THE USE OF AROCLORS IN FORMULATING HIGH STYRENE COPOLYMER SURFACE COATINGS
(Marbon 9200)

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St. Louis 4, Mo.

MONSANTO

Monsanto Technical Bulletin

This booklet has been prepared as a guide to formulating a variety of surface coatings with MARBON* 9200 resin using Monsanto AROCLORS** as the plasticizer and resin. High styrene copolymer resins formulated with AROCLORS make excellent paint vehicles — and are relatively easy to formulate. The types of coatings described include coatings for concrete, stucco and masonry, interior architectural paints, clear lacquers, aluminum paints and bronzing liquids.

Monsanto AROCLORS are inert chlorinated bi- and polyphenyls which show excellent compatibility with high styrene copolymer resins. Compounded with Marbon 9200, the AROCLORS produce a wide variety of specialized and general purpose coating vehicles which show excellent resistance to corrosive influences, including acids, alkalies and moisture.

The techniques presented in this booklet for preparing the protective coatings are in accordance with information prepared by the Marbon Corporation.

* Trade Name Reg. U.S. Pat. Off. Marbon Corporation, Gary, Indiana

** Trade Name Reg. U.S. Pat. Off. Monsanto Chemical Company

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The Use of Aroclors in Formulating High Styrene Copolymer Surface Coatings (Marbon 9200)

Monsanto Technical Bulletin

No. P-149
February 1, 1953

0508377

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WATER_PCB-00001920

GENERAL PHYSICAL CHARACTERISTICS OF AROCLORS 1254 AND 5460

	AROCLOR 1254	AROCLOR 5460
Form	Light yellow viscous liquid	Yellow transparent resin
Color	150 Max. (APHA)	2.0 Max. NPA
Acidity — Maximum (Mgm. KOH per Gm.)	0.015	0.07
Average Coefficient of Expansion cc/cc/°C	0.00066 (25°-65°C)	0.00179 (25°-124°C)
Typical Density		
Specific Gravity 25°/25°C (77°/77°F)	1.538	1.740
Pounds per Gallon — 25°C (77°F)	12.82	14.50
Distillation Range — ASTM D-20 (Mod.) Corr. °C	365°-390°	280°-335° at 5 mm. Hg.
Evaporation Loss-%-ASTM D-6 Mod.		
163°C..... 5 hrs.	1.1 to 1.3	0.03
100°C..... 6 hrs.	0.0 to 0.2	1.5 to 1.7 (at 260°-5 hrs.)
Flash Point-Cleveland Open Cup.....°C	None	None
°F		
Fire Point-Cleveland Open Cup.....°C	None	None
°F		
Pour Point-ASTM D-97.....°C	10°	——
°F	50°	——
Softening Point-ASTM E-28.....°C	——	100° to 105.5°
°F	——	212° to 222°
Refractive Index-D-line — 20°C	1.639-1.641	1.660-1.665
Viscosity-Saybolt Universal		
Sec. (ASTM-D-88) 210°F (98.9°C)	44-48	——
130°F (54.4°C)	260-340	——
100°F (37.8°C)	1800-2500	——

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SOLUBILITY OF AROCLORS IN 100 MILLILITERS OF VARIOUS SOLVENTS

Type of Solvent	1254 (@ 25°C)	1254 (@ Hot)	5460 (@ 25°C)
Drying Oil			
Tung Oil	S	S	S
Linseed Oil	S	S	S
Ester			
Amyl Acetate	S	S	S
Butyl Acetate	S	S	S
Cellosolve Acetate	S	S	S
Cottonseed Oil	S	S	S
Dibutyl Phthalate	S	S	S
Diethyl Phthalate	S	S	S
Ethyl Acetate	S	S	S
Ether Alcohol			
Carbitol	173 (26°C)	259 (98°C)	SS
Cellosolve	S	S	S
Diethylene Glycol	I	I	I
Hydrocarbon			
Benzene	VS	VS	143
Gasoline	VS	VS	S
Kersosene	VS	VS	S
Mineral Spirits	VS	VS	S
Paraffin	SS	S	SS
Pine Oil	S	S	S
Toluene	VS	VS	142
Turpentine	VS	VS	S
Xylene	VS	VS	178
Hydroxy — derivatives			
Amyl Alcohol	S	S	S
n-Butyl Alcohol	S	S	S
Ethyl Alcohol (3-A)	10 (27°C)	28 (75°C)	2
Methyl Alcohol	15 (26°C)	22.2 (65°C)	SS
Ketone			
Acetone	S	S	260
Miscellaneous			
Water	I	I	I

I — Insoluble
S — Soluble
SS — Slightly Soluble
VS — Very Soluble

Figures show grams of Aroclor per 100 Milliliters of solvent at 25°C unless otherwise indicated.

