

## RESULTS

### SALES OF ARCHITECTURAL AND INDUSTRIAL MAINTENANCE COATINGS

#### Distribution of Sales by Company Size and Location

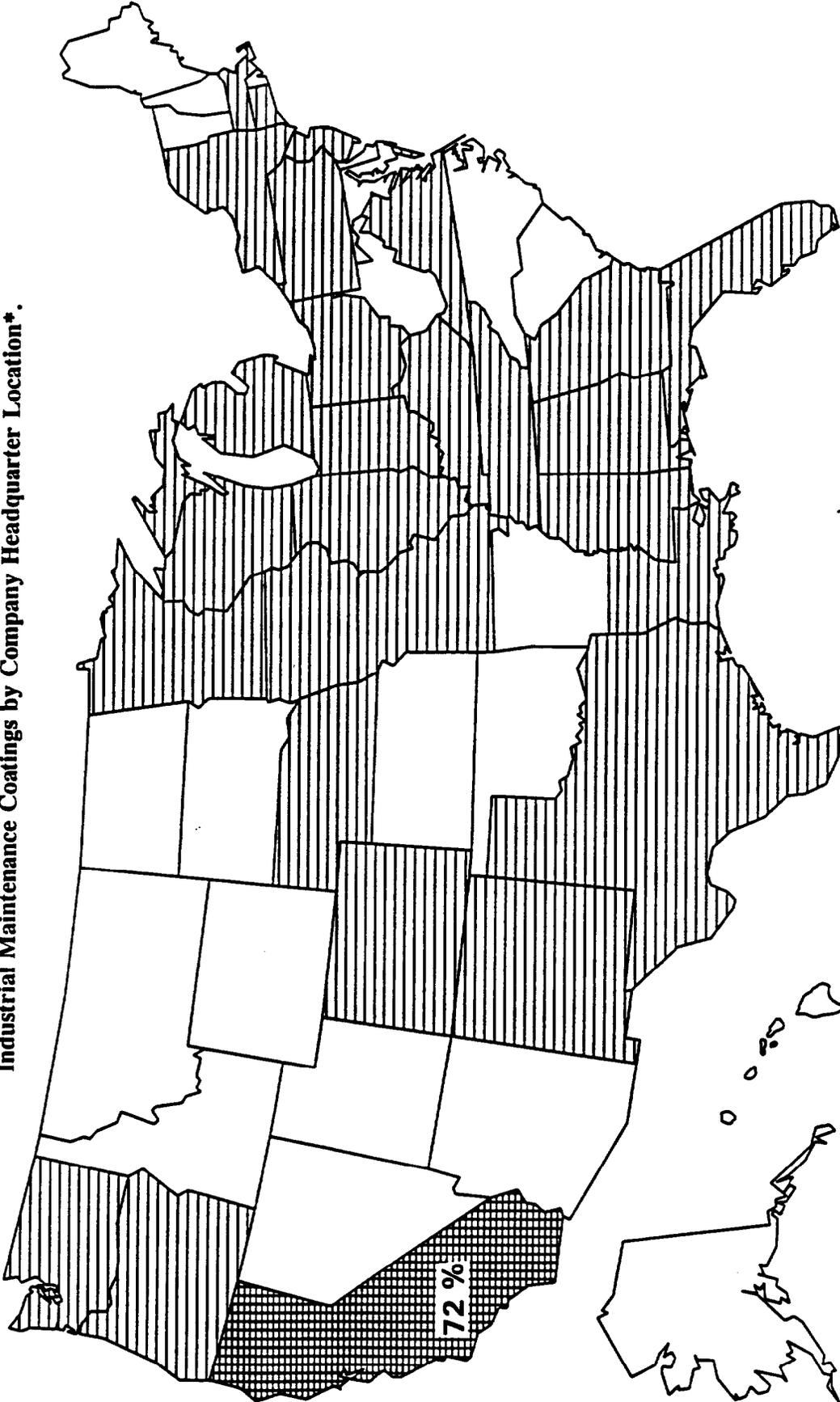
The 174 participating companies reported coating sales of 77.1 million gallons in California during 1990. Nearly three-quarters of the sales (72%) came from the 66 companies located in California. The remaining sales (28%) came from companies located in 27 other states, as shown in Figure 1.

Table 2 describes the distribution of companies by size, as determined by the annual business volume reported by the companies, and the contribution of these companies to the total coating sales in California. For example, 76 companies reported annual business volumes of less than \$5 million. Their total 1990 coating sales in California accounted for 6% of the total coating sales in the state. The 25 largest companies, reporting sales volumes of more than \$50 million, were responsible for more than half (57%) of the total coating sales in California. All companies with annual business volumes of less than \$10 million reported having fewer than 100 employees. All others had more than 100 employees.

#### Distribution of Sales by Coating Type and Carrier Technology

Table 3 lists the total reported coating sales of water-borne and solvent-borne products (including solvent-borne with exempts and 100% solids) in each of 33 coating categories. Tables 3, 4a, and 4b are similar to those published in the 1984 and 1988 survey results. The number of companies reporting sales in each category and the total number of products represented are also presented in Table 3. The survey questionnaire divided coatings into 39 categories. However, data on seven categories were combined into the category called "other specialty coatings" because these products are provided by fewer than four companies. Release of such data for individual categories could be considered proprietary by the manufacturers. The "other" category represents products that

**1990 ARB AIM Coating Survey**  
**Percentage of 1990 California Sales of Architectural and**  
**Industrial Maintenance Coatings by Company Headquarter Location\*.**



**Figure 1**

\*Shaded states other than California account for 28 percent of coatings sold in California.

## 1990 ARB AIM Coating Survey

**Table 2. Total AIM Coating Sales and Number of Companies Reporting Sales, by Size<sup>(a)</sup> of Company**

Company Sales Volume (\$M)	Number of Companies	Total AIM Coating Sales	
		Million Gallons	%
<5	76	4.9	(6%)
5-10	20	2.9	(4%)
10-50	53	25.1	(33%)
>50	25	44.1	(57%)
Total	174	77.0	(100%)

<sup>(a)</sup> Companies with sales volumes of less than \$10M have fewer than 100 employees. All others have more than 100 employees.

## 1990 ARB AIM Coating Survey

**Table 3. Summary of 1990 California Sales of Architectural and Industrial Maintenance Coatings.**

Coating Category	No. of Companies	No. of Products	Water-based Coating Sales (1,000 Gal)	Solvent-based Coating Sales (1,000 Gal)	Total 1990 Coating Sales (1,000 Gal)
Anti-Graffiti Coating	8	22	30	9	38
Below-Ground Wood Preservatives	4	4	0	37	37
Clear Wood Finishes - Lacquers	27	129	48	845	893
Clear Wood Finishes - Sanding Sealers	22	51	9	378	387
Clear Wood Finishes - Varnishes	47	348	45	816	861
Concrete Curing Compounds	6	24	169	29	197
Dry Fog Coatings	15	29	24	81	105
Fire Retardant Coating - Pigmented	7	12	7	16	23
Flats	53	1,105	32,116	61	32,177
Form-Release Compounds	4	6	4	6	10
Graphic Arts (sign) Coatings	8	165	5	528	533
High Temperature Coatings	18	54	0	13	13
Industrial Maintenance Coatings	77	1,248	241	2,837	3,078
Mastic Texture Coatings	21	86	603	172	775
Metallic Pigmented Coatings	39	125	11	355	366
Nonflats - High Gloss	44	420	687	1,330	2,017
Nonflats - Medium Gloss	51	810	12,645	1,471	14,116
Nonflats - Low Gloss	45	398	2,967	94	3,061
Nonflats - Quick Dry Enamels	19	42	1	483	484
Opaque Stains	27	130	1,528	258	1,785
Pre-treatment Wash Primers	15	21	4	18	21
Primers Sealers and Undercoaters	83	568	3,917	1,871	5,788
Quick Dry Primers, Sealers & Undercoaters	32	84	92	285	377
Roof Coatings	30	132	1,365	617	1,982
Semi-transparent Stains	46	451	574	1,163	1,736
Semi-transparent & Clear Wood Preservatives	11	66	32	231	264
Shellacs - Pigmented	4	5	0	74	74
Swimming Pool Coatings	4	4	0	3	3
Traffic Paints	30	189	1,037	3,200	4,237
Waterproofing Sealers - Clear	29	82	268	681	950
Waterproofing Sealers - Pigmented	12	18	19	55	74
Other Specialty Coatings (1)	14	55	31	88	118
Other (2)	36	113	317	156	473
All coating types pooled	174	6,996	58,796	18,260	77,057

- (1) Other specialty coatings include bond breakers, clear fire retardant coatings, clear fire retardant coatings, magnesite cement coatings, multi-color coatings, opaque wood preservatives, clear shellacs, and swimming pool repair coatings.
- (2) Products not classified according to any of the ARB specified categories.

companies could not classify according to any of the general or specialty coating types.

Some of the information in Table 3 is highlighted in Figures 2a through 2c. Figure 2a, for example, shows that water-borne products account for over 75% of the total sales. Products containing exempt compounds and those reported to be 100% solids account for just over 5% of total sales. Figure 2b shows how the sales are distributed among two general categories (flats and non-flats) and selected specialty categories. The category of primers, sealers, and undercoaters with sales of 5.8 million gallons is the largest among the specialty coatings. Figure 2c gives a further breakdown of sales according to coating category and carrier technology. Notice that nearly all of the flat coatings are water-borne products while the majority of specialty coatings are solvent-borne. The lower bar graph in Figure 2c highlights the specialty coatings with the largest volume of sales.

