 | 5 | 1⅝ |
| RBS33P-550 | 5½ | 1⅝ |
| SBS33P-525 | 5¼ | 1⅝ |
| SBS33P-575 | 5¾ | 1⅝ |
| SBS33P-650 | 6½ | 1⅝ |
| SBH33P-650 | 6½ | 1⅝ |

hrp associates inc.
engineering & geology
post office box 732
xington street
britain, ct 06050
(203) 827-0004

| PROJECT TITLE | MacDermid Part B | | |
|---|---|---|---|
| PROJECT NUMBER | MAC0001.RC | | |
| SUBJECT | Rack Loading Calculations | | |
| DESIGNED DAG | DATE 5/10/90 | CHECKED | DATE |

Main Container Storage Area
Rack Loading Calculations

MacDermid, Inc.
526 Huntingdon Avenue
Waterbury, CT

① Maximum drum weight:

550 lbs (waste material) + 25 lbs (drum) = 575 lbs/drum

② Pallet weight = 70 lbs

③ Maximum Allowable Horizontal Rack Loading:

6190 lbs per rack section level

④ Maximum Allowable Vertical Rack Loading:

23,900 lbs per rack section

Horizontal Loading per level

| | | |
|---|---|---|
| 8 drums / section | = | 4600 lbs. |
| 2 pallets / section | = | 140 lbs. |
| | | 4740 lbs/section |

4740 lbs < 6190 lbs allowable loading

∴ o.k.

hrp associates inc.
engineering & geology
post office box 732
xington street
britain, ct 06050
(203) 827-0004

| PROJECT TITLE | | | |
|---|---|---|---|
| PROJECT NUMBER | | | |
| SUBJECT | | | |
| DESIGNED | DATE | CHECKED | DATE |

Main Container Storage Area
Rack loading Calculations (cont'd)

MacDermid Inc.
526 Huntingdon Avenue
Waterbury, CT

Vertical Loading per section

4740 lbs/level
× 4 levels/rack section

18,960 lbs/rack section

18,960 lbs < 23,900 lbs allowable loading
∴ O.K.

# APPENDIX X

# MACDERMID, INC.'S QA/QC PLAN

**MacDermid Quality Assurance Program**

**for TSDF Laboratory Measurements**

Prepared by: Ronald Redline

Quality Control Laboratory Supervisor

Approved: Mary Jane Senechal

Date: May 10, 1990

Mary Jane Senechal

Director of Corporate Quality/SPC

Approved: Norris D. Shake

Date: May 10, 1990

Norris Shake

Waterbury SBU Manager

## Table of Contents

(1) Policy

(2) Project Description

(3) The Organization

(4) Sampling

(5) Calibration

(6) Analytical Procedures

(7) Reporting and Documentation

(8) Audits

(9) Corrective Action

(10) Training

(11) Reports and Management

## (1) POLICY

The objective of MacDermid's Quality Assurance TSDF Project is to provide superior analytical measurement data pertaining to the treatment, storage, or disposal of recyclable MacDermid products and wastes. To this end, the management is dedicated to the encouragement of excellence in measurement and ethics and to provide the environment necessary to achieve maximum reliability and responsibility.

The quality assurance project described in the following sections, is established to further these objectives and applies to all work conducted in relation to the analysis of recylcable MacDermid products or wastes, in principle and in detail, to the extent possible and feasible.

## (2) PROJECT DESCRIPTION

The purpose of this project is to formalize the quality assurance procedures that have been developed and to provide the staff with written procedures as to the preferred operation of the analytical laboratory. A secondary purpose is to inform the Connecticut Department of Environmental Protection of the established practices of the laboratory at 526 Huntingdon Avenue, Waterbury, Connecticut.

## (3) The Organization

1. Scope

The purpose of this chart is to define the organizational structure, relative to the quality function within MacDermid's Waterbury business unit.

2. General

Organizational Chart

**Peter Kukanskis**
Technical VP

**Michael Pfaff**
Marketing VP

**Mary Jane Senechal**
Dir.Corp.Quality

**Norris Shake**
Waterbury SBU Manager

**Ron Redline**
Q.C. Laboratory Supervisor

Laboratory Analysts(7)

3. Responsibilities

a) The Technical Vice President is responsible for establishing Corporate policy with respect to the quality of data and the effective management of this policy.

b) The Waterbury SBU Manager is responsible for the implementation of company policy within the Waterbury facility.

c) The Director of Corporate Quality is responsible for the effective management of Corporate policy with respect to quality of data and to prepare all specifications, recommend and document analytical procedures pertaining to recycled products. He/She conducts systems audits and periodically reviews the project and makes recommendations for its improvement.

d) The Laboratory Supervisor is responsible for the implementation of the prescribed techniques, maintenance of the laboratory facility and equipment, training of the laboratory personnel, and documentation and review of the analytical results.

e) The Laboratory Supervisor is responsible for developing and implementing the Q. A. Project Plan that ensures all data generated is technically sound and the coordinates monitors the systems, resolves any non-conformance within the system and assures compliance to the system.

f) The Laboratory Analysts are responsible for the accurate performance of the analytical techniques as documented and the reporting of the data obtained.