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General Physical Characteristics of Marbon 9200 Resin

Marbon 9200 is a high styrene copolymer resin which is soluble in a wide variety of solvents. Four different viscosity-type resins are available, ranging from high viscosity to very low viscosity. Determined on a No. 4 Ford Cup, the viscosity in seconds of 30% solutions of these "graded viscosity" resins in xylene are as follows:

(1)	HV	350 - 400 sec.
(2)	MV	110 - 130 sec.
(3)	LV	60 - 80 sec.
(4)	LLV	Below 40 sec.

Marbon 9200 resin has the following general properties:

Softening Point	48°±2°C.
Volatile Content	0.5% or less
Specific Gravity	Approximate 1.05
Colors & Appearance	White granules
Color in Solution	Nearly colorless

Solubility

Marbon 9200 has very good solubility in most types of solvents except the alcohols and straight aliphatic hydrocarbons. Aliphatics can be used as diluents, however, even in large proportions. Of the hydrocarbons in general, those with a Kauri-Butanol value above 50 can be classified as "solvents", those with a K-B value below 50 as "diluents". A good solvent combination is a mixture of 40 parts aromatic and 60 parts aliphatic solvent. The viscosity of a 20% solution of the MV resin in a good solvent mixture will be approximately 35-45 cps.

Solution rate of the resin granules is outstanding, and solutions can be prepared almost instantaneously. The resin particles have no tendency to form hard-to-disperse lumps when the resin is stirred in the solvent. Solvent wetting of the resins is very rapid.

Solubility of Marbon 9200
Determined on 10% Solutions at Room Temperature

Solvent	K-B Value	Solubility Characteristics
Denatured Ethyl Alcohol		I
Carbon Tetrachloride		D-2
Ethylene Dichloride		D-2
Butyl Acetate		D-2*
Methyl Ethyl Ketone		D-1*
Acetone		L
Trofuoil	40	L
Sovasol 14	32	L
Aposol 47	46	I
Toluene	105	D-1
Shell TS-28	70	D-1
Hi-Flash Naptha 2-50-W	86	D-1
Turpentine		D-3

* Slight Precipitate Formed

Key to Ratings:

I: Insoluble
L: Limited Swelling and/or Softening
D: Dissolves—
  1: Low Viscosity Solution
  2: Medium Viscosity Solution
  3: High Viscosity Solution

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Viscosity of Resin Solutions

While the average viscosity of a solution of Marbon 9200 MV in a solvent mixture with K-B value above 50 is about 35-45 cps., the viscosity characteristics of the resin can be changed. The viscosity can be lowered to about half its original value by mechanical working, as for instance, on a rubber mill. As an example, the viscosity of a solution based on MV 9200 can be decreased from 30 cps. to 15 cps. by milling the resin for 15 minutes at 120°-150°F.

Viscosity at various solids content can be controlled quite easily by the proper blending of the four viscosity-grades of the resins.

Viscosity of Solutions Containing Marbon 9200 and Other Constituents

These viscosities are obtained when Marbon 9200 MV is dissolved in Toluene to make a 33-1/3% solution and mixed with the second components dissolved in a separate portion of Toluene.

The mixture of the two solutions forms a solution of 30% total solids content. All viscosities were determined on a Brookfield Viscometer (#1 spindle) and are reported in centipoises.

VISCOSITIES

	Percent Marbon 9200 in Blend					
	10	20	50	75	95	100
D/D Boiled Linseed Oil	—	9.5	—	166	385	—
Kettle Bodied Soybean Oil	—	8.3	—	182	388	—
Raw Tung Oil	—	10.0	—	181	385	—
Super Beckacite 1001	—	12.0	—	194	379	—
Durez 219	—	14.0	—	205	396	—
Pentalyn A	—	15.0	73	195	388	—
FF Wood Rosin	8.7	14.0	75	204	376	—
20 cps Parlon	—	358.0	—	342	418	—
Aroclor 4465	7.3	14.0	69	191	377	—
Chlorafin 42	—	—	—	184	376	—
Chlorafin, 70	9.3	17.0	78	201	378	—
Marbon 9200	—	—	—	—	—	484

Melting Point, °C, "MV" Grade (Krumbhaar Mercury Method) 185

Color of Solution (40% resin in nitration grade xylene) (U. S. Bureau of Standards Rosin Colors) WW

Tolerance for Aliphatic Solvents: (Krumbhaar Method)

(At Room Temperature)

Tolerance for Mineral Spirits, %	73
Tolerance for Troluoil, %	75

Note: 40% Solutions of the MV resin in xylene, diluted with the aliphatic solvent until clouding occurred . . . . percentages indicate the aliphatic solvent content of the mixture at the cloud point.

