T E C H N I C A L  B U L L E T I N

# AROCLOR®

**resins and plasticizers for chlorinated rubber**

TECHNICAL BULLETIN
No. O/PL-311A

Monsanto

0212585

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# AROCLOR®

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TECHNICAL BULLETIN
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0212586

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## AROCLOR® RESINS AND PLASTICIZERS FOR CHLORINATED RUBBER

Some important *applications* for protective and decorative chlorinated-rubber-based coatings plasticized with Aroclor® compounds—

Wood and metal on yachts, barges, and other marine craft

Structural steel for bridges, buildings, roofs, and powerlines

Structural materials at chemical plants, pulp-and-paper mills, textile mills, petroleum refineries, and gas works for protection against acid fumes, alkalies, and gas

Tank cars and other railroad equipment and construction machinery for protection against corrosive materials and weathering

Equipment and stop-off lacquers used in *electroplating*

Masonry floors and walls, and highway markings

Cable coatings requiring flame retardance, chemical resistance, and excellent *electrical properties*

Flame-retardant finishes

Important *properties* imparted to chlorinated-rubber coatings by Aroclor plasticizers and resin extenders—

Chemical Resistance

Corrosion Resistance

Adhesivity

Flame Retardance

Flexibility

Electrical Resistance

Weather Resistance

Nonoxidation



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## INTRODUCTION

Monsanto's Aroclor chlorinated biphenyls and chlorinated terphenyls are used as plasticizers and resins for chlorinated-rubber-based lacquers, varnishes, and paints. These protective coatings are flame retardant, corrosion resistant, chemical resistant (to acids, alkalies, and water), and have good electrical insulating properties.

When properly pigmented, these coatings have unusually good weatherability. Chlorinated-rubber films plasticized with an Aroclor compound grip common structural materials in strong adhesive bonds, and the addition of an Aroclor compound improves the flexibility and life of chlorinated-rubber coatings.

The formulations suggested in this bulletin are given as starting points or guides for development of new formulations that capitalize on the outstanding qualities of these compounds.

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## NUMBERING AROCLOR COMPOUNDS

The first two digits of the number of an Aroclor compound represent its molecular type, as:

12—chlorinated biphenyls

44—blend of chlorinated biphenyls and chlorinated terphenyls

54—chlorinated terphenyls

The last two digits indicate the weight percentage of chlorine in the product. For example:

Aroclor 1248 is a chlorinated biphenyl that contains 48-weight-per cent chlorine

Aroclor 5460 is a chlorinated terphenyl with 60-weight-per cent chlorine

The physical properties of the Aroclor plasticizers vary gradually with the degree of chlorination. Compounds with low percentages of chlorine, such as Aroclor 1221 and 1232, are clear and very fluid. Aroclor 1242, with 42-per cent chlorine, resembles vegetable oil; the product with 48-per cent chlorine is slightly more viscous and looks like a medium-grade mineral oil. At 54-per cent chlorine, the compound is quite viscous. At higher chlorine percentages, the chlorinated biphenyls become gumlike. At 68-per cent chlorine, the range is complete; Aroclor 1268 is a white powder. Both chlorinated terphenyls (Aroclor 5442 and 5460) are yellow solids.

The gradual change in physical properties often allows a processor to select a plasticizer particularly suited for his operation. If a dry mix is desired, Aroclor 1268 acts as a flame retarding filler. It is also possible to use it as a solvent-plasticizer at higher processing temperatures. Complete physical properties and specifications for the Aroclor compounds are listed in technical bulletin O/PL-306, "Aroclor Plasticizers."

## PROPERTIES OF CHLORINATED RUBBER

Chlorinated-rubber-based coatings are used extensively for resistance to corrosion, moisture, fungus, mold, and other destructive agents.

Parlon † chlorinated rubber is a mixture of two polymers, with an average chlorine content of 67-per cent, made by chlorination of natural rubber. Its typical properties, according to the manufacturer, Hercules Inc., Wilmington, Delaware, are listed in Table I:

†Trademark of Hercules, Inc.