## (4) Sampling

1. Scope

The purpose of this section is to assure that all aspects of sampling will be performed in accordance with the prescribed procedure in Section 5.8 of NPDES Permit application made by MacDermid Incorporated, Waterbury, Connecticut.

2. General

a) All aspects of sampling will be performed in accordance with the approved plan.

b) Sample integrity will be protected by an appropriate chain of custody. The use of unauthorized personnel and/or procedures will not be tolerated.

c) Any limitation on the analytical results due to the sampling will be specified.

3. Procedures

a) Each container of recyclable product or waste will be sampled uniformly using a Calawasa tube and the sample placed in an identified container as described in Section 5.8.2 of TSDF Part B Application.

b) Each sample container will be marked with the same identifier (5 digit number) as the original material container.

c) If material is received with a certificate of analysis, the material need not be sampled.

d) Any deviation necessary from the standard sampling procedure will be documented on the analysis document.

4. Responsibilities

a) The Laboratory Supervisor is responsible for the insurance of the above procedures including labeling.

b) The Laboratory Analyst is responsible to carry out the described procedures pertaining to sampling and documentation.

## (5) Calibration

1. Scope

The purpose of this section is to define the system of maintenance and control of the measuring and test equipment located in the Waterbury quality control laboratory.

2. General

a) Any equipment or method used to provide numerical data that can influence a measured value will be calibrated to the accuracy required for its intended use.

b) Records shall be kept of all calibrations made internally or externally.

c) Calibration schedules will be established for all chemical measurements and will be strictly observed.

d) Calibration records will be filed in the laboratory and corrections shall be required by the accuracy of the data. This includes reagent standardizations which must be performed using materials of known purity.

e) External calibrations must be certified by the supplier.

f) All laboratory personnel have the authority through the proper channels, to initiate action if reagents or equipment do not appear to be in proper working order.

3. Procedure

a) Calibration of laboratory reagents is performed weekly as described in Appendix A.

b) Standardized reagents shall have the exact concentration displayed on the container with the date of calibration and the initials of the person who performed the calibration procedure.

c) Equipment which utilizes standardization with each use (example:pH meters) must use standards purchased with certification of analysis.

d) The laboratory balances shall be calibrated in March of each year and certified to NIST standards. Documentation of the calibration will be provided on the balance.

e) Atomic Absorption standards will be certified to NIST standards

and documentation kept in the AA laboratory.
An initial calibration curve is prepared with a minimum of a blank and three standards and subsequently verified on a daily basis with a blank and two check standards that have been prepared at concentrations near the method detection limit and the midpoint of the calibration range. The method of standard additions is used on all samples.

4. Responsibilities

a) The Laboratory Supervisor, or his/her nominated representative, is responsible for the control of measuring and test equipment within the laboratory.

b) The Laboratory Supervisor, or his/her nominated representative, is responsible for maintaining the service records of internal and external calibration.

c) The Laboratory Supervisor, or his/her nominated representative, is responsible for ensuring that no piece of measuring or test equipment is used without a current service report.

d) All personnel who require the use of measuring or test equipment have the responsibility to treat the equipment in a sensible and careful manner.

e) All personnel who require the use of measuring or test equipment have the responsibility to ensure that worn or damaged equipment is not used until such time as it is recalibrated.

## (6) Analytical Procedures

1. Scope

The purpose of this section is to describe the system of maintenance and control of the analytical procedures used in the spot testing and fingerprinting of samples.

2. General

a) All analytical methods will be described in writing.

b) Preference will be given to using standard methods when applicable according to Table 5.10 and 5.12 in TSDF Part B Application.

c) Laboratory safety rules will be enforced.

d) The potential hazard of each substance used in the laboratory will be made known to all personnel through MSDS information.

e) Safe disposal practices will be followed.

3. Procedure

a) The method of analysis is documented by product for both a spot test and a full fingerprint per the PIP Manual (Product Information Package).

b) The specifications for acceptance and the method of analysis are documented (Appendix B) and distributed to the laboratory.

c) The analysis is performed as prescribed and the results documented.

4. Responsibilities

a) The Director of Corporate Quality in conjuction with the Research Department shall be responsible for the specifications, methodology and the documentation thereof.

b) The Laboratory Supervisor is responsible to implement the designated analytical methods.

c) The Laboratory Analysts are responsible to perform the designated methods as written and document the results.

d) The Laboratory Analysts are responsible to notify the Laboratory Supervisor of any non-conformance to the specification.