PROPERTIES OF MARBON "9200" RESIN FILMS

Marbon 9200 films show excellent resistance to alkalis, acids, salt solutions, alcohol, mineral and motor oils . . . much higher, in fact, than conventional paint vehicles based on drying oils. The films are not resistant to gasoline, however.

The following performance characteristics are obtained on films cast from 40% solutions in xylene:

Drying Rate and Transfer Resistance

Dry to touch (minutes)	25
Dry to transfer (hours)	6

Note: **Dry to touch** . . . measured by recording the time elapsed until a ball of cotton leaves no fibers on the film when dabbed with light pressure.

Dry to transfer . . . measured by recording the time elapsed until newsprint from a 3-day old newspaper would leave no imprint on the film under approximately 120 psi pressure.

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Appearance of Dry Film

Refractive Index	1.581
Appearance	Transparent
Color	Colorless
Gloss	Excellent
18 months daylight aging	No Change

Film Hardness

Sward Rocker	62
Pencil Hardness	6-H
Shore "D" Hardness	83

Note: Pencil Hardness according to Wilkinson Pencil Method after 48 hours drying.

Shore "D" Hardness determined on 1/4" molded disc.

Resistance Towards Yellowing

Fade-Ometer Exposure 46 S.F. Hrs.	No Change
Fade-Ometer Exposure 150 S.F. Hrs.	Slight Yellowing

Films based on Marbon 9200 are tough, clear, and show very good resistance against yellowing.

Chemical Resistance of Films

Films for the following tests were prepared by dip-coating clear glass slides and allowing them to dry for one week at room temperature. The slides were then placed in a desiccator at room temperature and 90% RH. Spots of the reagents were placed on the films and allowed to remain for the time indicated.

Exposed to	30 min.	48 hrs.
5% Sodium Hydroxide	No Change	No Change
Ammonium Hydroxide, (Conc.)	" "	" "
10% Sodium Phosphate	" "	" "
Corn Oil	" "	" "
Butter	" "	" "
Nitric Acid, (Conc.)	" "	Cloudy *
Sulfuric Acid, (Conc.)	" "	No Change
Acetic Acid, (Conc.)	" "	" "
Hydrochloric Acid, (Conc.)	" "	" "
Oleic Acid	" "	" "

* Films clouded by concentrated nitric acid after 48 hours exposure — cleared, and the cloudiness disappeared after rinsing with water and drying at room temperature.

The following indications of Marbon 9200 films' chemical resistance is shown by the following tests run by the ASTM D-543-43 (modified) method:

Resistance at 25°C. to:	% Wt. Change after Immersion 24 hrs.	7 days	% Wt. Change Immersed 7 days Dried 7 days
3% Sulfuric Acid	+ 0.2	+ 0.3	—0.05
30% Sulfuric Acid	+ 0.2	+ 0.02	—0.05
1% Sodium Hydroxide	+ 0.4	+ 0.4	—0.03
10% Sodium Hydroxide	+ 0.4	+ 0.2	—0.03
Denatured Ethyl Alcohol	+ 0.8*	+ 2.5*	+ 0.1*
Distilled Water	+ 0.4	+ 0.4	—0.03
10% Sodium Chloride	+ 0.3	+ 0.3	—0.03
3% Hydrogen Peroxide	+ 0.4	+ 0.5	—0.02
Mineral Oil	+ 0.6	+ 0.3	—0.02
10 SAE Motor Oil	+ 0.1	+ 0.2	+ 0.1
Gasoline, Reg. 80 Octane	Dissolved	—	—

* Cloudy to opaque

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GUIDE TO FORMULATION OF COATINGS

Function of the AROCLORS

Monsanto AROCLORS are a series of liquid and solid chlorinated polyphenyls. Used with high styrene copolymer resins, AROCLOR 1254 (liquid) serves as a plasticizer; AROCLOR 5460 (solid) serves as a fortifying resin.