# 1990 ARB AIM Coating Survey

## Distribution of AIM Coating Sales by Carrier Technology

(Total Number of Gallons)

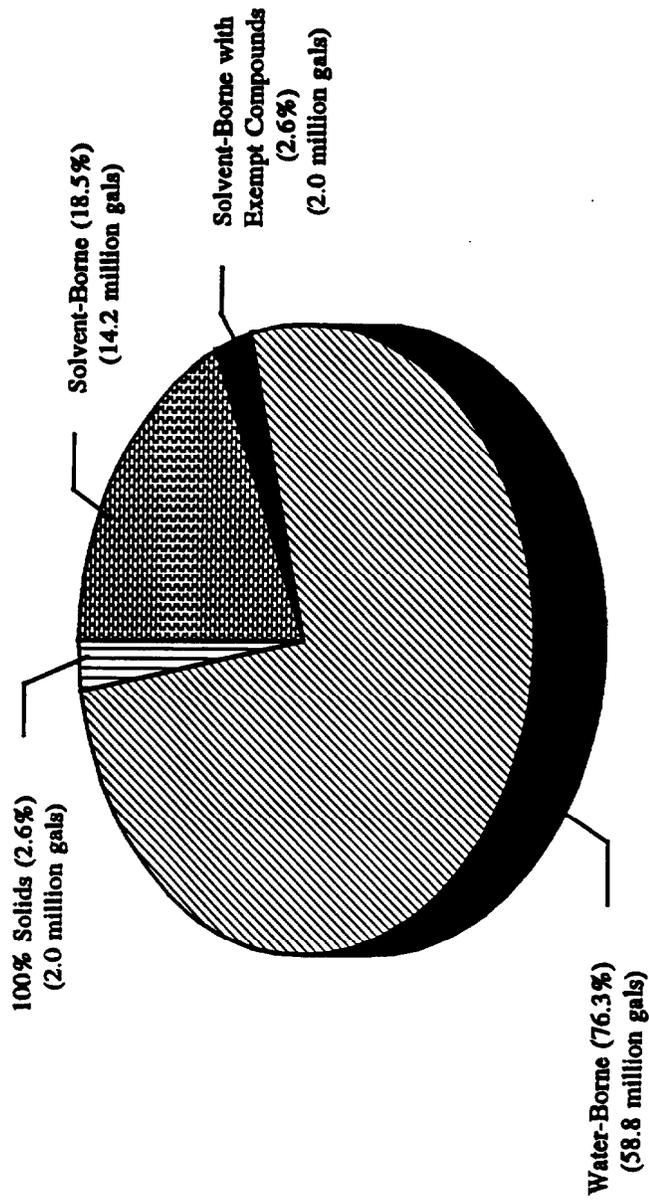


Figure 2a.

# 1990 ARB AIM Coating Survey

## Distribution of AIM Coating Sales by Coating Category

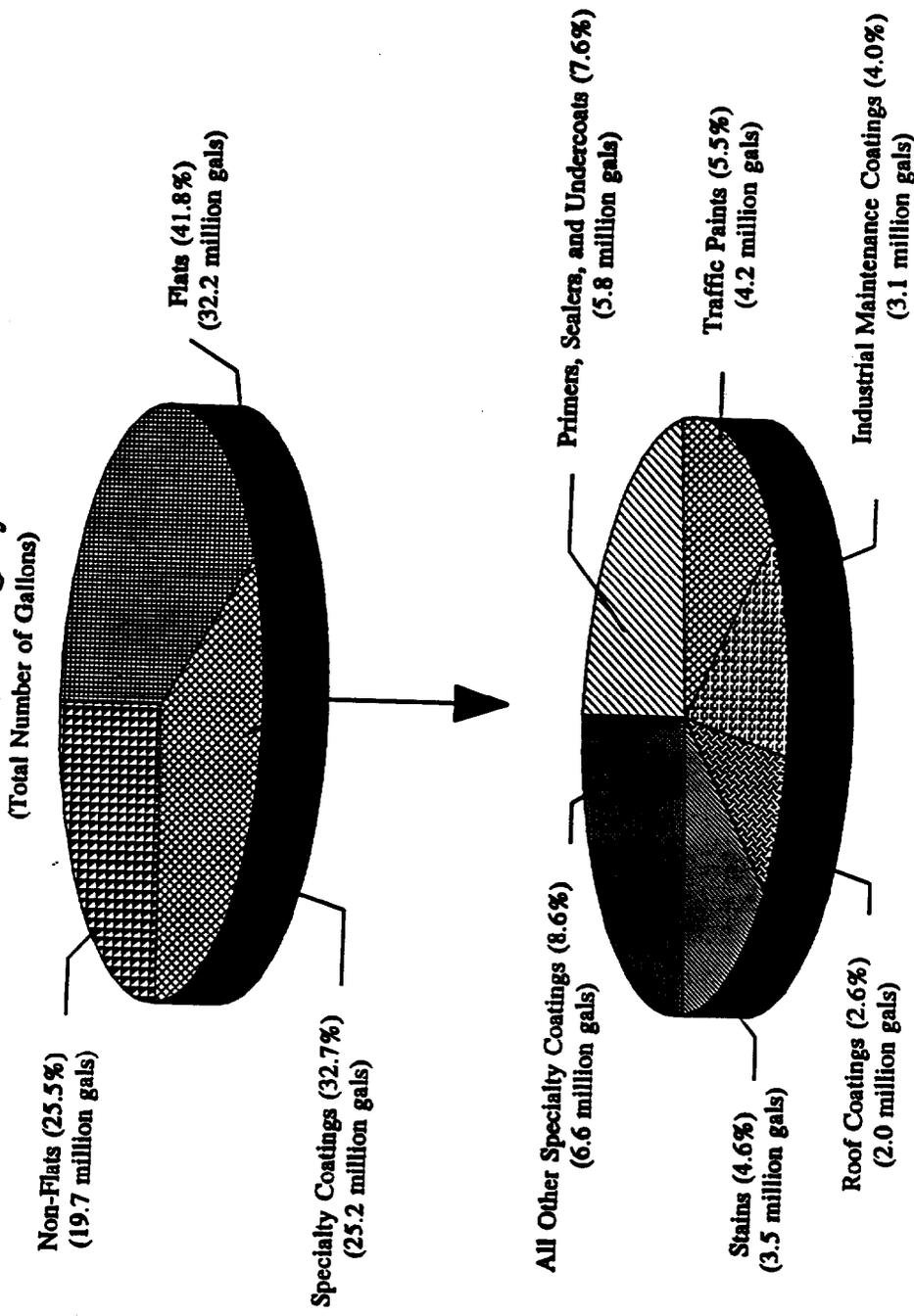
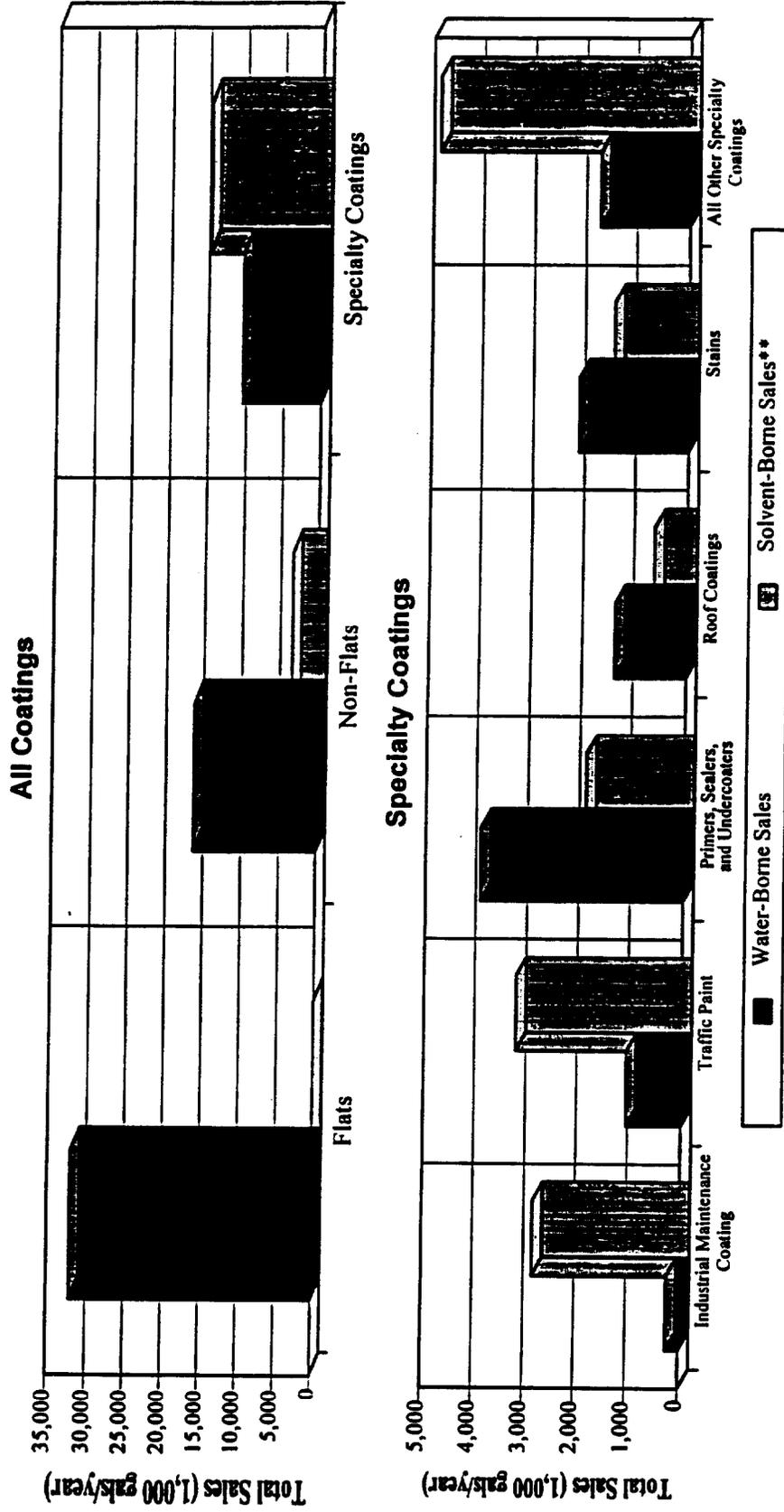


Figure 2b.

# 1990 ARB AIM Coating Survey

## Total Sales (1,000 gals/year) of AIM Coatings by Coating Category and Carrier Technology



\*\* Includes 100% solids and solvent-borne with exempts

Figure 2c.

## **ESTIMATED EMISSIONS FROM ARCHITECTURAL AND INDUSTRIAL MAINTENANCE COATINGS**

The total VOC emissions from architectural and industrial maintenance coatings sold in California in 1990 is estimated to be 39,061 tons per year. This includes 12,880 tons of VOCs from water-borne coatings and 28,181 tons from solvent-borne coatings and the solvents used at manufacturer recommended thinning levels. It does not include emissions of VOCs from solvents that may be used in cleanup or for thinning beyond manufacturers' recommended levels.

### **Estimated Emissions from Water-Borne Coatings**

Table 4a contains the estimated emissions from water-borne coatings in each category. Also presented are the sales weighted (SW) average volume percent solids (calculated as total volume of solids divided by total sales in each category), sales weighted average VOC content of the material ( $VOC_{mat}$  = grams of VOCs in the material per liter of material), and the sales weighted average regulatory VOC level ( $VOC_{reg}$  = grams of VOCs in the material per liter of material less water, less exempt solvents). Further definition of these parameters is provided in the instructions to the survey questionnaire contained in Appendix B.

Estimated emissions were calculated for each product by multiplying the reported material VOC content (g/l) by the reported volume of material sold (gallons/year), then multiplying by the appropriate factor to convert results to tons per year. Total emissions from water-borne coatings are estimated to be 12,880 tons/yr. Almost 83% of these emissions are from flat and non-flat water-borne products, which account for 82% of the total water-borne product sales.