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**TABLE 1 — Typical Properties of Chlorinated Rubber**

**General**

| | |
|---|---|
| Form as shipped | White, granular powder |
| Color of film | Water white |
| Odor | None |
| Clarity of film | Good |
| Taste | None |
| Moisture, per cent, as shipped | 0.5 Maximum |

**Physical**

| | |
|---|---|
| Specific gravity | 1.64 |
| Specific volume, as shipped, cubic inches per pound | 16.9 |
| Bulking value, gallons per pound | 0.0735 |
| Refractive Index, at 25°C | 1.554 |

**Chemical Resistance to:**

| | |
|---|---|
| Acids, weak | excellent |
| Acids, strong | excellent |
| Alkalies, weak | excellent |
| Alkalies, strong | excellent |
| Salt spray | good |
| Alcohols | excellent |
| Ketones | soluble |
| Esters | soluble |
| Hydrocarbons, aromatic | soluble |
| Hydrocarbons, aliphatic | good |
| Oils, mineral | good |
| Oils, animal | poor |
| Oils, vegetable | poor |

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## Electrical (clear, unplasticized film*)

| | |
|---|---|
| Specific surface resistance, ohms x $10^{10}$ | 2000 |
| Dielectric strength, volts per mil (ASTM method) | 2300 |
| Dielectric constant at 25°C and 1000 cycles | 3.1 |
| Power factor at 25°C and 1000 cycles | 0.0015 to 0.0030 |
| Power factor at 25°C and 1000 cycles, after immersion in water for 140 hours and surface wiped dry | 0.0027 |

## Mechanical (clear, unplasticized film*)

| | *20-cp. type* | *1000-cp. type* |
|---|---|---|
| Tensile strength, dry, pounds per square inch | 4270 | 4850 |
| Tensile strength, wet, pounds per square inch | 4100 | 4360 |
| Elongation, dry, per cent | 3.6 | 3.3 |
| Elongation, wet, per cent | 3.8 | 3.4 |
| Modulus of elasticity, pounds per square inch | 1.4 x $10^5$ | .... |
| Hardness, Sward index, per cent of glass | 90 | .... |

Note: Flexibility of Parlon† film increases with viscosity of Parlon used.

## Thermal (clear, unplasticized film*)

| | |
|---|---|
| Burning rate | nonflammable |
| Effect of dry heat on film | stable at 125°C |
| Softening point, °C | decomposes at 135 to 150 |

## Physical-Chemical (clear, unplasticized film*)

| | |
|---|---|
| Effect of sunlight | Discolors and embrittles |
| Effect of aging | Very slight |
| Effect of hot water | Blushes |
| Effect of cold water | None |
| Moisture absorption (80% relative humidity for 24 hours), per cent | 0.27 |
| Moisture-vapor permeability of 0.003-inch film (grams water/square centimeter/0.01 centimeter/hour at 21°C) | 0.2 x $10^4$ |

*laid down from toluene solution

†Trademark of Hercules, Inc.

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## VISCOSITY TYPES

**TABLE 2 — Parlon† Viscosity Types**

| *Viscosity Type* | *Viscosity Range (centipoises)* |
|---|---|
| 5 cp | 5 to 7 |
| 10 cp | 8 to 12 |
| 20 cp | 16 to 25 |
| 125 cp | 110 to 190 |
| 1000 cp | 800 to 2000 |

Examples of actual or suggested applications of the several viscosity types are as follows:

| *Type* | *Example of Use* |
|---|---|
| 5 cp. | In printing inks and as a fortifier for alkyd resin enamels |
| 10 cp. | In high-solid finishes and as a fortifier for alkyd resin and oleoresinous varnishes and enamels |
| 20 cp. | As a film-former in protective coatings and as a fortifier in enamels and varnishes |
| 125 cp. | As a film-former in protective coatings, in paper lacquers, adhesives, and textile finishes |
| 1000 cp. | As a film-former in adhesives, textile finishes, and other finishes where flexibility is important |

## SOLVENT COMPATIBILITY

Solvents and solvent mixtures suggested for use in preparing formulations with Aroclor and Parlon are given in Table 3:

**TABLE 3 — Suggested Solvents for Compositions with Aroclor® and Parlon†**

Amsco Solv[a] B and E
Amyl acetate
Butyl acetate
Carbon tetrachloride
Cellosolve[b]
Diacetone alcohol
Diethyl carbonate
Ethyl acetate
Ethylene dichloride
High-Flash naphtha
Methyl acetate
Methyl ethyl ketone
Methyl isobutyl ketone
Methyl salicylate
Mobilsol[c] Nos. 74, 75
Notol[d]
Octyl acetate
Solvesso[e] 100
Tollac[d]
Toluene
Trichloroethylene
Union[f] Aromatic Solvent 3553-10
Union Solvent No. 30
Xylene

†Trademark of Hercules, Inc.
a) Trademark of American Mineral Spirits Co.
b) Trademark of Union Carbide Chemical Co.
c) Trademark of Socony Mobil Oil Co.
d) Trademark of Neville Chemical Co.
e) Trademark of Esso Standard Oil Co.
f) Trademark of Union Oil Co.