Compounding Paints With Marbon 9200 and AROCLORS

Two basic methods may be used for compounding surface coatings with Marbon 9200 and AROCLORS. The first is by making up dry chips; the second uses ball or pebble mills, or multi-roll paint mills to grind the paint directly. Formulation by the dry chip method ordinarily gives coatings with better gloss.

Method A: Pre-mix all dry ingredients thoroughly, then make up the batch on a differential speed, two-roll mill (as used in rubber compounding) with roll temperature of approximately 120°-130°F. As soon as the band has formed, turn on cold water to chill both rolls to prevent temperature from rising above 150°F. Wetting of the pigments is normally very rapid and only a few minutes dispersion time is required. When pigment dispersion is complete, the batch is sheeted off the mill and granulated after cooling. Chips are then dissolved in the solvent; plasticizers, oils, or other liquid additives are stirred in; and after proper straining, the paint is ready for use.

Method B: Add 90% of total solvent in the formulation to a mixing vessel and add the Marbon slowly with rapid agitation.

When all the resin has been added, but before it has completely dissolved, add in the remaining components of the *vehicle*.

Stir the mixed vehicle ingredients for about 30 minutes, which normally will be sufficient time for dissolving the resin granules. The vehicle may appear slightly cloudy due to trapped air but it is actually solubilized and ready for transfer to a ball mill for further processing.

Add the vehicle to the ball mill and introduce the pigments and roll the batch for 16 to 48 hours, depending on the fineness of the grind desired. Flat paints require about 16 hours; semi-gloss paints, 16 to 24 hours; high gloss enamels up to 48 hours.

After the grinding, the batch is removed and the 10% solvent originally withheld is used to flush out the ball mill and then stirred into the paint. The batch will reach maximum consistency after a week's aging. It should then be strained and packaged.

In some formulations where the pigments are not too hard and where a very fine grind is not required, the pigments may simply be stirred into the vehicle and proper dispersion obtained by grinding on a three-roll paint mill.

TYPICAL FORMULATIONS

Surface coatings, formulated with high-styrene copolymer resins and AROCLORS, dry to the touch in minutes, rather than the many hours or even days which is characteristic of oil base paints. The paints age well, show very little tendency for the pigment to settle, and are always free of "skinning".

Cobalt and zinc driers are recommended in some of the "guide" formulations. These metals used in combination do not appear to affect the shelf life of the paints but often induce greater hardness of the applied film, possibly through more complete solvent release or possibly through some action on the resins themselves. Lead driers are not recommended.

Driers are not essential in paints formulated with AROCLORS and Marbon 9200; many formulations give films of suitable hardness and elasticity and derive no appreciable benefit from the use of driers.

The following typical formulations are intended as guides. Except for Marbon 9200 resins and AROCLORS 1254, 5460 — materials that are exactly equivalent to the brand name products cited may, if necessary, be substituted.

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WATER_PCB-00001926

CLEAR VEHICLE

Material	Supplier	%/Wt.	Lbs./Gallon	100 Gallons
MARBON "9200" MV	1	17.60	1.43	16.30
MONSANTO AROCLOR 5460	2	9.11	0.74	5.10
MONSANTO AROCLOR 1254	2	8.39	0.68	5.43
Raw Tung Oil	—	1.655	0.135	1.73
Lecithin	3	0.545	0.044	0.51
TS-28	4	62.70	5.08	70.20
		100.00	8.11	100.00

Dry Time (dust free)	1 hour
Viscosity (#4 Ford Cup)	53 seconds
Specific Gravity	0.947
Refractive Index	1.516

Many satisfactory MARBON "9200" vehicles can be made up simply by varying types and amounts of plasticizers, extenders, etc. This particular vehicle will give a very clear film and serves as the base for many types of paints and enamels. When large amounts of high oil-absorption pigments must be used, the LV or LLV MARBON "9200" resin is recommended.

CLEAR LACQUER

Material	Supplier	%/Wt.	Lbs./Gallon	100 Gallons
MARBON "9200" LLV	1	40.	3.15	36.00
MONSANTO AROCLOR 1254	2	10.	0.789	6.30
Ethyl Alcohol	—	5.	0.395	7.80
D-5 (s)	5	45.	3.55	49.90
		100.0	7.884	100.00

Dry Time (dust free)	20 minutes
Viscosity (#4 Ford Cup)	311 seconds
Sward Rocker Hardness	50 (oven-dried)

This lacquer has excellent clarity. When applied to non-porous surfaces, maximum hardness is not attained for several weeks.