### **Estimated Emissions from Solvent-Borne Coatings**

The estimated emissions from solvent-borne coatings are shown for each coating category in Table 4b along with sales weighted averages of percent solids, material

**1990 ARB AIM Coating Survey**  
**1990 California Sales of Architectural and Industrial Maintenance Coatings.**  
**WATER-BORNE COATINGS**

Coating Category	Total 1990 Coating Sales (1,000 gal.)	SW Avg. Percent Solids	SW Avg. Material VOC (1) (g/l)	SW Avg. Regulatory VOC (2) (g/l)	Estimated VOC Emissions (tons/yr)
Anti-Graffiti Coating	30	51.9	66.2	123.2	8
Clear Wood Finishes - Lacquers	48	28.5	122.9	302.1	25
Clear Wood Finishes - Sanding Sealers	9	22.4	84.3	293.6	3
Clear Wood Finishes - Varnishes	45	28.2	79.2	205.6	15
Concrete Curing Compounds	169	11.0	25.1	118.3	18
Dry Fog Coatings	24	33.3	50.2	75.6	5
Fire Retardant Coating - Pigmented	7	45.8	9.1	26.0	0
Flats	32,116	38.9	44.1	104.7	5,889
Form-Release Compounds	4	2.2	49.3	592.4	1
Graphic Arts (sign) Coatings	5	40.6	44.3	97.3	1
Industrial Maintenance Coatings	241	38.4	96.7	205.9	97
Mastic Texture Coatings	603	50.1	44.7	87.6	112
Metallic Pigmented Coatings	11	55.5	9.3	18.0	0
Nonflats - High Gloss	487	39.3	98.2	211.4	281
Nonflats - Medium Gloss	12,645	36.9	70.3	162.3	3,699
Nonflats - Low Gloss	2,967	37.1	63.6	153.5	785
Nonflats - Quick Dry Enamels	1	33.8	43.9	106.9	0
Opaque Stains	1,528	36.1	54.3	133.0	345
Pre-treatment Wash Primers	4	1.0	293.0	702.0	5
Primers Sealers and Undercoaters	3,917	35.2	44.7	116.8	729
Quick Dry Primers, Sealers & Undercoaters	92	38.3	42.2	96.8	16
Roof Coatings	1,365	44.4	36.2	67.2	206
Semi-transparent Stains	574	18.0	72.9	257.8	174
Semi-transparent & Clear Wood Preservatives	32	15.7	47.9	279.6	6
Traffic Paints	1,037	54.9	78.3	120.5	338
Waterproofing Sealers - Clear	268	9.7	20.0	158.2	22
Waterproofing Sealers - Pigmented	19	46.7	28.9	58.3	2
Other Specialty Coatings (3)	31	16.2	317.7	560.4	41
Other (4)	317	44.2	42.5	88.1	56
All coating types pooled	58,796	38.2	52.7	124.3	12,880

(1) Sales weighted average grams of volatile organic compounds (VOC) per liter of material.  
(2) Sales weighted average grams of volatile organic compounds (VOC) per liter of material plus thinning solvent less water less exempt compounds.  
(3) "Other specialty coatings" includes bond breakers, clear fire retardant coatings, magnesite cement coatings, multi-color coatings, opaque wood preservatives, clear shellacs, and swimming pool repair coatings.  
(4) Products not classified according to any of the ARB specified categories.

**1990 ARB AIM Coating Survey**  
**Table 4b. Estimated Emissions from 1990 California Sales of Architectural and Industrial Maintenance Coatings.**  
**Solvent-Borne Coatings**

Coating Category	Total 1990 Coating Sale (1,000 Gal.)	SW Avg Percent Solids	SW Avg(1) Material VOC(g/l)	SW Avg VOC(2) at Max Thinning VOC (g/l)	SW Avg(3) Regulatory VOC (g/l)	SW Avg. Recomm. Thinning	Estimated VOC Emissions (tons/year)	
							from Material	from Thinning
							Total	Max Thin.
Anti-Graffiti Coating	9	81.3	161	161	173	0.00	6	6
Below-Ground Wood Preservatives	37	51.4	377	377	377	0.00	58	58
Clear Wood Finishes - Lacquers	845	26.0	666	668	668	0.93	2,341	2,370
Clear Wood Finishes - Sanding Sealers	378	22.9	667	668	667	0.00	1,048	1,055
Clear Wood Finishes - Varnishes	816	44.2	432	436	434	0.00	1,467	1,501
Concrete Curing Compounds	29	14.0	794	794	794	0.00	94	94
Dry Fog Coatings	81	42.8	372	373	392	0.00	125	126
Fire Retardant Coating - Pigmented	16	53.0	373	373	373	0.00	25	25
Flats	61	31.9	347	359	362	0.45	88	89
Form-Release Compounds	6	67.0	597	597	597	0.00	15	15
Graphic Arts (sign) Coatings	528	60.8	412	428	412	0.22	904	977
High Temperature Coatings	13	36.6	539	556	539	0.00	30	30
Industrial Maintenance Coatings	2,837	56.5	364	390	374	1.12	4,301	4,418
Mastic Texture Coatings	186	58.3	186	276	274	14.96	133	227
Metallc Pigmented Coatings	355	52.9	470	472	470	0.01	694	694
Nonflats - High Gloss	1,330	61.2	313	318	348	0.29	1,723	1,798
Nonflats - Medium Gloss	1,471	67.4	282	283	298	0.29	1,738	1,746
Nonflats - Low Gloss	94	53.3	374	393	384	2.71	147	156
Nonflats - Quick Dry Enamels	483	55.3	402	403	402	0.00	808	810
Opaque Stains	258	50.9	394	405	395	0.00	422	446
Pre-treatment Wash Primers	18	8.4	729	736	740	3.67	53	55
Primers Sealers and Undercoaters	1,871	54.4	322	331	371	1.22	2,504	2,720
Quick Dry Primers, Sealers & Undercoaters	1,285	46.3	369	386	418	3.94	84	88
Roof Coatings	617	70.1	263	263	263	0.00	674	674
Semi-transparent Stains	1,163	44.3	421	421	432	0.00	2,037	2,038
Shellacs - Pigmented	231	50.5	367	367	367	0.00	353	353
Swimming Pool Coatings	74	33.6	523	544	544	6.14	162	179
Traffic Paints	3	31.4	572	575	572	0.00	8	8
Waterproofing Sealers - Clear	3,200	78.9	117	118	132	0.00	1,563	1,565
Waterproofing Sealers - Pigmented	681	41.2	410	410	418	0.00	1,162	1,162
Other Specialty Coatings (4)	55	49.0	399	399	399	0.00	206	206
Other (5)	88	30.4	567	567	588	0.00	322	324
Other (5)	156	47.5	496	497	496	0.30	444	444
All coating types pooled	18,260	57.0	339	347	355	0.66	25,737	26,181
								27,042

(1) Sales weighted average grams of volatile organic compounds (VOC) per liter of material.  
(2) Sales weighted average grams of volatile organic compounds (VOC) in material plus solvents at maximum thinning per liter of material plus solvent.  
(3) Sales weighted average grams of volatile organic compounds (VOC) per liter of material plus thinning solvent less water less exempt compounds.  
(4) "Other specialty coatings" include bond breakers, clear fire retardant coatings, magnesite cement coatings, multi-color coatings, opaque wood preservatives, clear shellacs, and swimming pool repair coatings.  
(5) Products not classified according to any of the ARB specified categories.

VOC content, VOC content at maximum thinning ( $VOC_{MT}$ ), and regulatory VOC content. The VOC content at maximum thinning is the total weight (grams) of VOCs in the material plus thinning solvent at maximum thinning levels divided by the total volume (liters) of material plus thinning solvent. The estimated total annual emissions from solvent-borne coatings, including emissions from the material and solvents used at recommended thinning, is 26,181 tons. The largest source of emission among the various coating categories is the category of industrial maintenance coatings. This category contributes nearly 17% of the total emissions from all solvent-borne coatings.

According to the ARB-CAPCOA Suggested Control Measure (May 12, 1989)  $VOC_{reg}$  for solvent-borne coatings is to be calculated based on the VOC content of the material plus recommended thinning solvent. That is,  $VOC_{reg}$  equals the total weight (grams) of VOCs in the material plus recommended thinning solvent divided by the total volume (liters) of material plus solvent.

The survey did ask for VOC content at recommended thinning; however, it did not ask specifically for the amount of solvent used to thin the coating. To estimate the emissions due to thinning, we considered the relationship between  $VOC_{mat}$ ,  $VOC_{MT}$ , and  $VOC_{reg}$  for solvent-borne products. These values depend on the manufacturer's recommendation for thinning and whether or not the product contains exempt compounds. This information was used to estimate the level of recommended thinning. Table 4b contains the sales weighted average level of recommended thinning (total volume of solvent for recommended thinning as a percent of total sales) in each category. For example, the average recommended thinning of mastic texture coatings is nearly 15%. On the other hand, thinning is not recommended for most products. The average level of thinning recommended for solvent-borne coatings is less than one percent.

The level of recommended thinning could not be determined for the 11% of solvent-borne sales that contain exempt compounds. For some individual products containing exempt compounds, the value reported for  $VOC_{MT}$  was less than the value reported for  $VOC_{reg}$ . This is reflected in the relationship between the corresponding sales-weighted averages in Table 4b ( $VOC^{(2)} < VOC^{(3)}$ ) for some of the coating categories. However, for the vast majority of products that do not contain exempts, companies either reported  $VOC_{mat} = VOC_{reg} \leq VOC_{MT}$ , implying that thinning is not recommended, or  $VOC_{mat} < VOC_{MT} =$

$VOC_{reg}$ , implying that thinning is recommended at the maximum thinning level. Therefore, using the definition of  $VOC_{mat}$  and  $VOC_{MT}$  and the U.S. EPA estimate of 883 g/l for the average density of VOCs, it can be shown that the volume of recommended thinning solvents is

$$V_{s,rec} = V_{mat}(VOC_{reg} - VOC_{mat})/(883 - VOC_{reg}),$$

where  $V_{mat}$  is the volume of material sold. (Note: The volume of thinning solvents equals zero if  $VOC_{reg} = VOC_{mat}$ . Adjustments were made for the few cases involving products with exempt compounds that require thinning.)

The volume of solvents used at maximum thinning was also calculated to determine the maximum estimated emissions if all products were thinned at the maximum level. The formula for the volume of thinning solvents at maximum thinning is

$$V_{s,MT} = V_{mat}(VOC_{MT} - VOC_{mat})/(883 - VOC_{MT}).$$

Notice that  $V_{s,MT} = V_{s,rec}$  if the company reported  $VOC_{MT} = VOC_{reg}$ .