## (7) Reporting and Documentation

1. Scope

The purpose of this section is to describe the system of documentation and reporting at MacDermid, Waterbury SBU to assure the integrity of the data over time.

2. General

Standard operating procedures for the performance, preparation of standards and reagents, and general laboratory procedures are documented and distributed the Corporate Quality (see Appendix B).

3. Procedure

a) The laboratory analyst shall perform the prescribed spot testing and will report the results on the spot test worksheet (Appendix H). These will be filed in the recyclable holding area files.

b) Any sample which does not pass the spot test characteristics shall be segregated and the deviation reported to Safety, Regulatory, and Compliance on the discrepancy report (Appendix C). The discrepancy reports are filed in the recylable holding area for a period of three years.

c) All fingerprint analyses are performed in accordance with the established procedures and the results are reported on a bench sheet (Appendix D).

d) The fingerprint bench sheets are filed in the laboratory by schedule for a period of three years.

e) A formal report is prepared (Appendix E) and sent to Safety, Regulatory, and Compliance for filing and customer contact if necessary.

## (8) **Audits**

1. Scope

This section describes the activities associated with systems and performance audits.

2. Definitions

Systems Audit: Review of laboratory operations to verify that the laboratory has adequate facilities, equipment, staff, and procedures in place to generate acceptable data.

Performance Audit: Verifies the accuracy of the laboratory results.

3. Procedure

a) A complete systems audit shall be performed once a year and include the verification of
   1) equipment calibration
   2) completeness of data forms
   3) review of analytical procedures
   4) review of personnel training records
   5) data archival procedures
   6) corrective action reports

b) Unscheduled systems audits of specific areas will be made on a more frequent basis.

c) Performance evaluation samples are submitted semiannually and reviewed for accuracy to the prescribed limits.

4. Responsibilities

a) The Director of Corporate Quality shall perform a systems audit in conjunction with the annual facility audit.

b) The laboratory supervisor is responsible to perform unscheduled systems audits and provide performance samples.

## (9) Corrective Action

1. Scope

This section describes the corrective action process.

2. General

Corrective action is necessary when:

1) blanks contain contaminants
2) trends are detected
3) unusual changes in detection limits
4) audit discrepancies
5) inquiries occur concerning reported results

3. Procedure

a. Analyst or supervisor detects any of the general conditions above.

b. Analyst reviews sample preparation, instrument calibration, reagent standardization, etc. for errors.

c. If problem persists, the data is reviewed, investigated and the cause of the problem is determined.

d. The corrective action is determined.

e. The corrective action is implemented.

4. Responsibilities

a. The laboratory supervisor is responsible to investigate the cause of a problem and determine the corrective action required.

b. The analyst is responsible to review procedures and assist in the implementation of corrective action.

## (10) **Training**

1. Scope

The purpose of this section is to define the training given an individual to perform their prescribed function in the analytical laboratory.

2. Procedure

a) A formal job description for each position is produced including job title, minimum qualifications (education and work experience), reporting structure, a description of the job and specific responsibilities.

b) A formal orientation program in chemical safety and handling is given to each employee upon hiring (Appendix F).

c) Training on a one-to-one basis by appropriate laboratory personnel is provided including the Q.A. plan and specific Q.C. procedures.

d) All analysts are required to demonstrate proficiency in a given analytical methodology which is documented as shown in Appendix G.

e) All proficiency testing results as well as other training records are maintained in the employees personnel file.

3. Responsibilities

a) The laboratory supervisor is responsible to prepare a written job description.

b) The Safety, Regulatory and Compliance department is responsible to provide the chemical orientation.

c) The laboratory supervisor is responsible to appoint an appropriate representative to train laboratory personnel in Q.A. and Q.C. procedures.

d) The laboratory supervisor is responsible to perform proficiency tests and report the results which are documented in the employees personnel file.

e) The Human Resources department is responsible to maintain the employee records.

## (11) **Reports and Management**

1. Scope

   This section illustrates the procedure for the reporting of laboratory measurements to management for effective assessment and review of the laboratory activities.

2. Procedure

   a. A quarterly report is submitted to the SBU Manager and the Director of Corporate Quality which includes the following:
      1) Results of systems/performance audits
      2) Results of regulatory visit/audits
      3) Corrective actions
      4) Numbers and types of analysis per period
      5) Problems
      6) Training completed
      7) Comments and recommendations

   b. The content of this report is review at a quarterly meeting with the laboratory personnel.

3. Responsibilities

   a. The laboratory supervisor is responsible to prepare and distribute the quarterly laboratory report.

   b. The laboratory supervisor is responsible to schedule a quarterly laboratory meeting to review the management report for that period.