For rapid drying to high hardness, methyl ethyl ketone or ethyl acetate may be used as the solvent.

GENERAL PURPOSE ALUMINUM ENAMEL

Material	Supplier	%/Wt.	Lbs./Gallon	100 Gallons
MARBON "9200" LV	1	7.40	0.634	7.22
MONSANTO AROCLOR 5460	2	13.40	1.148	7.92
MONSANTO AROCLOR 1254	2	6.00	0.515	4.10
W. G. Mica, 325 Mesh	6	8.00	0.685	2.92
(1) Aluminum Paste	7	8.55	0.730	5.75
Xylene	—	22.40	1.92	26.60
Mineral Spirits	—	33.60	2.86	44.00
		100.0	8.49	100.00

(1) Alcoa #1571 or equivalent.

Dry Time (dust free)	10 minutes
Viscosity (#4 Ford Cup)	14 seconds
PVC	31%
Pigment Volume	8.67
Binder Volume	19.24

This general purpose enamel is a low-cost aluminum finish for miscellaneous interior uses. Appearance, application and protection are good.

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TOWOLDMON0005417
WATER_PCB-00001927

SPECIAL ALUMINUM ENAMEL

Material	Supplier	%/Wt.	Lbs./Gallon	100 Gallons
MARBON "9200" MV	1	13.40	1.13	13.00
MONSANTO AROCLOR 5460	2	13.40	1.13	8.00
(1) Aluminum Paste	7	17.05	1.44	12.00
Xylene	—	56.20	4.75	67.00
		100.0	8.45	100.00

(1) Alcoa #1571 or equivalent.

This special aluminum enamel is a better grade finish with more brillance than the general purpose and with better weather-durability. Heat-aging tests on unprimed steel panels coated with this coating show that prolonged exposure to 500°F. causes practically no change in the film. Flexibility and metal adhesion are excellent.

Weathering tests on the enamel applied to a steel exhaust stack and to miscellaneous metal parts show only a slight chalking of the finish after one year.

Tests on the use of this special enamel over roofing felt, asphalt, pitch and roofing paper show this enamel to be comparable to other high quality aluminum paints. For use over roofing compositions, it might be preferable to use a large aluminum flake such as as in Alcoa Std. Paste #240, Stamford Plating Paste, or Reynolds #37 Paste.

GOLD BRONZE DECORATIVE FINISH

Material	Supplier	%/Wt.	Lbs./Gallon	100 Gallons
MARBON "9200" MV	1	16.53	1.685	19.00
MONSANTO AROCLOR 5460	2	7.84	0.800	5.50
MONSANTO AROCLOR 1254	2	4.35	0.444	3.50
Pale Gold Brilliant No. 137	9	26.04	2.69	4.70
SC100	10	18.27	1.862	25.80
Mineral Spirits	—	26.97	2.740	41.50
		100.00	10.22	100.00

PVC	16.8%
Pigment Volume	4.7
Binder Volume	28.00

This is a decorative finish for miscellaneous uses — the less leafing of the pigment the better, since the resin can then form a protective film over the metal pigment and reduce the tendency to discolor. This enamel is recommended for interior uses only.

CONCRETE FLOOR PAINTS

The Tile Red and the Light Oak formulae listed here are similar to formulations that meet Federal Specification TT-P-91A.

TILE RED CONCRETE FLOOR PAINT

Material	Supplier	%/Wt.	Lbs./Gallon	100 Gallons
MARBON 9545 Chips	1	2.62	0.2715	1.33
MARBON 9548 Chips	1	14.60	1.40	8.35
MARBON 9551 Chips	1	15.90	1.529	11.20
MARBON 10829 Chips	1	3.54	0.3398	2.29
MONSANTO AROCLOR 5460	2	5.70	0.547	3.93
MONSANTO AROCLOR 1254	2	6.84	0.658	5.25
Raw Tung Oil	—	2.05	0.197	2.52
AFA X2280	11	0.045	0.0043	0.054
Cobalt Naphth. (6%)	8	0.02	0.0019	0.024
Zinc Naphth. (8%)	8	0.035	0.0033	0.038
TS-28	4	48.65	4.66	64.50
		100.00	9.61	100.00

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PVC	21.8%
Pigment Volume	7.61
Binder Volume	27.38