Total estimated emissions are divided into two parts in Table 4b: Emissions from the material, and emissions from the solvent used at recommended thinning. Estimated emissions from the material were calculated by

$$\text{Material Emissions} = VOC_{mat} \times V_{mat}.$$

Total emissions, including material emissions and emissions from recommended thinning solvents, were calculated by

$$\text{Total Emissions} = VOC_{reg} \times (V_{mat} + V_{s,rec}).$$

Estimated emissions from recommended thinning solvents were obtained by subtracting material emissions from total emissions.

The final column in Table 4b contains the estimated total emissions at maximum thinning. This was calculated by

$$\text{Total Emissions at Maximum Thinning} = \text{VOC}_{\text{MT}} \times (V_{\text{mat}} + V_{\text{s,MT}}).$$

This value is only presented as a reference value. It represents an upper bound on emissions if all consumers used each product at its maximum recommended thinning.

The estimated emissions in Table 4b do not include emissions due to cleanup. In reporting the total estimated emissions from solvent-borne coatings based on surveys conducted in 1984 and 1988, the ARB calculated the emission from thinning and cleanup by assuming that one pint of VOC thinner having a density of 770 grams per liter was used per gallon of solvent-borne coating (excluding roof coatings). In 1988, ARB estimated thinning and cleanup emissions to be 5,966 tons per year based on a solvent-borne coating sales of 17.4 million gallons. The same method would produce a similar estimate of thinning and cleanup emissions for the 18.3 million gallons of solvent-borne coating sold in 1990. Comparisons among the different surveys are presented later in the report.

#### **Distribution of Emissions by Carrier Technology and Coating Category**

Figures 3a through 3c show the distribution of estimated emissions among the different carrier technologies and coating categories. These figures have the same format as Figures 2a through 2c except they describe the distribution of emissions rather than sales. Notice in Figure 3a that water-borne coatings, which comprise nearly 76% of the total sales (See Figure 2a.), account for less than one-third of total emissions. Solvent-borne coatings with exempt compounds account for about 4% of the total emissions. A few coatings were classified by manufacturers as 100% solids but contained small amounts of VOCs (less than 5% by volume).

Figure 3b shows that the specialty coatings account for more than half of the estimated total emissions. Furthermore, as shown in the lower pie chart, no one category of specialty coatings contributes more than 15% to the total. A further breakdown is provided in Figure 3c. The specialty coatings which produce the largest amount of emissions are highlighted in the lower bar graph.

# 1990 ARB AIM Coating Survey

## Distribution of AIM Coating Emissions\* by the Carrier Technology

(Total Number of Tons)

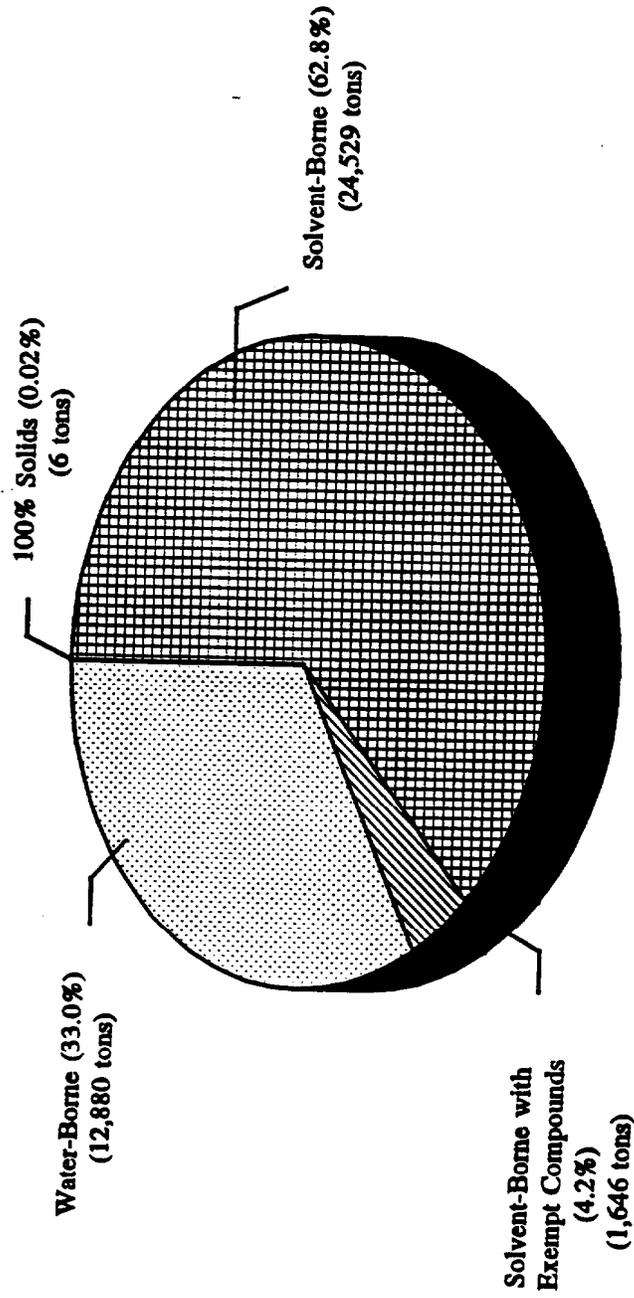


Figure 3a.

\* Total emissions at recommended thinning

# 1990 ARB AIM Coating Survey

## Distribution of AIM Coating Emissions\* by Coating Category

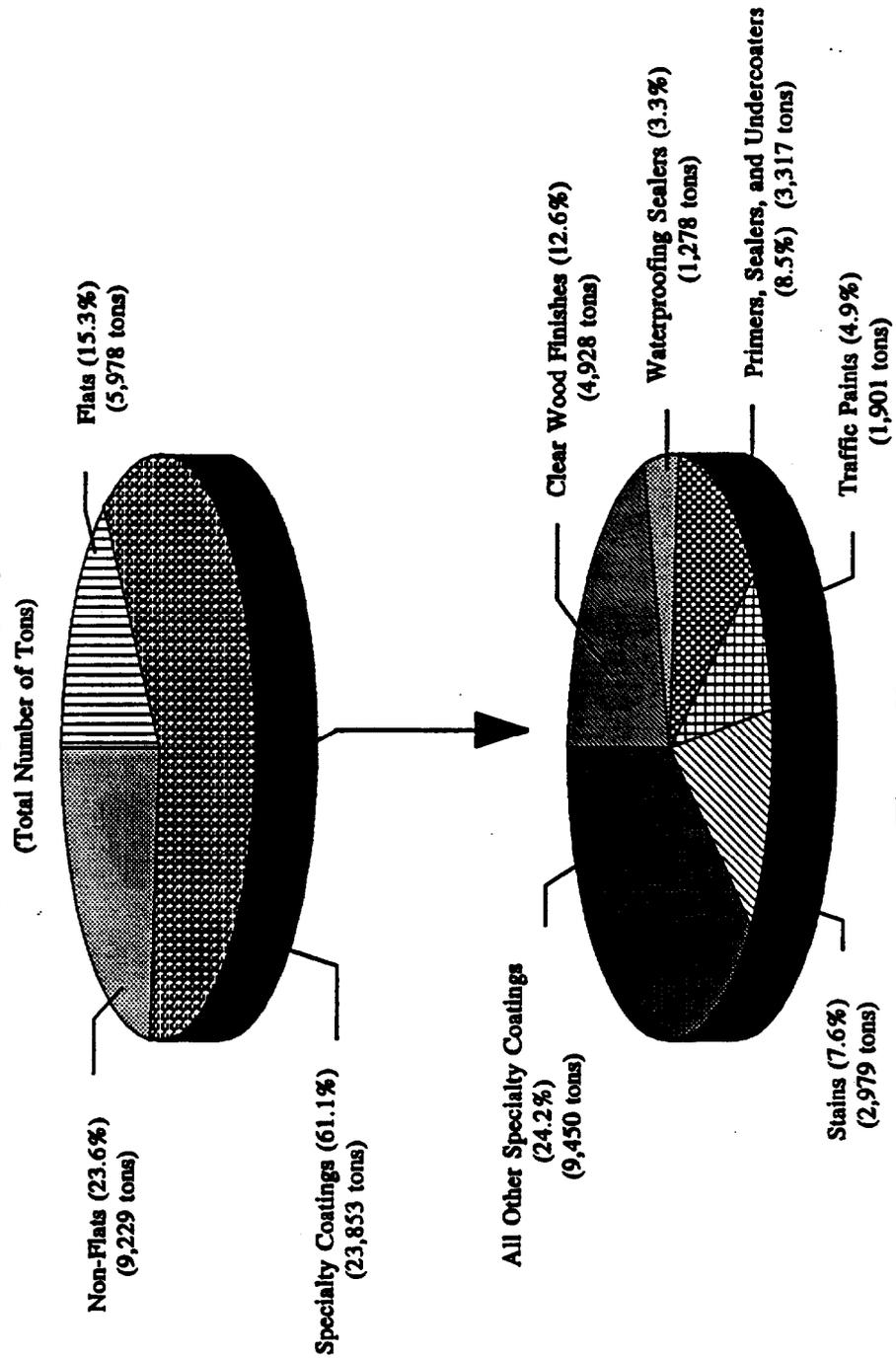
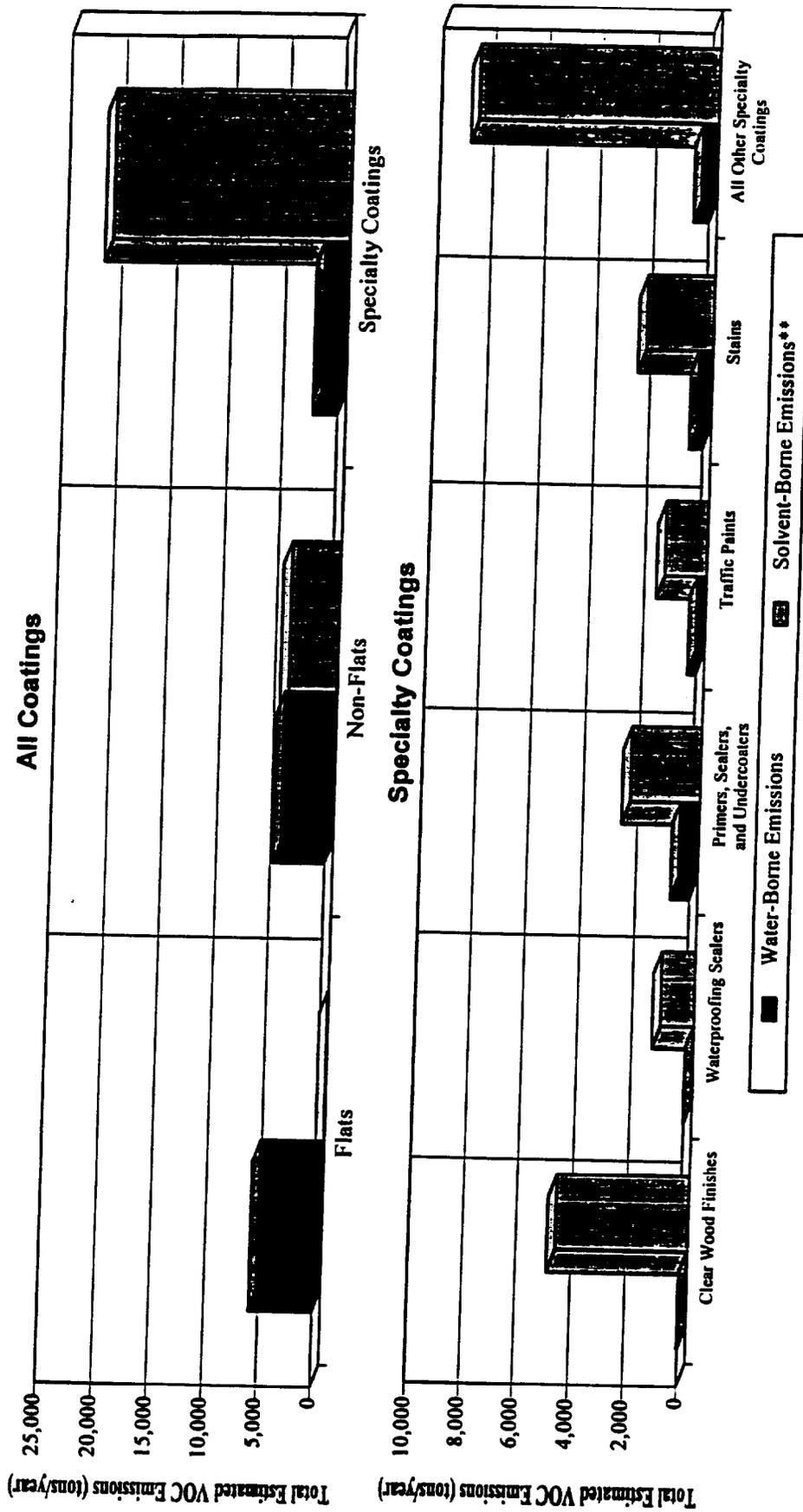