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## FORMULATIONS AND PROPERTIES OF CHLORINATED RUBBER

### Chlorinated-Rubber Films

Chlorinated rubber is very hard & brittle; consequently, plasticizers and plasticizing resins must be added to make useful coatings. To make chemical- and corrosion-resistant coatings, the modifiers must likewise be nonreactive with acids, alkalies, and salts. As little as five per cent of a saponifiable material, such as linseed oil, alkyd resin, or ester plasticizer, seriously detracts from the alkali resistance of the finished coating. Monsanto compounds, such as Aroclor 5460 and Aroclor 1254 or 1260, are the best available plasticizing resin and plasticizers, respectively, since they are unaffected by acids, alkalies, or salts. The following table summarizes some of the benefits imparted to chlorinated-rubber coatings by Aroclor plasticizers:

**TABLE 4 — Benefits of Aroclor® Plasticizers in Chlorinated Rubber**

| | GOOD ADHESION TO | | | | RESISTANCE TO | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| ® Aroclor | Aluminum | Steel | Transite | Cellophane | 10% Hydrochloric Acid | 5% Sodium Hydroxide | Sodium Chloride | Water | Sward Hardness | Cold-Check Resistance |
| 1254 | — | — | X | X | X | X | X | X | 35 | 3 |
| 1260 | — | — | X | X | X | X | X | X | 40 | 4 |
| 5460 | X | X | X | — | X | X | X | X | 22 | 2 |

Aroclor 1262 and 5460, resinous types, show good compatibility in chlorinated-rubber films laid down from toluene solution containing 20-per cent of the plastic in ratios of 2:1 and 1:1 (Parlon to Aroclor). The plasticizer types, Aroclor 1252, 1254, and 1260, also have good compatibility. Formulations and properties of films derived from both resin- and plasticizer-type Aroclor are listed in Table 5:

**TABLE 5—Formulations Containing Aroclor® Resins or Plasticizers**

| Ingredient | Parts by Weight | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Parlon,† 20-cp | 16 | 16 | 16 | 12 | 12 | 12 | 20 | 20 | 20 |
| Aroclor® 5460 | 8 | 8 | 8 | 12 | 12 | 12 | — | — | — |
| Aroclor 1254 or 1260 | — | — | — | — | — | — | 4 | 7 | 20 |
| Santicizer® 160 or Dibutyl phthalate | — | 4 | — | — | 3 | — | — | — | — |
| Tung oil, Thermolyzed, 976 | — | — | 5 | — | — | 3.75 | — | — | — |
| Xylene or butyl acetate | 76 | 72 | 71 | 76 | 73 | 72.25 | 76 | 73 | 70 |

†Trademark of Hercules, Inc.

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The Aroclor compounds impart the following advantages to the films cast from these lacquers:

### Adhesion

Unplasticized chlorinated-rubber films have very poor adhesion. The lacquer film containing Aroclor 5460 adheres well to aluminum, bare steel, primed steel, galvanized iron, and Transite surfaces. The lacquer films plasticized with Aroclor 1254 or 1260 give good adhesion to Transite, cellophane, galvanized iron, and primed-steel surfaces.

Though compounds with an Aroclor alone possess pronounced adhesion qualities, better adhesion to all of the surfaces results if mixtures of Aroclor or varied contents are used.

### Resistance to Aqueous Solutions

Chlorinated-rubber films with Aroclor 1254 or 1260 (plasticizers) and Aroclor 5460 (resin) show satisfactory resistance to solutions of 10-per cent hydrochloric acid, 5-per cent sodium hydroxide, 5-per cent sodium chloride, and water-spot tests.

### Film Hardness

Softer films are produced with Aroclor 5460 in ratios of 5:10 and 10:10 (Aroclor and Parlon) than with other commercial resins in similar mixtures. Likewise, softer films result from Aroclor 1254 or 1260 in ratios of 2:10 and 5:10 (Aroclor and Parlon) than with other commercial plasticizers at these concentrations. These tests show that Aroclor compounds have strong plasticizing action on chlorinated rubber.