# APPENDIX A

## Standarization of Laboratory Reagents

1. Laboratory reagents shall be standardized each Monday morning or when a new reagent has been prepared, according to the attached procedures.

2. The concentration as determined by standarization shall be displayed on the container along with with date of calibration and the initials of the person who performed the calibration procedure.

3. Purchased standards are used with the appropriate amount of reagent. These are purchased from:

Chemical Service Laboratories
P.O.Box 281
Largo, Florida 33540
(813) 531-5731

| Catalog No. | Standard | To be titrated against | |
|---|---|---|---|
| 105A | Arsenious Oxide | Iodine | 0.1N |
| 131 | Copper Sulfate | Thiosulfate | 0.1N |
| 21 | Hydrochloric Acid | Base | 0.5N |
| 104 | Sodium Chloride | Silver Nitrate | 0.1N |
| 23 | Sodium Hydroxide | Acid | 0.5N |
| 190 | Zinc Sulfate | Titrant (EDTA) | 0.1N |

## 0.1 N Sodium Thiosulfate

($Na_2S_2O_3$)

Preparation: Dissolve 189.2 gr. of $Na_2S_2O_3$ in 7570 mls. distilled water. Add 2 gr. sodium carbonate ($NaCO_3$).

Standardize:
1) 1 vial copper sulfate (rinse 3 times).
2) 5 mls. sulfuric acid (conc.) cool to room temperature.
3) 20 mls. 10% K.I.
4) Titrate with 0.1 N $Na_2S_2O_3$ to a light straw color.
5) Add starch.
6) Continue titrating with $Na_2S_2O_3$ until milky white endpoint.

* Repeat procedure 2 or 3 times.

$$\text{Normality} = \frac{\text{milliequivalents}}{\text{mls. } Na_2S_2O_3}$$

## 0.5 N Sodium Hydroxide

(NaOH)

Preparation: Dissolve 151.4 gr. sodium hydroxide in 7570 mls. of distilled water.

Standardize:
1) 1 vial 0.5 N hydrochloric acid standardette (rinse 3 times).
2) Add 3 - 5 drops phenophthalein.
3) Titrate with NaOH to a pink endpoint.

* Repeat procedure 2 or 3 times.

$$\text{Normality} = \frac{\text{milliequivalents}}{\text{mls. NaOH}}$$

## 0.2 N Disodium EDTA Dihydrate

(0.1 M)

Preparation: Dissolve 148.6 gr. of EDTA in 4 liters of distilled $H_2O$.

Standardize:
1) 1 vial zinc sulfate standardette (rinse 3 times).
2) Add ammonia hydroxide dropwise until precipitate dissolves (add 5 mls. excess).
3) Add 0.25 grs. Erichrome Black-T.
4) Titrate from purple to blue.

* Repeat procedure 2 or 3 times.

$$\text{Normality} = \frac{\text{milliequivalents}}{\text{mls. EDTA}}$$

Molarity = 1/2 of Normality

## 0.5 N Hydrochloric Acid

(HCl)

Preparation: Dissolve 334 mls. of HCl in 7570 mls. of distilled water.

Standardize:
1) 1 vial 0.5 N sodium hydroxide or tham (rinse out 3 times) or methyl red with tham.
2) Add 3 - 5 drops phenophthalein.
3) Titrate with HCl to clear endpoint.

* Repeat procedure 2 or 3 times.

$$\text{Normality} = \frac{\text{milliequivalents}}{\text{mls. HCl}}$$

## 0.1 N Silver Nitrate

($AgNO_3$)
45660 - raw material code number

Preparation: Dissolve 64.3 grs. of $AgNO_3$ in 3785 mls. of distilled $H_2O$.

Standardize:
1) 1 vial sodium chloride (rinse 3 times).
2) Add 1 ml. sodium chromate indicator.
3) Titrate with $AgNO_3$ to reddish-brown endpoint.

* Repeat 2 or 3 times.

$$\text{Normality} = \frac{\text{milliequivalents}}{\text{mls. } AgNO_3}$$

## 0.1 N Iodine

## ($I_2$)

Preparation: Weigh 50.8 grs. of $I_2$ and 96 grs. of potassium iodide (KI). Grind together *under a hood* to a fine powder and dissolve in 3785 mls. of distilled water. Mix on a stir plate for 2 hours or more and run through #4 filter paper.

Standardize:
1) Burette 25 ml. sample of iodine.
2) Add 10 mls. 1:1 $H_2SO_4$. * Do under hood.
3) Titrate with 0.1 N sodium thiosulfate to a straw color.
4) Add 5 mls. starch - continue titrating to clear endpoint.