Light Oak Concrete Floor Paint

Material	Supplier	%/Wt.	Lbs./Gallon	100 Gallons
MARBON 9545 Chips	1	2.62	0.237	1.17
MARBON 9551 Chips	1	15.90	1.500	11.00
MARBON 9556 Chips	1	14.60	1.38	8.80
MARBON 10829 Chips	1	3.54	0.334	2.15
MONSANTO AROCLOR 5460	2	5.70	0.54	3.73
MONSANTO AROCLOR 1254	2	6.84	0.646	5.17
Raw Tung Oil	—	2.05	0.194	2.48
AFA X2280	11	0.045	0.0042	0.053
Cobalt Naphth. (6%)	8	0.02	0.0019	0.036
Zinc Naphth. (8%)	8	0.035	0.0033	0.085
TS-28	4	48.65	4.599	63.50
		100.00	9.44	100.00

PVC	22.8%
Pigment Volume	7.93
Binder Volume	26.89

These concrete paints dry down to glossy, tough, scuff-resistant coatings with excellent water and alkali resistance, good adhesion and where exposed to the weather, very good durability.

The concrete surface should be dry and free from dirt and concrete dust. Except in special cases, (very dense surfaces) acid etching or wire-brushing is seldom necessary. For the prime coat the paint should be thinned with the specific solvent at a rate of one quart of solvent per gallon of paint. The concrete should preferably be allowed to age for about 2 months if possible, before painting.

Since concrete is a permeable material, the prevention of blistering of a paint film and at the same time the creation of a durable film depends to a great extent upon the proper PVC. These are high gloss paints with a PVC of 22%. Under severely wet conditions, this PVC should probably be increased to perhaps 30-35%, at some sacrifice in gloss.

INTERIOR WALL PAINTS

Flat White

Material	Supplier	%/Wt.	Lbs./Gallon	100 Gallons
MARBON 9566 Chips	1	32.38	3.14	18.42
MARBON 9551 Chips	1	10.50	1.02	7.60
MARBON 10829 Chips	1	1.62	0.157	1.03
Diatomaceous Silica	12	4.40	0.427	2.23
AROCLOR 5460	2	2.52	0.2445	1.69
70% Chlorinated Paraffin	15	2.16	0.209	1.46
Raw Tung Oil	—	0.57	0.0553	0.70
Lecithin	3	0.26	0.0252	0.30
Aluminum Stearate	13	0.40	0.0388	0.42
Cobalt Naphth. (6%)	8	0.06	0.0058	0.07
Zinc Naphth. (8%)	8	0.012	0.00117	0.013
Hi-Flash Coal Tar Naphtha	—	23.00	2.23	31.58
Mineral Spirits (low odor)	—	22.18	2.15	32.85
		100.00	9.703	100.00

PVC	34.88%
Pigment Volume	11.77
Binder Volume	21.97

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Flat Gray

Material	Supplier	%/Wt.	Lbs./Gallon	100 Gallons
MARBON 9200 (MV)	1	15.88	1.579	18.00
TiO_2 (NC-NY)	16	20.94	2.081	5.95
China Clay	17	6.23	0.619	2.88
Diatomaceous Silica	12	4.37	0.435	2.26
Aluminum Stearate	13	0.40	0.04	0.43
Chrome Oxide A9341	19	0.71	0.0706	0.21
P-33 Carbon Black	20	0.12	0.012	0.79
Raw Tung Oil	—	0.56	0.0557	0.72
Extra Fine Talc	18	1.10	0.1093	0.47
70% Chlorinated Paraffin	15	2.14	0.213	1.51
MONSANTO AROCLOR 1254	2	2.50	0.2485	1.98
Lecithin	3	0.26	0.0258	0.28
Cobalt Naphth. (6%)	8	0.006	0.0006	0.008
Zinc Naphth. (8%)	8	0.12	0.00116	0.014
Hi-Flash Coal Tar Naphtha	—	22.80	2.268	31.10
Mineral Spirits (low odor)	—	21.98	2.185	33.40
		100.00	9.943	100.00