### Cold-Check Resistance

Aroclor 5460 is superior to phenol-formaldehyde resins in cold-check resistance imparted to chlorinated-rubber films, but not as good as long-oil-alkyd modification. Aroclor 1260 is a somewhat better plasticizer than Aroclor 1254.

### Weather Resistance

Pigmented chlorinated-rubber finishes containing Aroclor have consistently withstood outdoor weather tests, but unpigmented finishes do not weather well regardless of the resin or plasticizer used.

Poor resistance to ultraviolet light is also a weakness of chlorinated rubber. Most pigments (except ultramarine blue) are usable with Parlon and are recommended if the coating is to be subjected to outdoor weather or ultraviolet light. However, pigment protection varies considerably. Inspection of alkyd enamels fortified with Parlon showed weatherability varied from 63 months with chrome green to 4 months for titanium dioxide-iron blue combinations.

### Sanding and Polishing Properties

Plastic films compounded with Parlon and Aroclor 5460, 1254, or 1260 have shown satisfactory sanding and polishing characteristics.



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## APPLICATIONS

### Alkali-Resistant Coatings

Products containing Aroclor and chlorinated rubber are highly resistant to alkalies and moisture. Paints with combinations of Aroclor and chlorinated rubber are used in large quantities for concrete floors, walls, swimming pools, and other surfaces. Paint formulations are suggested in Table 6:

**TABLE 6 — Paints for Alkaline Surfaces**

| Ingredients | Basement Floors (parts) | Fed-Spec. TT-P-91 (parts) |
|---|---|---|
| Parlon† (20-cp.) chlorinated rubber | 100 | 100 |
| Medium-oil, drying alkyd resin | ... | ... |
| Long-oil, drying alkyd resin | 45 | ... |
| Aroclor® 1254 | 55 | 56 |
| Aroclor 5460 | ... | 33 |
| Titanium Dioxide | 89 | 89 |
| Zinc Oxide | 11 | 11 |
| Silica Flour | 17 | ... |
| Carbon Black | 1 | 3 |
| Magnesium Silicate | ... | ... |
| Bentone* 34 gelling agent | 12 | 12 |
| Epichlorohydrin | ... | ... |
| Xylene | 239 | ... |
| Hi-Flash naphtha | ... | ... |
| Turpentine | ... | 26 |
| Solvesso‡ 100 | ... | ... |
| Solvesso 150 | ... | 237 |

†Trademark of Hercules, Inc.
*Trademark of National Lead Co.
‡Trademark of Esso Standard Oil Co.



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## Chemical-Resistant Finishes

Particular care is necessary in choosing resins and plasticizers for chemical-resistant paints. Chlorinated-rubber formulations with an Aroclor plasticizer have proven outstanding for acid and alkali resistance. Five suggested formulations are shown in Table 7.

**TABLE 7 — Formulations for Chemical-Resistant Paints**

| Ingredients | Exterior[a] use, acids (parts) | Exterior[b] use, alkalies (parts) | Maximum[c] resistance, acids and alkalies (parts) | Soap[d] resistant (parts) |
|---|---|---|---|---|
| Parlon,† (20-cp.) chlorinated rubber | 100 | 100 | 100 | 100 |
| Phenolic resin | ... | 40 | ... | ... |
| Alkyd resin | 40 | ... | ... | ... |
| Aroclor® 1254 | 30 | 30 | 45 | ... |
| Aroclor 1260 | ... | ... | 33 | ... |
| Aroclor 5460 | ... | ... | ... | 50 |
| Tung oil, Thermolyzed, 976 | 30 | 30 | ... | 64 |
| Iron oxide | 100 | 100 | 100 | ... |
| Titanium dioxide | ... | ... | ... | 150 |
| Zinc oxide | ... | ... | ... | 50 |
| Epichlorohydrin | ... | ... | 0.5 | ... |
| Stabilizer | ... | ... | 5 | ... |
| Xylene | 325 | 325 | ... | 245 |
| Toluene | ... | ... | ... | 100 |
| Solvesso‡ 100 | ... | ... | 250 | ... |
| Hi-Flash naphtha | ... | ... | ... | 86 |
| Turpentine | ... | ... | 28 | ... |

These formulations were applied to metal bars or panels and tested for resistance:

a) Excellent outdoor protection to metal surfaces in acid-manufacturing plants
b) *Good performance on exteriors of alkali-producing plants*
c) Excellent resistance to acids, alkalies, and salt solutions (Also adhered well to glass and other surfaces)
d) Good resistance to warm, soapy water
NOTE: No finishes with an Aroclor compound or chlorinated rubber are recommended for continuous exposure at temperatures above 140° F.