Figure 3b.

\* Total emissions at recommended thinning

# 1990 ARB AIM Coating Survey

## Total Estimated VOC Emissions\* (tons/year) of AIM Coatings by Coating Category and Carrier Technology



\* Total emissions at recommended thinning  
 \*\* Includes 100% solids and solvent-borne with exempts

Figure 3c.

**POTENTIAL EMISSION REDUCTIONS DUE TO 1989**  
**ARB-CAPCOA SUGGESTED CONTROL MEASURE**  
**1992 LIMITS**

Tables 5a and 5b show the potential emission reductions by coating category for water-borne and solvent-borne coatings that might be achieved by the 1989 ARB-CAPCOA Suggested Control Measure 1992 standards relative to the 1990 emissions estimates. Potential emission reductions were calculated under two different assumptions: (1) The total volume of solids will remain constant (Method A -- the EPA method), and (2) The total volume of material sold plus the volume of solvents used at recommended thinning will remain constant (Method B). These calculations are discussed in a separate section below.

The two methods produced fairly similar estimates of total emission reduction for the water-borne coatings -- 79 and 71 tons per year. However, the estimated emission reduction in individual categories were not always the same. For example, Method A estimated emissions reduction of 28 tons per year for the low gloss non-flat coatings. Method B estimated the emissions reduction to be 8 tons per year from this category. Both methods agree that most of the potential emission reductions would occur in the low gloss non-flat and semi-transparent stain categories, as well as the group of specialty coatings sold by fewer than four companies.

Not surprisingly, the Suggested Control Measure would have the largest impact on solvent-borne coatings. As shown in Table 5b, Method A estimates the potential total emission reductions from solvent-borne coatings to be 7,887 tons per year. The largest source of reductions would be from industrial maintenance coatings. Method B estimates the potential reduction to be 4,841 tons per year with sanding sealers contributing the largest share.

The rule limits listed in Tables 5a and 5b under the "Other Specialty Coatings" represent sales weighted averages of the limits for the pooled categories.

**1990 ARB AIM Coating Survey**  
**Table 5a. Potential Emission Reduction Due to 1989 Suggested Control Measure 1992 Limits,**  
**Based on Survey of 1990 Sales.**

**Water-Borne Coatings**

Coating Category	Total 1990 Coating Sales (1,000 Gal)	SW Avg. (1) Regulatory VOC(g/L)	SW Avg. (2) 1992 VOC Rule Limit (g/L)	Estimated 1990 VOC Emissions (tons/yr)	Potential Emission Reduction(3)	
					Method A Tons/year (%)	Method B Tons/year (%)
Anti-Graffiti Coating	30	123	340	8	0 (0.0)	0 (0.0)
Clear Wood Finishes - Lacquers	48	302	680	25	0 (0.0)	0 (0.0)
Clear Wood Finishes - Sanding Sealers	9	294	350	3	0 (0.0)	0 (0.0)
Concrete Curing Compounds	169	45	350	15	0 (0.0)	0 (0.5)
Dry Fog Coatings	24	118	350	18	3 (17.1)	0 (0.0)
Fire Retardant Coating - Pigmented	7	76	400	5	0 (0.0)	1 (4.6)
Flats	32,116	26	350	0	0 (0.0)	0 (0.0)
Form-Release Compounds	4	105	250	5,869	1 (0.0)	0 (0.0)
Graphic Arts (sign) Coatings	5	592	250	1	1 (84.5)	1 (98.3)
Industrial Maintenance Coatings	241	206	340	97	0 (0.0)	0 (0.0)
Metallic Texture Coatings	603	88	300	112	3 (3.5)	2 (1.7)
Moniflats - High Gloss	11	18	500	0	0 (0.0)	0 (0.0)
Moniflats - Medium Gloss	687	211	250	281	2 (0.8)	0 (0.0)
Moniflats - Low Gloss	12,645	162	250	3,699	0 (0.0)	1 (0.4)
Moniflats - Quick Dry Enamels	2,967	153	250	785	28 (3.5)	0 (0.0)
Opaque Stains	1	107	250	0	0 (1.9)	8 (1.1)
Pre-treatment Wash Primers	1,528	133	350	345	0 (0.0)	0 (0.6)
Primers Sealers and Undercoaters	4	702	780	0	0 (0.0)	0 (0.0)
Quick Dry Primers, Sealers & Undercoaters	3,917	117	350	729	4 (77.2)	4 (77.2)
Roof Coatings	92	97	350	16	0 (0.0)	0 (0.0)
Semi-transparent Stains	1,365	67	300	206	0 (0.1)	1 (5.3)
Seal-transparent & Clear Wood Preservatives	574	258	350	174	10 (5.5)	0 (0.1)
Traffic Paints	32	280	350	6	0 (0.0)	33 (19.2)
Waterproofing Sealers - Clear	1,037	121	250	338	0 (0.0)	0 (0.0)
Waterproofing Sealers - Pigmented	268	158	400	22	0 (0.1)	1 (3.2)
Other Specialty Coatings (4)	19	58	350	2	0 (0.0)	0 (0.0)
Other (6)	31	560	418 (5)	41	0 (0.0)	0 (0.0)
	317	88	250	56	24(60.3)	16(40.0)
All coating types pooled	58,796	124	264	12,880	79 (0.6)	71 (0.5)

(1) Sales weighted average grams of volatile organic compounds (VOC) per liter of material plus thinning solvent less water less exempt compounds.  
 (2) ARB-CAPCOA suggested control measure (May 12, 1989).  
 (3) Method A: Constant total volume of solids. Method B: Constant total volume of material.  
 (4) Other specialty coatings include bond breakers, multi-color coatings, and opaque wood preservatives.  
 (5) Sales weighted average of rule limit values over three coating categories.  
 (6) Products not classified according to any of the ARB specified categories.

# 1990 ARB AIM Coating Survey

Table 5b. Potential Emission Reduction Due to 1989 Suggested Control Measure 1992 Limits, Based on Survey of 1990 Sales.

## Solvent-Borne Coatings

Coating Category	Total 1990 Coating Sales (1,000 Gal)	SU Avg. (1) Regulatory VOC (g/L)	SU Avg. 1992 VOC(2) Rule Limit (g/L)	Estimated 1990 VOC Emissions (tons/yr)	Potential Emission at Recommended Method A Tons/year (%)	Potential Emission on Thinning Method B Tons/year (%)
Anti-Graffiti Coating	9	173	340	6	0 (7.0)	0 (0.3)
Below-Ground Wood Preservatives	37	377	350	58	27 (45.7)	12 (21.2)
Clear Wood Finishes - Lacquers	865	668	680	2,370	116 (4.9)	6 (0.2)
Clear Wood Finishes - Sanding Sealers	378	667	350	1,048	840 (80.1)	832 (79.4)
Clear Wood Finishes - Varnishes	816	434	350	1,467	601 (41.0)	372 (25.4)
Concrete Curing Compounds	29	794	350	94	85 (89.8)	85 (89.8)
Dry Fog Coatings	81	392	400	125	24 (20.4)	26 (20.6)
Fire Retardant Coating - Pigmented	16	373	350	25	4 (17.6)	4 (17.6)
Flats	61	362	250	89	52 (58.5)	41 (46.5)
Form-Release Compounds	6	597	250	15	12 (81.4)	9 (59.5)
Graphic Arts (sign) Coatings	528	412	500	908	7 (0.7)	3 (0.3)
High Temperature Coatings	13	539	550	30	6 (18.6)	0 (0.4)
Industrial Maintenance Coatings	2,837	374	340	4,618	1,218 (27.6)	254 (5.7)
Mastic Texture Coatings	355	274	300	227	66 (28.8)	0 (0.0)
Metallic Pigmented Coatings	1,330	470	500	694	10 (1.4)	0 (0.0)
Moniflats - High Gloss	1,471	348	250	1,762	434 (25.0)	522 (29.6)
Moniflats - Medium Gloss	94	298	250	1,738	86 (5.8)	338 (19.4)
Moniflats - Low Gloss	384	364	250	1,156	86 (5.8)	58 (37.1)
Moniflats - Quick Dry Enamels	483	402	250	808	419 (51.9)	419 (51.9)
Opaque Stains	258	395	350	422	108 (25.6)	74 (17.6)
Pre-treatment Wash Primers	18	740	780	55	18 (33.0)	10 (18.6)
Primers Sealers and Undercoaters	1,871	371	350	2,588	510 (19.7)	301 (11.6)
Quick Dry Primers, Sealers & Undercoaters	285	418	350	479	191 (39.8)	81 (16.9)
Roof Coatings	617	263	300	674	42 (6.2)	1 (0.1)
Semi-transparent Stains	1,163	432	350	2,037	795 (39.0)	506 (24.9)
Semi-transparent & Clear Wood Preservatives	231	367	350	353	127 (36.0)	66 (18.8)
Shellacs - Pigmented	74	344	350	179	27 (15.4)	0 (0.1)
Swimming Pool Coatings	3	572	340	8	5 (69.6)	5 (69.6)
Traffic Paints	3,200	132	250	1,563	733 (46.9)	386 (24.7)
Waterproofing Sealers - Clear	681	418	400	1,162	337 (29.0)	249 (21.4)
Waterproofing Sealers - Pigmented	55	390	350	92	34 (37.0)	4 (4.5)
Other Specialty Coatings (7)	88	588	570(5)	206	59 (28.8)	58 (28.0)
Other (8)	156	496	250	324	225 (69.5)	117 (36.2)
All coating types pooled	18,260	355	336	26,181	7,887 (30.1)	4,841 (18.5)

(1) Sales weighted average grams of volatile organic compounds (VOC) per liter of material plus thinning solvent less water less exempt compounds.  
 (2) ARB-CAPCOA suggested control measure (May 12, 1989).  
 (3) Method A: Constant total volume of solids. Method B: Constant total volume of material plus recommended thinning solvents.  
 (4) Other specialty coatings include bond breakers, clear fire retardant coatings, magnesia cement coatings, multi-color coatings, opaque wood preservatives, clear shellacs, and swimming pool repair coatings.  
 (5) Sales weighted average of rule limit values over seven coating categories.  
 (6) Products not classified according to any of the ARB specified categories.