*Repeat procedure 2 or 3 times.

$$\text{Normality} = \frac{\text{mls. thio x N thio}}{\text{sample size}}$$

# APPENDIX B

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Facility ID#: CTD001164599

Phase Classification: R-1B

Purpose of Target Sheet:

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Description of Oversized Material, if applicable:

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# APPENDIX C

# Notice of Discrepancy

Date:_____

Customer EPA #:_____

Customer Name:_____

City and State:_____

Product Number: _____
Product Name:_____

Quantity Received:_____ Drums/Bulk?

Manifest #:_____ Receiving Report #:_____

Date Received (Sample Date) :_____

Discrepancy (describe in detail) :_____
_____
_____
_____
_____
_____
_____
_____

Number of previous discrepancies from this customer for this product:_____

Name of Quality Control Chemist:_____
CC: Name of Distributor:_____
Name of Salesman:_____
Name of Regional Manager:_____

# APPENDIX D

SCHEDULE: _____ PRODUCT: _____

| CUSTOMER/DRUM NO. | DATE | TEST NUMBER | | | | | | | | | | ADDITIONS/ COMMENTS | TECH |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | | |
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# APPENDIX E

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# APPENDIX F

Revised 1/89

On-The-Job: Hazardous Communication/Hazardous Waste
TRAINING CHECKLIST

EMPLOYEE: _____ DATE STARTED _____

DEPT. SUPERVISOR: _____

| | Individual Confirm | Group Leader Confirm |
|---|---|---|
| I. GENERAL CHEMICAL INTRODUCTION | | |
| A. ACIDS | _____ | _____ |
| B. ALKALINE MATERIALS | _____ | _____ |
| C. FLAMMABLES | _____ | _____ |
| D. POISONS & TOXIC SUBSTANCES | _____ | _____ |
| E. OXIDIZERS | _____ | _____ |
| II. PREVENTION, PROTECTIVE EQUIPMENT AND FIRST AID | | |
| A. DESCRIPTION | _____ | _____ |
| B. CLOTHING | _____ | _____ |
| C. SHOES | _____ | _____ |
| D. FIRST AID | _____ | _____ |
| III. MANUFACTURING EQUIPMENT USAGE | | |
| A. FORKLIFT TRAINING | _____ | _____ |
| B. EMERGENCY EQUIPMENT AND USE | _____ | _____ |
| C. PRODUCTION EQUIPMENT AND USE | _____ | _____ |
| D. SAFETY EQUIPMENT AND USE | _____ | _____ |
| IV. FACILITY OPERATION | | |
| A. WORK FLOW | _____ | _____ |
| B. SECURITY | _____ | _____ |
| C. BUDDY SYSTEM | _____ | _____ |
| D. ACCIDENT REPORTING | _____ | _____ |
| V. ON-THE-JOB TRAINING - GROUP LEADER/SUPERVISOR: I have instructed said employee in: | | |
| 1. Operations in the work area where hazardous chemicals are present | _____ | _____ |
| 2. Location/availability of written hazardous communication program and MSDS's | _____ | _____ |
| 3. Methods/deservations to detect presence of hazardous chemicals | _____ | _____ |
| 4. Physical/health hazards of chemicals in work area | _____ | _____ |
| 5. Protective equipment to be used for work area | _____ | _____ |
| 6. Training in safe and proper handling of the hazardous chemicals in the work area | _____ | _____ |
| 7. Familiarizing employee with safety rules, contingency plan/ emergency procedure | _____ | _____ |

Figure 11.3.4

# APPENDIX G

## LABORATORY TRAINING REPORT

..... ..... who is a full time employee of MacDermid Waterbury SBU, 526 Huntingdon Avenue, Waterbury, Connecticut, has been trained and has demonstrated acceptable competence in the following areas:

| SKILL | Date of Approval | Trainer |
|---|---|---|
| Academic qualification | ..... | ..... |
| Safety regulations and use of the equipment | ..... | ..... |
| Sampling and labeling | ..... | ..... |
| Laboratory documentation | ..... | ..... |
| Gravimetric analysis | ..... | ..... |
| Volumetric analysis | ..... | ..... |
| Spectrophotometric analysis | ..... | ..... |
| Use of the automatic titrator | ..... | ..... |
| Physical performance testing | ..... | ..... |
| Atomic Absorption Analysis | ..... | ..... |
| Corrective Action analysis | ..... | ..... |

# APPENDIX H

| | |
|---|---|
| Customer: | |
| Manifest No: | |
| Date Received: | |
| Receivers Initials: | |
| Date Sampled: | |
| Sample Method: Random/Composite/Individual | |
| Sampler/Tester Initials | / |

**HUNTINGDON AVENUE**

**QC LOG FOR SPOT TESTING RECYCLE MATERIAL**

TOTES/DRUMS

MATERIAL

W = Warehouse Storage

| | Test 1 | Test 2 | Test 3 | Test 4 | Test 5 | Test 6 | Additional | | Disposal Date | |
|---|---|---|---|---|---|---|---|---|---|---|
| Drum No. | Appearance | pH | S.G. | Free Amm. | Lib. Amm. | | Comments | Dr. St. | On Site | Off Site TSDF |
| | | | | | | | | W | | |
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**RETAIN FOR 3 YRS**

# APPENDIX Y

## LIST OF PERSONNEL WHO ATTENDED THE 24-HOUR TRAINING PROGRAM (29 CFR 1910.120) AND QUALIFICATIONS OF THE INSTRUCTOR

MICHAEL H. ZISKIN CONSULTING, INC.