†Trademark of Hercules, Inc.
‡Trademark of Esso Standard Oil Co.

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## Continuous Metal-Painting Process

A recently-developed continuous-painting process for finishing metal offers savings on capital investment, plant space, and operating costs. The technique utilizes the physical properties of trichloroethylene, the only solvent in the paint. Metal parts enter the unit covered with grease and leave the other end completely painted and dry to the touch. Detailed information about the process can be obtained from E. I. DuPont de Nemours & Co., Inc., Wilmington, Delaware. The formulation in Table 8 has given good characteristics in this continuous-painting system:

**TABLE 8 — Formulation for Continuous-Painting Process**

| Ingredients | Parts by Weight | |
|---|---|---|
| | Vehicle | Pigment[a] Dispersion |
| Parlon† (20-cp) chlorinated rubber | 100 | .... |
| Long-oil, drying, alkyd resin | 15 | 23.7 |
| Aroclor® 1254 | 50 | ... |
| Titanium Dioxide (Rutile) | ... | 100 |
| Bentone* 38 gelling agent | ... | 1.25[b] |
| Epoxy stabilizer | 3.9 | ... |
| Trichloroethylene | 217 | 53.5 |

a) Add pigment dispersion to vehicle after 24 hours in pebble mill
b) Add gelling agent to pigment dispersion during last two hours of grind

## Marine Finishes

The marine industry makes great use of chlorinated-rubber coatings plasticized with Aroclor compounds to protect wood and metal on boats, barges, and other marine equipment. They resist salt water, and their hard finish deters algae and other marine growth. A suggested formula for a white marine paint is given in Table 9:

**TABLE 9 — Formulation for a White Marine Paint**

| Ingredients | Parts by Weight |
|---|---|
| Parlon† (20-cp) chlorinated rubber | 77 |
| Long-oil, oxidizing, alkyd resin | 23 |
| Aroclor® 1254 | 23 |
| Titanium dioxide | 96.5 |
| Xylene | 87.5 |
| Hi-Flash Naphtha | 77 |

*Trademark of National Lead Co.
†Trademark of Hercules, Inc.

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## Emulsion Paints

If chemical resistance is required on porous surfaces, Aroclor 1254 is often added to chlorinated-rubber-emulsion paints. Hercules, Inc. reports that preferred water phases for such paints are either a 1-per cent-distilled-water solution of Aerosol* OT or a 4-per cent-distilled-water solution of sodium oleate. A lacquer-to-water weight ratio of 2.5 to 1 is suggested for the complete emulsion. Chlorinated rubber of any viscosity may be used. A typical lacquer phase for such an emulsion paint is given in Table 10:

**TABLE 10 — Formulation for Lacquer Phase of Emulsion Paint**

| Ingredients | Parts by Weight |
|---|---|
| Parlon† chlorinated rubber | 28 |
| Aroclor® 1254 | 14 |
| Aroclor 5460 | 10 |
| Xylene | 24 |
| Hi-Flash naphtha | 24 |

## Mastics

Mastic compositions are used to deposit thick films with a minimum number of coats. Mastics modified with Aroclor compounds can effectively seal cracks in concrete, smooth rough concrete surfaces for subsequent glossy coatings, give excellent corrosion resistance under severe conditions, and retard fire. A typical starting formulation is given in Table 11:

**TABLE 11 — Mastic Composition**

| Ingredients | Parts by Weight |
|---|---|
| Parlon† (20-cp) chlorinated rubber | 100 |
| Aroclor® 1254 | 30 |
| Aroclor 5460 | 49 |
| Asbestos | 160 |
| *Titanium Dioxide (Rutile)* | 25 |
| Toluene | 300 |

Although this mastic formulation adheres well to either wood or masonry, a primer is suggested before application to steel. To further increase fire retardance, replacement of 33 parts of the asbestos by 47 parts of antimony oxide is suggested as a starting formulation.

†Trademark of Hercules, Inc.
*Trademark of American Cyanamid Co.