### Calculation of Potential Emission Reduction

It can be shown that the VOC emissions from a product that exactly meets a regulated limit  $VOC_{reg} = L$  is given by

$$\text{Regulated Emissions} = L/(1-L/883) \times \beta \times V_{mat},$$

where  $\beta$  is the volume percent solids of the material.

Because the regulated VOC limit ( $VOC_{reg}$ ) depends only on the amount of VOCs per volume of solids sold (volume of solids =  $\beta \times V_{mat}$ ), no further assumptions were needed using Method A to calculate potential emission reductions. However, to calculate emission reductions under the assumption of constant volume of material plus thinning solvents, Method B, some assumptions were required. If thinning is not currently recommended, then it was assumed that thinning would not be recommended under a new formulation and the volume percent of solids for the new product would be equal to the average percent solids for all products that currently meet the new limit. Data provided by the manufacturers indicated that the solids content of products that currently meet the new limits were generally 20% higher than products that failed to meet the standard. If thinning is recommended by the manufacturer, the following formula was used:

$$\text{Regulated emissions} = L \times (V_{mat} + V_{s,rec}).$$

Potential emission reduction was then calculated by summing the positive differences between estimated emissions and regulated emissions for all products within each coating category.

### COATING SALES AND EMISSIONS BY TYPE OF RESINS USED

Figure 4a shows the volume of AIM coatings that contain various resins. For example, acrylics were the only resin reported for approximately 36 million gallons of coatings sold in 1990. Acrylics were used in combination with other resins in another 4 million gallons of coatings. Alkyds and vinyls were the only other resins used in categories

with at least 10 million gallons of coating sales. Figure 4b reveals that acrylics and vinyls are used primarily in water-borne coatings, while alkyds are the primary resins used in solvent-borne coatings.

Emissions from products that use various resins are shown in Figures 5a and 5b. Emissions from water-borne coatings that use acrylics and vinyls are generally proportional to sales. However, the relative emissions from solvent-borne products that use cellulosic resins are somewhat higher than those from other products. Cellulosic resins are primarily used in clear wood lacquers and sanding finishes.

# 1990 ARB AIM Coating Survey

## Total 1990 Sales (1,000 gallons/year)

### of AIM Coatings

#### by Resin Code

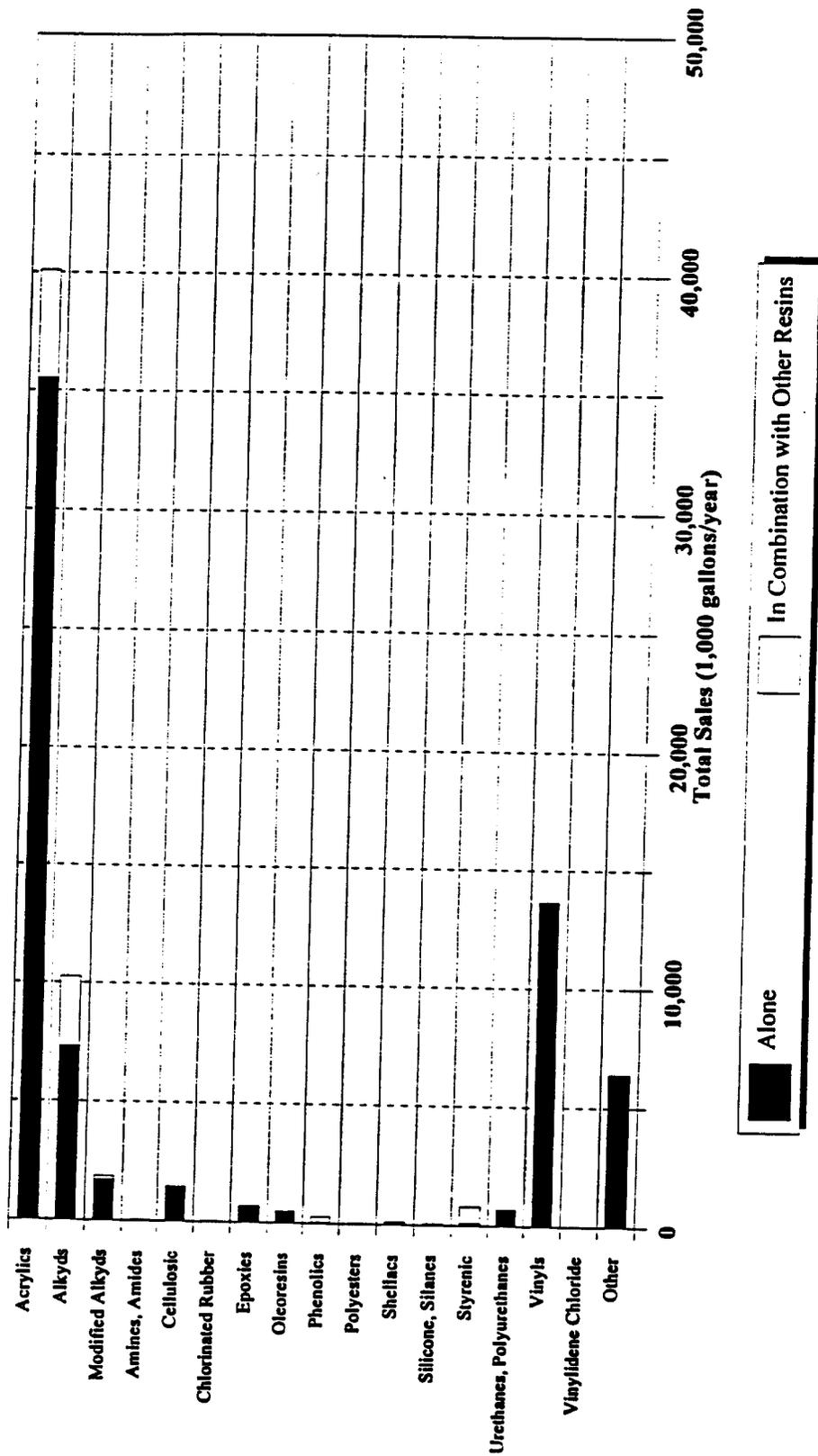


Figure 4a.

# 1990 ARB AIM Coating Survey

## Total 1990 Sales (1,000 gallons/year) of AIM Coatings by Carrier Technology (Solvent-Borne or Water-Borne) and Resin Code