20 Magee Avenue, Stamford, Connecticut 06902
203-964-9199

received
4-3-90

March 29, 1990

MAY - 7 1990

Mr. Frank J. Cruice, M.S.
MacDermid, Incorporated
245 Freight Street
Waterbury, CT 06702

Dear Mr. Cruice:

This letter certifies that the following individuals have successfully completed the 24-hour "Hazardouse Waste Operations and Emergency Response Course" held February 19-20-21,1990, in Waterbury, Connecticut. This training is consistent with the OSHA requirements as set forth in 29CFR, Part 1910.120.

Bob Ardzijauskas
Bob Neuman
Dave Fortier
Kurt J. Ritucci
Dave Howell
John Miele
Bill Schweikher
Kenneth S. Riblon
Nino Mattei Jr.
Fremont B. Brown
Jonathon F. Alperin
Ralph Tardy
Rick Daley
Paul Maloney
Adla D.S. Reddy
Frank J. Cruice
Max DiMarco
Luis Arce

Sincerely,

Michael H. Ziskin

Michael H. Ziskin, CHCM, CHMM
President

MHZ/no

MICHAEL H. ZISKIN CONSULTING, INC.

20 Magee Avenue, Stamford, Connecticut 06902
203-964-9199

# PROFESSIONAL QUALIFICATIONS

Michael H. Ziskin Consulting, Inc. (MHZCI), located in Stamford, Connecticut, is a private multi-disciplinary environmental and occupational health and safety consulting firm providing turnkey services in the areas of Corporate Program Development, Management and Employee Training, Field Services, and Protective Equipment Evaluations.

Partial listing of clients for whom professional services have been provided:

Atlantic Environmental Consultants
C.A. Rich Consultants
Carrier (UTC Carrier)
Commission on Fire Prevention - State of Connecticut
Converse Consultants East
Dames and Moore
Eichelberger Well Drilling
ENSR Consulting and Engineering
ERM-Northeast
Envirotrol, Inc.
Environmental Waste Resources (EWR)
Excavation Technologies
Fred C. Hart Environmental Management
Fuji Photo Film USA, Inc.
General Electric Corporation
GeoEnvironmental Consultants, Inc.
Hamden Fire Department - Connecticut
Hardin-Huber Well Drilling
Hudson Fire Department - Massachusetts
International Business Machines (IBM)
Interim Dewatering Services, Inc.
Leggette, Brashears & Graham
Lewis Excavating
Loctite Corporation
Massachusetts Fire Academy
Monsanto
Montgomery County HIRT
National Oil
National Water Well Association
New Jersey Department of Labor
New York State Dept. of Environmental Conservations
New York State Power Authority
Northeast Utilities
Princeton Plasma Physics Laboratory
Recon Drilling Company
Ridgefield Fire Department - Connecticut
R.E. Wright and Associates

Rocky Hill Fire Department - Connecticut
S & D Engineering Services, Inc.
Sargent Construction Corporation
Sealand
Soil Mechanics Drilling Corporation
S.S. Papadopulos
Suffolk County Police Department HIRT
Turn of River Fire Department - Connecticut
U.S. Army - New Cumberland Army Depot, Pennsylvania
U.S. Army - Picatinny Arsenal, New Jersey
U.S. Coast Guard - Groton, CT
U.S. Navy - Groton Submarine Base - Connecticut
Westchester County HIRT
York Wastewater Consultants, Inc.

mzqual
10/89

RÉSUMÉ

# MICHAEL H. ZISKIN

PRESIDENT

## SUMMARY OF QUALIFICATIONS

- Founder, President and Owner of Field Safety Corporation and Michael H. Ziskin Consulting, Inc., companies that provide consulting, training, equipment, and services to the occupational and environmental, health, safety, and hazardous materials markets.
- 14 years experience in planning, conducting, and supervising of major projects in occupational and environmental health and safety, air pollution assessment, hazardous waste site investigations, program development, and compliance training.
- Member of NFPA and ASTM F23 committees addressing chemical protective clothing.
- Conducts training sessions for management and operations personnel in the industrial, governmental, and military areas.
- Academic background in environmental health and industrial hygiene with additional training from EPA and NIOSH; certified at master levels as a Hazardous Materials Manager and Hazard Control Manager.
- Knowledgeable and experienced in the following areas:
  - Corporate industrial hygiene and safety programs
  - Corporate health and safety manuals
  - Environmental and occupational health studies
  - Industrial hygiene inspections and evaluations
  - Site specific health and safety manuals
  - Air pollution assessments
  - Hazardous waste site investigations
  - Remedial actions
  - Emergency response