PVC	36.5%
Pigment Volume	12.96
Binder Volume	22.51

Light Green Gloss

Material	Supplier	%/Wt.	Lbs./Gallon	100 Gallons
MARBON 9200 MV	1	1.93	0.1766	2.01
MARBON 9543 Chips	1	11.65	1.066	6.22
MARBON 10829 Chips	1	3.55	0.324	2.11
MARBON 9551 Chips	1	15.93	1.459	10.84
MARBON 9545 Chips	1	2.62	0.240	1.13
MARBON 10849 Chips	1	1.14	0.104	1.04
MARBON 9556 Chips	1	1.00	0.091	0.58
MONSANTO AROCLOR 5460	2	5.70	0.520	3.59
MONSANTO AROCLOR 1254	2	6.84	0.622	5.00
Raw Tung Oil	—	2.05	0.188	2.43
AFA 81069	21	0.044	0.004	0.05
Cobalt Naphth. (6%)	8	0.023	0.002	0.025
Zinc Naphth. (8%)	8	0.033	0.003	0.035
Hi-Flash Coal Tar Naphtha	—	24.25	2.22	30.97
Mineral Spirits (low odor)	—	23.25	2.12	34.05
		100.00	9.15	100.00

Dry Time (dust free)	26 minutes
Viscosity (#4 Ford Cup)	63 seconds
PVC	23.59%
Pigment Volume	8.12
Binder Volume	26.94

The white and gray are typical low-sheen interior wall paints. Various modifications can be made to satisfy any particular requirement. Wet-edge time is easily controlled by the proper choice of solvents; consistency can be varied (in the ball mill basic formula) without changing the solids content simply by using various proportions of the high and the low viscosity MARBON 9200 resins; sheen and gloss can be improved by the use of increased amounts of the LLV resin.

Hiding-power, non-sagging properties and washability are good. Can-stability, non-settling and non-skinning properties are superior to oil base paints.

The light green formula will produce a gloss finish with excellent coverage for use on kitchen and bathroom walls.

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The best of low odor solvents should be used for these interior applications. Any of the low odor thinners (of K. B. values of 20-35) can be used in combination with the best high K. B. solvents, such as Drakes D-5(s) or SC-150. Viscosity and dry time will vary. Whatever solvent combination is used, the K. B. should be about 55 or higher.

COLORED TRIM ENAMELS

Dark Green Gloss Enamel

Material	Supplier	Chip Formula %/Wt.	%/Wt.	Basic Formula Lbs./Gal.	100 Gals.
MARBON 9200 MV	1	1.346	17.11	1.58	18.00
MARBON 9557 Chip	1	25.00	—	—	—
Chrome Green A4464	11	—	15.00	1.385	4.20
MARBON 9551 Chip	1	10.03	—	—	—
China Clay	17	—	6.02	0.555	2.40
MARBON 9545 Chip	1	2.50	—	—	—
Zinc Oxide XX50	22	—	1.75	0.162	0.346
MARBON 11790 Chip	1	0.72	—	—	—
Bentone #34	23	—	0.50	0.046	0.32
MONSANTO AROCLOR 5460	2	5.70	5.70	0.527	3.63
MONSANTO AROCLOR 1254	2	4.83	4.83	0.446	3.56
Raw Tung Oil	—	2.09	2.09	0.1936	2.48
Hi-Flash Coal Tar Naphtha	—	24.25	24.25	2.24	30.68
Mineral Spirits (low odor)	—	23.53	23.53	2.16	34.10
		100.00	100.00	9.294	100.00

Dry Time (dust free)	45 minutes
Viscosity (#4 Ford Cup)	130 seconds
PVC	20.06%
Pigment Volume	7.27
Binder Volume	27.67
Sward Rocker Hardness	45

Medium Blue Gloss Enamel

Material	Supplier	Chip Formula %/Wt.	%/Wt.	Basic Formula Lbs./Gal.	100 Gals.
MARBON 9200 LV	1	1.01	22.14	2.032	23.16
MARBON 9552 Chip	1	9.44	—	—	—
Lithopone (low oil)	14	—	6.61	0.607	1.69
MARBON 9565 Chip	1	10.86	—	—	—
Titanium Calcium	16	—	7.00	0.643	2.37
MARBON 12011 Chip	1	17.83	—	—	—
Monastral Blue Lake BL282	24	—	4.46	0.409	3.35
MARBON 9545 Chip	1	3.55	—	—	—
Zinc Oxide XX50	22	—	2.48	0.228	0.48
MONSANTO AROCLOR 5460	2	10.95	10.95	1.005	6.93
Hi-Flash Coal Tar Naphtha	—	23.66	23.66	2.172	29.79
Mineral Spirits (low odor)	—	22.70	22.70	2.083	31.83
		100.00	100.00	9.18	100.00

Dry Time (dust free)	45 minutes
Viscosity (#4 Ford Cup)	230 seconds
PVC	20.82%
Pigment Volume	7.89
Binder Volume	30.00
Sward Rocker Hardness	45