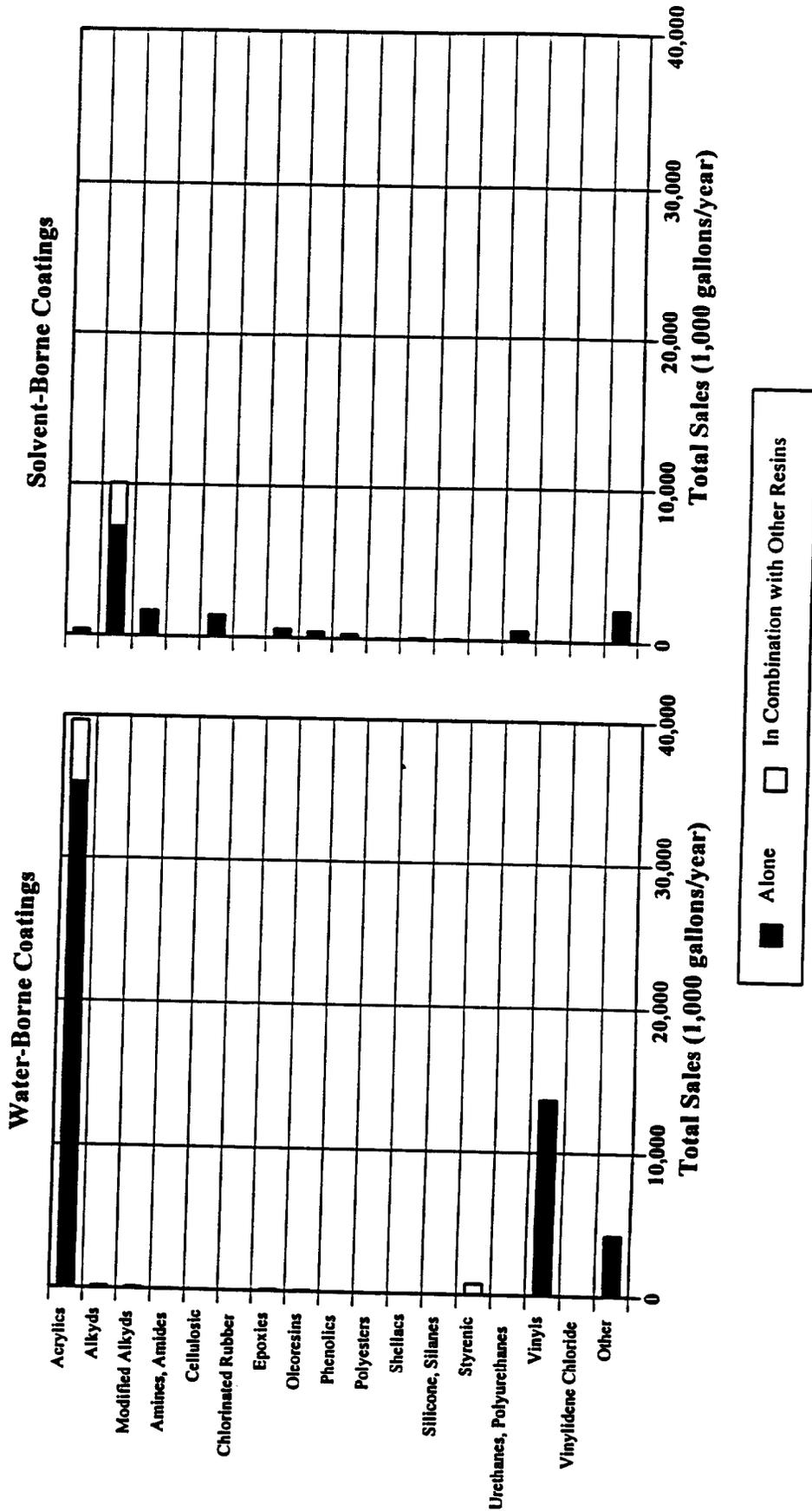
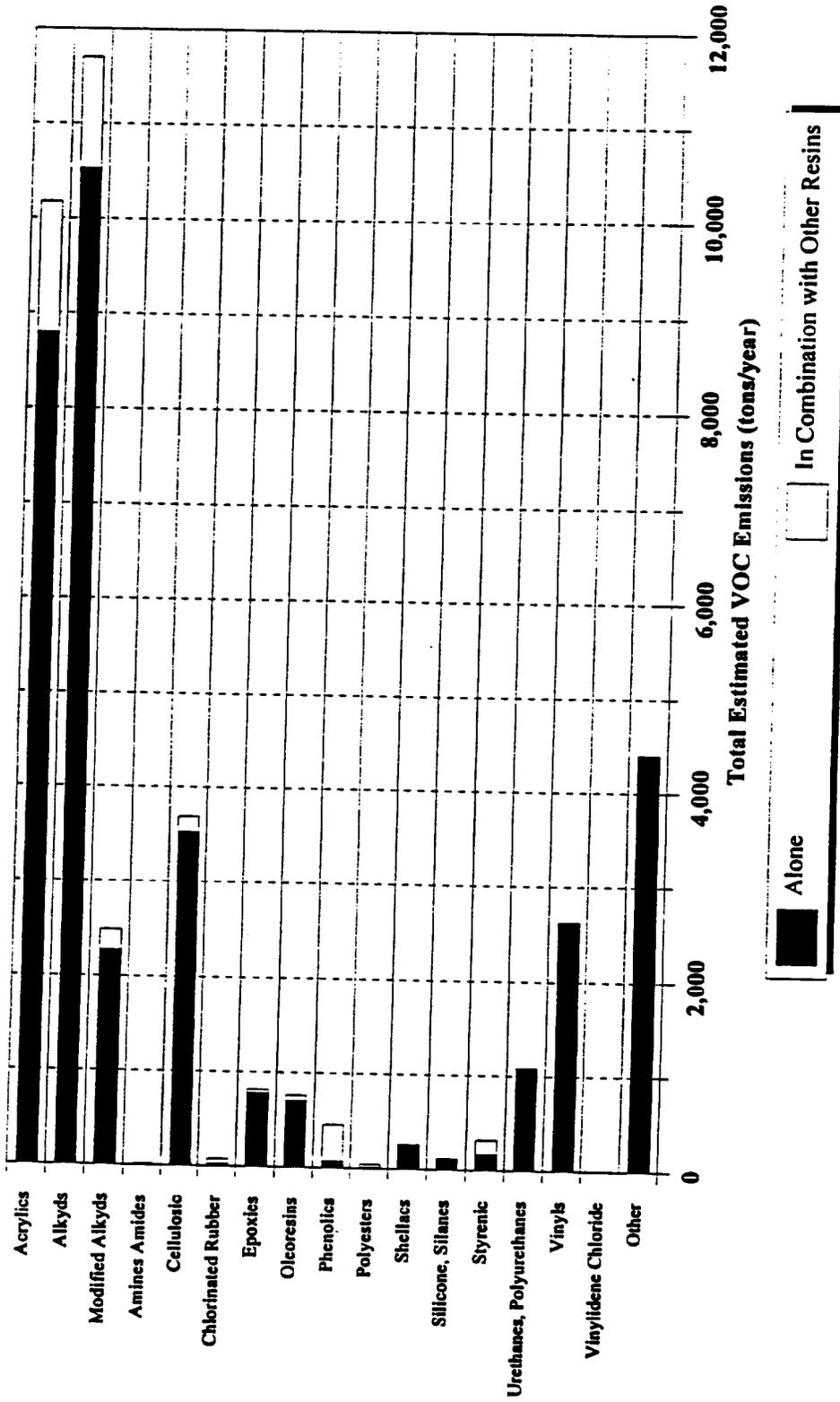


Figure 4b.

# 1990 ARB AIM Coating Survey Total 1990 Estimated VOC Emissions\* (tons/year) of AIM Coatings by Resin Code

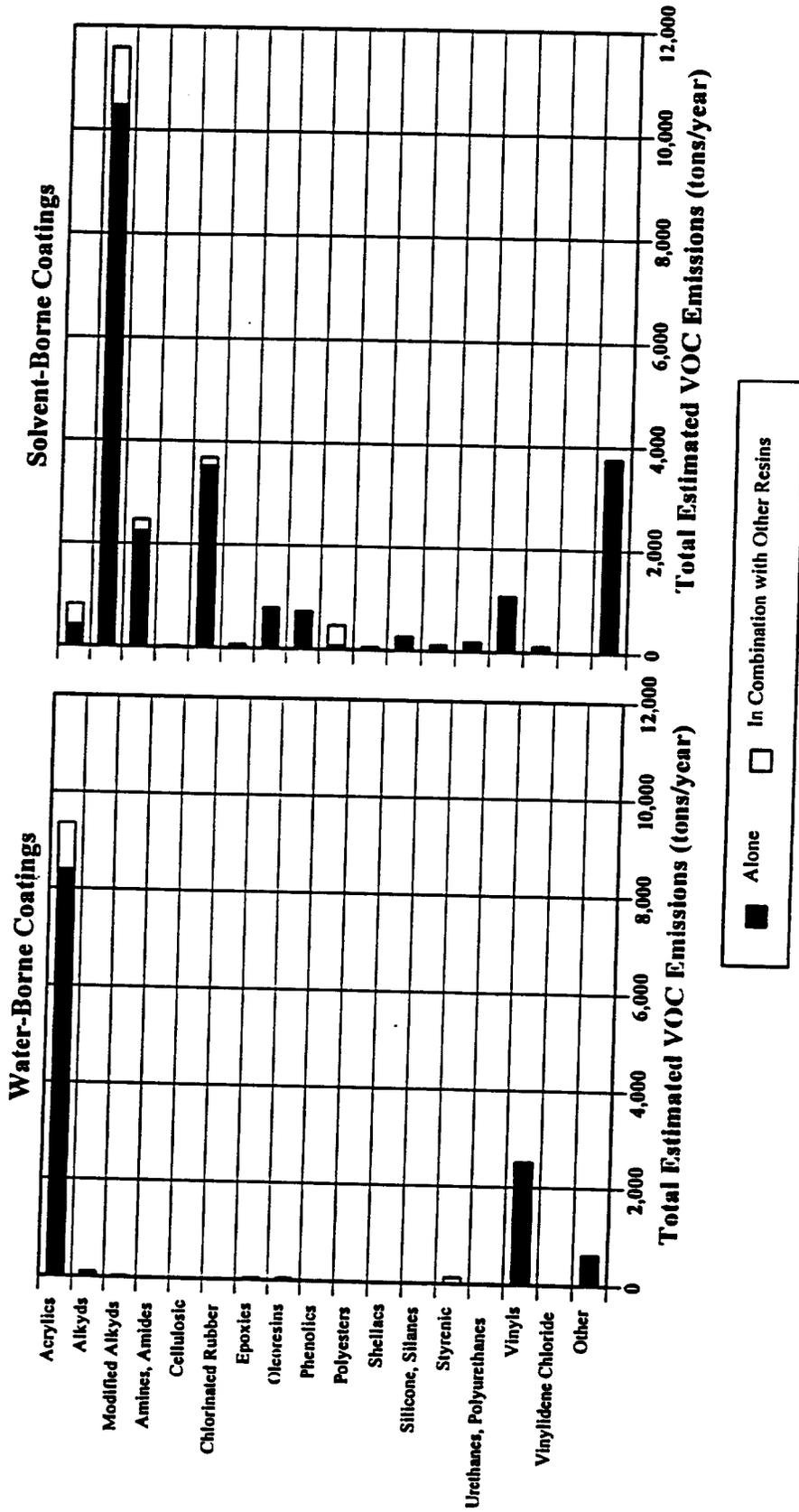


\* Total emissions at recommended thinning

Figure 5a.

# 1990 ARB AIM Coating Survey

Total 1990 Estimated VOC Emissions\* (tons/year) of AIM Coatings  
by Carrier Technology (Solvent-Borne or Water-Borne) and Resin Code



\* Total emissions at recommended thinning

Figure 5b.

## COMPARISON OF RESULTS WITH PRIOR AIM COATING SURVEYS

Four architectural coatings surveys have been conducted by the ARB since 1980. They were based on sales in 1980, 1984, 1988, and 1990. For the 1984 survey 143 manufacturers responded, and in 1988 the survey had 120 respondent companies. For the current survey, based on 1990 sales, a total of 174 companies responded. About 60 percent of the 130 companies queried for the 1988 survey were not respondents to the 1984 survey. Sixty-four percent of the respondents in 1984 were not among the respondents in 1988. Of the 174 manufacturers that responded to the 1990 survey 53 percent were companies that had not responded to either the 1984 or 1988 surveys. Omission of a company on the list from one survey to the next may be the result of the company no longer doing business in California, a change in the company name, the company going out of business, the company merging with another company, or the company not responding to the survey.

The product categories varied with each survey. The surveys have become more refined through the years and therefore the definition of the coating products has been changed in each survey. In 1980 there were 27 categories. In 1984 the survey divided the products into 29 categories, then in 1988 it was 38 categories, and in 1990, 41 categories were used. These increases have not resulted from simply increasing the number of subdivisions. For some surveys there were consolidations of categories from the previous survey while new categories were added. For instance, in 1990, quick-dry primers, sealers, and undercoaters were combined into one group, as were general primers, sealers, and undercoaters. At the same time the 1988 non-flat coatings category was split out into the high gloss, medium gloss, low gloss, and quick-dry enamel subcategories.

Total California sales of all architectural coatings (including both solvent-borne and water-borne) as reported by the manufacturers are shown in Table 6.