## PROFESSIONAL EXPERIENCE

**FIELD SAFETY CORPORATION /**
**MICHAEL H. ZISKIN CONSULTING, INC.** — Stamford, CT
**President / Owner** — 1983 - Present

Responsible for company policies and implementation of research, education, outfitting, and services to industry professionals involved with hazardous materials.

- Perform occupational health and safety management consultations involving program development, compliance audits, and risk assessments.
- Develop health and safety programs and standard operating procedures including respiratory protection, hazard communication, and confined space entry.
- Provide health and safety planning, hazardous waste site supervision, and industrial hygiene monitoring.
- Outfit personnel with protective equipment, air monitoring systems, and spill control products.
- Research and develop quantitative test method for vapor flash protection and for assessing physical integrity of chemical protective clothing ensembles.
- Maintain service contracts for integrity testing and routine maintenance of encapsulating suits.
- Conduct seminars and hands on training for OSHA / EPA compliance. Conduct advanced training on chemical protective clothing, confined space entry, chemical identification, hazardous waste operations, emergency response, and respiratory protection.

## Accomplishments:

- Delivered more than five thousand hours of training to hazardous waste site operators and emergency responders.
- Conducted in-depth technical advice to health and safety professionals throughout the U.S.
- Appointed to the NFPA Subcommittee on Chemical Protective Clothing. Committee has since authored three national documentation standards - 1991, 1992 and 1993.
- Designated round robin test participant for ASTM F 23 Committee on Protective Clothing. Round robin tests are being conducted to standardize methodology for encapsulating suit evaluations.
- Developed quantitative test method to assess the physical integrity of chemical protective clothing ensembles.
- Developed new performance test for vapor flash protection now being presented to ASTM F23 Committee for adoption as a nationally recognized test method.
- Created personal protection equipment use strategies for over 500 hazardous site operations and emergency response organizations.
- Produced new educational methods and procedures while training health and safety professionals in areas of chemical handling, confined space entry, chemical protective clothing, and respiratory protection.
- Major contributor in re-design of total encapsulating chemical protective suits which incorporated specific safety and comfort benefits to the emergency responder.
- Established first mobile test unit in U.S. to provide quantitative respiratory fit testing and encapsulating suit inward leakage testing.

## Major Projects:

- Provided health and safety management consulting and training to major Northeastern U.S. utility company. Program included industrial hygiene, safety, environmental, and front line management services.
- Established health and safety management structure and program for national environmental testing laboratory and consulting engineering firm.
- Managed field operations, directed staff of eight, and assisted in the coordination of excavation and environmental sampling activities during a three and a half year clean up of a Superfund site (first voluntary cleanup under CERCLA in the U.S.).
- Provided health and safety services for environmental engineering firm investigating a client's hazardous waste site under a petroleum refinery storage tank farm. Services included health and safety planning, site supervision, air monitoring, outfitting personnel, and providing support facilities for site owner.
- Designed and delivered spill response and control system for an international photochemical company which was implemented throughout their U.S. distribution system. Project included chemical compatibility testing, control product selection, outfitting of equipment, training, program development, and service contracting.

**S & D ENGINEERING SERVICES, INC.** Metuchen, NJ
**Senior Staff Consultant** 1983 - 1984

Provided hazard control consulting services to New Jersey Department of Environmental Protection, private, industrial and municipal fire departments, and other organizations engaged in hazardous material response operations.

- Managed industrial hygiene and safety programs, hazardous waste site investigations and clean-ups, environmental health assessments, air monitoring studies, and health and safety training programs.
- Organized and conducted hazardous waste training programs.
- Provided remedial investigatory services at more than 5 major sites in Northeast U.S.

**DAMES & MOORE** (1979 - 1983) White Plains, NY
**Corporate Industrial Hygiene and Safety Director** 1981 - 1983

Responsible for developing and directing company health and safety programs for 23 waste management service locations nationwide.

- Provided health and safety project management for more than 80 waste management field investigations and remedial operations.
- Developed more than 250 health and safety plans for hazardous waste site operations.
- Trained over 300 personnel in health and safety aspects of site operations.

**Project Manager** 1980 - 1981

- Managed corporate medical surveillance, respiratory protection, and trained over 450 employees.
- Managed environmental health assessment projects involving air quality studies, odor measurements, stack emission characterizations, public health surveys, and expert testimony.