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## Adhesives

Chlorinated-rubber adhesives with an Aroclor plasticizer were developed originally for acid-bottle labels because of their general resistance to chemicals. These adhesives are also of unusual interest because they are flame resistant. A typical formulation is given in Table 12:

**TABLE 12 — Formulation for Acid- and Flame-Resistant Adhesive**

| Ingredients | Parts by Weight |
|---|---|
| Parlon† (125-cp) chlorinated rubber | 20 |
| Aroclor® 1254 | 6 |
| Aroclor 1260 | 6 |
| Toluene | 68 |

## Electrical Coatings

Because of their desirable electrical properties, these compositions are useful for insulating and protecting electrical wire and apparatus from moisture. With selected fungistats and waxes, coatings of this type are used to protect electronic equipment in the tropics against moisture and fungi. The fire retardance of Aroclor and Parlon combinations is an added dividend in the electrical field.

## Printing Inks

Printing inks requiring fast drying time and chemical resistance are often based on chlorinated-rubber compositions plasticized with an Aroclor compound. These inks are especially useful on soap wrappers and boxes, bottle labels, and many other commodities because of their alkali resistance.

†Trademark of Hercules, Inc.

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## OTHER MONSANTO PLASTICIZERS COMPATIBLE WITH CHLORINATED RUBBER

The following Monsanto plasticizers (Table 13) are also compatible with chlorinated rubber, but none give the over-all desired qualities attained by using an Aroclor plasticizer:

**TABLE 13 — Other Monsanto Plasticizers Compatible With Chlorinated Rubber**

| | |
|---|---|
| Dibutyl phthalate | Santicizer® M-17 |
| Diethyl phthalate | Santolite® MHP plasticizer |
| Dimethyl phthalate | Tricresyl phosphate |
| Santicizer® B-16 plasticizer | Triphenyl phosphate |
| Santicizer® 160 | |

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## TOXICITY AND SAFE HANDLING

### Inhalation

At ordinary temperatures the Aroclor chlorinated polyphenyls have not presented industrial toxicological problems. The hazard of potential toxic exposure varies with their volatility: the lower-chlorinated, more-volatile ones present more of a potential problem from the standpoint of both inhalation and skin contact. When Aroclor compounds are used at elevated temperatures, engineering controls must be applied, either by the use of closed systems or by effective local-exhaust ventilation together with general workroom exhaust.

Vapor of the liquid Aroclor compounds at room temperature should not be breathed in a confined space, and no vapor of any Aroclor compound evolved at elevated temperatures should be allowed to be dispersed into the general workroom.

Inhalation tests on animals indicate that the maximum safe concentration of vapor is in the range of from 0.5 to 1.0 milligram of the lower-chlorinated Aroclor compounds per cubic meter of air. The threshold limit values (maximum allowable concentration for an 8-hour working day) set by the American Conference of Government Hygienists are 1.0 milligram per cubic meter of air for the lower-chlorinated Aroclor compounds and 0.5 milligram per cubic meter of air for the more-highly-chlorinated compounds, such as Aroclor 1254.

### Skin Contact

Schwartz patch tests on 200 volunteers showed that Aroclor 1254 was neither a primary skin irritant or a sensitizer.

Prolonged or repeated skin contact with the Aroclor compounds must be avoided by the use of gloves and protective garments, because of the possible occurrence of a condition called chloracne. Although reports of this condition caused by Aroclor compounds are rare, it can be produced by excessive skin contact. It any Aroclor compound is spilled on the skin, the skin should be washed in the usual manner with a soap solution.

A burn caused by contact with a hot Aroclor compound should be treated like any ordinary burn. Aroclor compound adhering to the burned area need not be removed immediately, unless treatment of the burn demands it, in which case either soap and water or repeated washings with a vegetable oil arerecommended.



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## SHIPPING

### Freight Classification

Aroclor 1221, 1243, 1242, 1248, 1254, 1260, 1262 . . . Synthetic Resin, Liquid, NOIBN

### Rail Classification

Aroclor 1268, 4465, 5442, 5460 . . . . . Synthetic Resin, Other Than Liquid, NOIBN