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Medium Red Gloss Enamel

Material	Supplier	Chip Formula %/Wt.	Basic Formula %/Wt.	Lbs./Gal.	100 Gals.
MARBON 9200 LV	1	1.24	22.14	2.032	23.16
MARBON 9552 Chip	1	9.44	—	—	—
Lithopone (low oil)	14	—	6.61	0.606	1.69
MARBON 9565 Chip	1	10.86	—	—	—
Titanium Calcium	16	—	7.00	0.642	2.37
MARBON 12010 Chip	1	17.83	—	—	—
BON Red Lake RL586	24	—	4.46	0.409	2.90
MARBON 9561 Chip	1	3.31	—	—	—
Rex Orange X1939	11	—	2.48	0.228	0.46
MONSANTO AROCLOR 5460	2	10.95	10.95	1.005	6.93
Hi-Flash Coal Tar Naphtha	—	23.66	23.66	2.161	29.65
Mineral Spirits (low odor)	—	22.70	22.70	2.083	31.83
		100.00	100.00	9.165	100.00

Dry Time (dust free)	45 minutes
Viscosity (#4 Ford Cup)	213 seconds
PVC	20.80%
Pigment Volume	7.42
Binder Volume	28.26
Sward Rocker Hardness	45

WHITE EXTERIOR MASONRY PAINTS
(Stucco, Concrete, Concrete Block, etc.)
Heavy Bodied Satin Finish

Material	Supplier	%/Wt.	Lbs./Gallon	100 Gallons
MARBON 9200 (MV)	1	13.80	1.59	18.12
MONSANTO AROCLOR 5460	2	6.81	0.781	5.40
MONSANTO AROCLOR 1254	2	6.80	0.78	6.24
TiO_2 (Anatase)	16	17.80	2.05	6.40
Zinc Oxide XX50	22	5.09	0.584	2.15
Extra Fine Talc	18	17.70	2.04	8.70
TS-28	4	32.00	3.69	52.00
		100.00	11.51	100.00

Viscosity (#4 Ford Cup)	966 seconds
PVC	36.5%
Pigment Volume	17.28
Binder Volume	29.76

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Lighter Body

Material	Supplier	%/Wt.	Lbs./Gallon	100 Gallons
MARBON 10846 Chips	1	10.00	1.09	6.45
MARBON 9543 Chips	1	30.00	3.26	19.10
MARBON 9545 Chips	1	12.00	1.31	6.42
MONSANTO AROCLOR 5460	2	2.50	0.275	1.95
MONSANTO AROCLOR 1254	2	1.40	0.154	1.24
Bentone #34	23	1.00	0.11	0.56
Raw Tung Oil	—	2.50	0.275	3.51
Cobalt Naphth. (6%)	8	0.023	0.0025	0.031
Zinc Naphth. (8%)	8	0.033	0.0036	0.42
D-5 (s)	5	21.86	2.38	33.55
SC-150	10	18.69	2.15	29.05
		100.00	11.01	100.00

Dry Time (dust free)	40 minutes
Viscosity (#4 Ford Cup)	260 seconds
PVC	29%
Pigment Volume	11.17
Binder Volume	27.30

These two formulations are designed for use on stucco, concrete block, poured concrete walls, etc., where good sealing against moisture, attractive appearance, and alkali resistance is needed.

The heavy-bodied paint gives a satin finish with excellent sealing properties — tests on new concrete blocks filled with water showed no penetration, blistering or leaking of the paint film after 15 weeks. This is a full-chalking type paint for self-cleaning of the rough surfaces to which it is usually applied.

The lighter bodied paint is a chip-formula for stucco and concrete. It does not require ball-milling and is considerably less viscous giving better brushing properties. A combination of Anatase and Rutile TiO_2 is used for controlled chalking with maximum durability.

The PVC of paints of this type is important in determining the durability and resistance to blistering; for very wet porous stucco walls the heavy bodied higher PVC paint is recommended. There may be instances where an even higher PVC will be necessary. For the more general uses the lighter bodied formula should prove satisfactory with probably better weather-durability.

Weathering tests for a year in South Florida (on paints of this type) on concrete, stucco, and masonite have shown good results.

For fresh work previously unpainted, a prime coat of the particular paint thinned with one quart of solvent to one gallon of the paint should be used.

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21. General Electric Company
22. New Jersey Zinc Sales Company
23. National Lead Company
24. E. I. DuPont de Nemours and Company

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