**Principal Investigator** 1979

- Participated in many environmental studies at uncontrolled hazardous waste sites and industrial facilities.
- Conducted mass balance and pollution control studies at a low-level radioactive waste treatment facility.
- Task Group Leader for low level radioactive burial site environmental assessment involving proposed NRC regulation.

**YORK RESEARCH CORPORATION** Stamford, CT
**Project Director** 1976 - 1979

Directed numerous air pollution studies at steel, utility, chemical, and research facilities. These studies involved U.S. EPA research, compliance testing, performance evaluations, and point source characterizations.

- Managed staff up to 10 and budgets of $30,000 - $500,000 for projects of up to 3 months duration.

**WESTCHESTER COUNTY DEPARTMENT OF NATURAL RESOURCES PLANNING**
White Plains, NY

**Specialist** 1975 - 1976

Responsible for environmental land use planning studies, natural resource inventories, and environmental impact statements.

- Conducted environmental impact analysis for proposed county activities.
- Developed a local citizen advisory council for each municipality in West Chester County.

## PRESENTATIONS

"Personal Protection - A False Sense of Security and Liability ?". Presented at The Northeast Waste Management Exposition, Hartford, CT, 1989.

"Chemical Protective Clothing - Standards, Trends and Training". Presented at the Environmental Hazards Management Conference, Hartford, CT, 1989.

"Encapsulating Suits - Inspection, Maintenance and Testing". Presented at a Hands On Workshop at The National Hazardous Response Team Conference, Bethesda, MD, 1989.

"Considerations for Decision Makers Selecting Chemical Protective Clothing". Presented at the International Symposium on Protective Clothing: Chemical Protective Clothing Performance in Chemical Emergency Response, Sponsored by ASTM Committee F-23, San Diego, CA, 1989.

"Decision Logic for Selecting Multi-Layer Ensembles". Presented at Clemson University's Second Annual Conference on Protective Clothing, College Park, GA, 1988.

"Testing Total Encapsulating Critical Protective Suits". Presented at a Hands on Workshop at the National Hazardous Materials Response Team Conference, Bethesda, MD, 1988.

"The Role of Thermal Protection In Multi-Layered Ensembles". Presented At the Second International Symposium of the Performance of Protective Clothing, ASTM F23, Sponsors - AIHA and Royal Institute of Technology, Tampa, FL, 1987.

"Safety Procedures On Hazardous Waste Sites". Presented at the New Jersey Water Well Association Seminar Program, Atlantic City, NJ, 1983.

"Hazardous Material Incidents: Overcoming Management and Training Problems". Presented At The Spill Control and Hazardous Materials Conference, New Haven, CT, 1983.

"Investigating Hazardous Waste Sites - Safely". Presented at the 84th American Chemical Society National Meeting - Health and Safety Concerns at Uncontrolled Chemical Waste Sites Symposium, Kansas City, MO, 1982.

## EDUCATION

**POLYTECHNIC INSTITUTE OF NEW YORK** — Brooklyn, NY
Master of Science pending; Environmental Health Science — 1978 - 1985

**COLUMBIA UNIVERSITY** — New York, NY
Environmental Systems Analysis — 1976

**LONG ISLAND UNIVERSITY, SOUTHAMPTON COLLEGE** — Southampton, NY
Bachelor of Arts; Environmental Land Use Planning — 1975

## CERTIFICATIONS

Certified Hazardous Materials Manager (No. 336) Master Level (IHMM)
Certified Hazardous Control Manager (No. 1648) Master Level (BHCM)
Certified Hazardous Materials Technician (IECA)
Certified HAZ CAT Trainer (HAZTECH, INC)

## ADDITIONAL TRAINING

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|---|---|
| Chemical Identification System - HAZTECH, INC. | 1989 |
| Quantitative Fit Testing, ATI | 1989 |
| Emergency Control of Hazardous Materials Incident, I & II, New York State Fire Academy | 1986 |
| Response Safety Decision Making, EPA | 1985 |
| Hazardous Material Incident Response Operations, EPA | 1982 |
| Groundwater Investigation at Hazardous Waste Sites, National Water Well Association | 1982 |
| Occupational Respiratory Protection, NIOSH | 1981 |
| Visible Emissions Measurements, Connecticut Department of Environmental Protection | 1979 |

## PROFESSIONAL AFFILIATIONS

Member, ASTM F23 Committee on Chemical Protective Clothing Standards
Member, National Environmental Training Association
Member, Air and Waste Management Association
Member, National Association of Environmental Professionals
Member, National Fire Protection Association
Member, NFPA Sub-Committee on Chemical Protective Clothing
Full Member, American Industrial Hygiene Association
Member, Connecticut Forum for Environmentally Regulated Professionals
Diplomat, Academy of Hazardous Materials Management