### Truck Classification

Aroclor 1268 . . . . . Synthetic Resin, Powder, NOI

Aroclor 4465, 5442, 5460 . . Synthetic Resin, Lumps or Solid Mass, NOI

**Shipping Regulations** . . . None

### Standard Containers

Aroclor 1221 . . . . . Tank car, 520-lb. steel drum, 50-lb. can

Aroclor 1232 . . . . . Tank car, 550-lb. steel drum, 50-lb. can

Aroclor 1242, 1248 . . . . . Tank car, 600-lb. steel drum, 55-lb. can

Aroclor 1254, 1260, 1262 . . Tank car, 600-lb. steel drum, 60-lb. can

Aroclor 1268 . . . . . 200-lb. fiber drum, 50-lb. can

Aroclor 4465 . . . . . 500-lb. steel drum, 50-lb. can

Aroclor 5442 . . . . . 450-lb. steel drum, 50-lb. can

Aroclor 5460 (flaked) . . . . . 50-lb. bag

### Ease of Handling

All Aroclor plasticizers except 1254, 1260 and 1262 can be shipped in bulk year-round. Aroclor 1254 may be difficult to ship in bulk in certain cold parts of North America between November and April unless heated equipment is used. Aroclor 1260 and 1262 cannot be shipped in bulk.

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*HONOLULU, HAWAII 96812*
*205 Pacific International Bldg.*
*677 Ala Moana Blvd., P. O. Box 3824*
*Tel. (808) 531-2744*

*HOUSTON, TEXAS 77027*
*1301 Post Oak Tower*
*5051 Westheimer Road*
*Tel. (713) 621-9550*

*LOS ANGELES, CALIFORNIA 90022*
*6670 E. Flotilla St.*
*Tel. (213) 723-2492*

*NEW YORK, NEW YORK 10017*
*277 Park Avenue*
*Tel. (212) 922-4111*

*ST. LOUIS, MISSOURI 63166*
*800 N. Lindbergh Blvd.*
*Tel. (314) 694-1000*

*SAN FRANCISCO BAY AREA*
*2710 Lafayette, Santa Clara, Calif. 95052*
*Tel. (408) 243-0414*

*SEATTLE, WASHINGTON 98104*
*911 Western Avenue*
*Tel. (206) 622-4203*

*SPRINGFIELD, MASSACHUSETTS 01101*
*730 Worcester Ave.*
*Tel. (413) 788-6911*

*WILMINGTON, DELAWARE 19803*
*2005 Concord Pike, Fairfax*
*Tel. (302) 658-6531*

***Additional District Offices are maintained by:***

**Agricultural Division**

ALLENTOWN, PENNSYLVANIA 18104
Park Professional Building
2200 Hamilton Street
Tel. (215) 437-5471

DES MOINES, IOWA 50310
312 Merle Hay Tower
Tel. (515) 276-3503

FREMONT, NEBRASKA 68025
150 South Main Street
Tel. (402) 727-1230

INDIANAPOLIS, INDIANA 46205
Suite 218, 4000 Meadows Drive Building
Tel. (317) 547-9148

LULING, LOUISIANA 70070
P. O. Box 174
Tel. (504) 784-6263

MANKATO, MINNESOTA 56001
111 Madison East
Tel. (507) 387-3406

MEMPHIS, TENNESSEE 38104
303 Union Plaza Building
1835 Union Avenue
Tel. (901) 278-7811

MUSCATINE, IOWA 52761
P. O. Box 473
Tel. (319) 263-1331

**Hydrocarbons & Polymers Division-Lion Oil**

EL DORADO, ARKANSAS 71730
Lion Oil Building
Tel. (501) 863-3111

JACKSON, MISSISSIPPI 39209
P. O. Box 10937, Westland Station
Tel. (601) 352-3648

N. LITTLE ROCK, ARKANSAS 72119
410 West 8th Street, P. O. Box 5821
Tel. (501) 376-2437

MEMPHIS, TENNESSEE 38113
1023 Riverside Drive, P. O. Box 13248
Tel. (901) 948-4451

**Organic Division**
***(Rubber Instruments)***

AKRON, OHIO 44311
920 Brown Street, P. O. Box 2307
Tel. (216) 434-1962

**Plastic Products & Resins Division**

KENILWORTH, NEW JERSEY 07033
North Seventh St. & Monroe Ave.
Tel. (201) 276-2900

**Textiles Division**

ATLANTA, GEORGIA 30303
Atlanta Merchandise Mart
240 Peachtree St., N. W.
Tel. (404) 577-2260

CHARLOTTE, NORTH CAROLINA 28210
6230 Fairview Road, Suite 400
Tel. (704) 364-0110

GREENVILLE, SOUTH CAROLINA 29606
McAlister Plaza
P. O. Box 5564, Station B
Tel. (803) 239-9171

NEW YORK, NEW YORK 10001
350 Fifth Ave.
Tel. (212) 556-5100

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