According to survey results, California sales of all architectural coatings reached a peak in 1988 and decreased from then to 1990. Sales and estimated VOC emissions from solvent-borne coatings were highest in 1984, while the year of highest sales and emissions from water-borne coatings was 1988. Note that the sales weighted average material VOC contents for water-borne coatings, solvent-borne coatings, and all coatings combined have consistently decreased between 1984 and 1990. Table 6 was compiled from

## 1990 ARB AIM Coating Survey

**Table 6. Comparison of Results of the Air Resources Board's Architectural Coatings Surveys in 1980, 1984, 1988, and 1990**

Year	Total Sales (1,000 gallons)	Sales Weighted Average of Material VOC Content (g/l)	Estimated VOC Emission from Material (tons/year)	Estimated VOC Emissions at Recommended Thinning (tons/year)
<b>Solvent-borne Coatings</b>				
1980	15,141	--(a)	28,464	33,417 <sup>(b)</sup>
1984	21,028	451	39,549	46,957 <sup>(b)</sup>
1988	17,376	379	27,421	33,387 <sup>(b)</sup>
1990	18,260	339	25,737	26,181 <sup>(b)</sup>
<b>Water-borne Coatings</b>				
1980	26,471	--(a)	6,017	6,017 <sup>(c)</sup>
1984	37,453	60	9,310	9,310 <sup>(c)</sup>
1988	60,500	58	14,641	14,641 <sup>(c)</sup>
1990	58,796	53	12,880	12,880 <sup>(c)</sup>
<b>Totals for All Coatings</b>				
1980	41,612	--	34,481	39,434
1984	58,481	200	48,859	56,267
1988	77,815	130	42,062	48,028
1990	77,057	121	38,617	39,061

(a) Not calculated in 1980.

(b) In 1980, 1984 and 1988 maximum thinning of solvent-borne coatings (except roof coatings) was assumed to be attained by adding one pint of thinner to each gallon of coating. The calculation is:

$$\text{Sales } \frac{(\text{gal.})}{\text{year}} \times 1/8 (\text{solvent gal./sales gal.}) \times 6.4 \text{ lb/gal.} \times \frac{1}{2000 \text{ lb/ton}}$$

No thinner is used for roof coatings. For 1990 the recommended thinning volume was calculated from reported VOC levels.

(c) No thinner is used with water-borne architectural coatings.

the data given in Table 2 of "Results of 1984 Architectural Coating Sales Survey" (California Air Resources Board, July 1986) and Tables 2 and 3 of "Results of the 1988 Architectural Survey" (California Air Resources Board, May 1991).

Comparisons of the sales and estimated emissions from the different coating categories show that there was not a uniform decrease in emissions over all the categories between 1988 and 1990. Nor is there any consistent pattern of increases in sales of water-borne coatings accompanying decreases in sales of solvent-borne coatings. The overall decrease in sales and emissions noted for all water-borne coatings, all solvent-borne coatings, and all architectural coatings combined is a result of large decreases in sales and emissions in some categories, such as lacquers, flats, and roof coatings, outweighing smaller increases in sales and emissions in other categories, such as graphic arts, traffic paints, and concrete curing compounds.



**APPENDIX A**

**1989 ARB-CAPCOA SUGGESTED CONTROL MEASURE  
FOR ARCHITECTURAL COATINGS**



## AIR RESOURCES BOARD

1000 G STREET  
BOX 2815  
SACRAMENTO, CA 95812



July 7, 1989

Air Pollution Control Officers:

ARB-CAPCOA Suggested Control Measure for Architectural Coatings

On May 12, 1989, the Air Resources Board (Board) approved, with amendments, a suggested control measure (SCM) for architectural coatings. The SCM was developed by the Air Resources Board-CAPCOA Technical Review Group (TRG). On May 24, the TRG approved the amended SCM, making it the "ARB-CAPCOA Suggested Control Measure for Architectural Coatings." The TRG is now recommending the SCM to districts for adoption into their regulations.

The SCM is being sent to you for your use in adopting regulations needed for attainment or maintenance of state and federal ambient air quality standards. Adoption of a regulation based on this SCM or amendment of an existing architectural coatings regulation to be consistent with the SCM is appropriate if emission reductions from the use of architectural coatings are needed in your district.

During the development of this SCM, a major concern shared by the TRG and the coatings industry was the uniformity of architectural coatings regulations in California. Non-uniformity among the districts' architectural coatings regulations has created difficulties for both the air pollution control community and the paint industry. In its resolution approving the SCM, the Air Resources Board emphasized the need for substantial uniformity among the districts' architectural coatings rules. To this end, I believe it is important in adopting this SCM as your architectural coatings rule, that you make only those changes absolutely necessary to fit the SCM into the structure of your district's regulations. It is especially important that the definitions, the standards, and the effective dates be uniform.

Attached is a copy of the "ARB-CAPCOA Suggested Control Measure for Architectural Coatings" (Attachment A). The staff report supporting the SCM, including a draft version of the suggested control measure, and public notice of the Air Resources Board's meeting to consider the SCM were mailed to you on April 24, 1989. The technical support document was mailed to you on May 1.

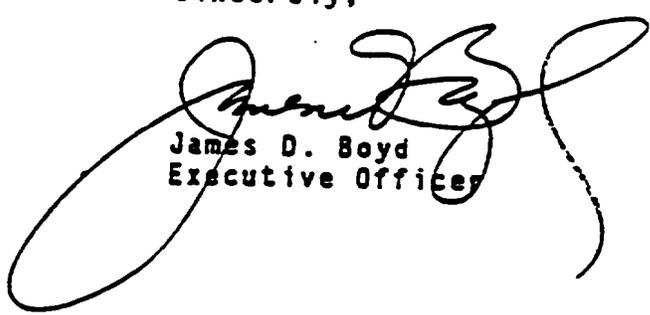
As approved, the suggested control measure is different from the draft version mailed on April 24. The differences reflect changes made by the TRG prior to the Board's meeting on May 12, and changes made by the Board at that meeting. Because of those changes, some of the information in the supporting documentation is now obsolete. Attached is new material to replace such obsolete information (Attachment B), including a table of recalculated emission reductions (Table 6). Also attached is the letter from the TRG endorsing the SCM as approved by the Board and recommending adoption by local districts (Attachment C).

The SCM contains several technology-forcing provisions. That is, it has standards which cannot be met at the present time, but which, based on anticipated technological developments, have future effective dates. We believe, with the TRG, that coating technology will advance sufficiently to meet these standards by the time they go into effect. There remains however, the slight but real possibility that technology will not develop within this time frame and you will want to relax or delay these limits. If the technology forcing provisions have been submitted to EPA and approved as part of the SIP, EPA may not allow a relaxation at the time you wish to make it.

An option available to you to prevent submittal of technology forcing provisions to EPA is to designate these provisions in your rule as applying only to state standards. As such, we will not submit them to EPA and you will retain the flexibility to adjust, if necessary, to a slower than anticipated pace of technology, while at the same time giving notice to the industry that these standards are indeed coming.

I have directed my staff to assist you as needed to ensure the timely adoption of this SCM. If you have any questions on the technical basis for the SCM or other matters related to it, please feel free to call Dean Simeroth, Chief, Criteria Pollutants Branch, at (916) 322-6020.

Sincerely,



James D. Boyd  
Executive Officer

Attachments (3)

cc: Dean Simeroth

May 1989

**ARB-CAPCOA Suggested Control Measure for Architectural Coatings**

**RULE \_\_\_\_\_ ARCHITECTURAL COATINGS**

**(a) APPLICABILITY**

This rule is applicable to any person who supplies, sells, offers for sale, applies, or solicits the application of any architectural coating, or who manufactures any architectural coating for use within the District.

**(b) DEFINITIONS**

(1) **Appurtenances:** Accessories to an architectural structure, including, but not limited to: hand railings, cabinets, bathroom and kitchen fixtures, fences, rain-gutters and down-spouts, window screens, lamp-posts, heating and air conditioning equipment, other mechanical equipment, large fixed stationary tools and concrete forms.

(2) **Architectural Coatings:** Coatings applied to stationary structures and their appurtenances, to mobile homes, to pavements, or to curbs.

(3) **Below-Ground Wood Preservatives:** Coatings formulated to protect below-ground wood from decay or insect attack and which contain a wood preservative chemical registered by the California Department of Food and Agriculture.

(4) **Bituminous Coatings:** Black or brownish coating materials which are soluble in carbon disulfide, which consist mainly of hydrocarbons, and which are obtained from natural deposits or as residues from the distillation of crude oils or of low grades of coal.

(5) **Bond Breakers:** Coatings applied between layers of concrete to prevent the freshly poured top layer of concrete from bonding to the layer over which it is poured.

(6) **Clear Wood Finishes:** Clear and semi-transparent coatings, including lacquers and varnishes, applied to wood substrates to provide a transparent or translucent solid film.

(7) **Concrete Curing Compounds:** Coatings applied to freshly poured concrete to retard the the evaporation of water.

(8) **Dry Fog Coatings (Mill White Coatings):** Coatings formulated only for spray application such that overspray droplets dry before subsequent contact with other surfaces.

(9) Exempt Solvents: Compounds identified as exempt under the definition of Volatile Organic Compounds, Subsection (b)(38).

(10) Fire-Retardant Coatings: Coatings which have a flame spread index of less than 25 when tested in accordance with ASTM Designation E-84-87, "Standard Test Method for Surface Burning Characteristics of Building Material," after application to Douglas fir according to the manufacturer's recommendations.

(11) Form-Release Compounds: Coatings applied to a concrete form to prevent the freshly poured concrete from bonding to the form. The form may consist of wood, metal, or some material other than concrete.

(12) Graphic Arts Coatings (Sign Paints): Coatings formulated for and hand-applied by artists using brush or roller techniques to indoor and outdoor signs (excluding structural components) and murals, including lettering enamels, poster colors, copy blockers, and bulletin enamels.

(13) High-Temperature Industrial Maintenance Coatings: Industrial Maintenance Coatings formulated for and applied to substrates exposed continuously or intermittently to temperatures above 400 degrees Fahrenheit.

(14) Industrial Maintenance Anti-Graffiti Coatings: Two-component clear industrial maintenance coatings formulated for and applied to exterior walls and murals to resist repeated scrubbing and exposure to harsh solvents.

(15) Industrial Maintenance Coatings: High performance coatings formulated for and applied to substrates in industrial, commercial, or institutional situations that are exposed to one or more of the following extreme environmental conditions:

- (i) immersion in water, wastewater, or chemical solutions (aqueous and non-aqueous solutions), or chronic exposure of interior surfaces to moisture condensation;
- (ii) acute or chronic exposure to corrosive, caustic or acidic agents, or to chemicals, chemical fumes, chemical mixtures, or solutions;
- (iii) repeated exposure to temperatures in excess of 250 F;
- (iv) repeated heavy abrasion, including mechanical wear and repeated scrubbing with industrial solvents, cleansers, or scouring agents; or
- (v) exterior exposure of metal structures.

Industrial Maintenance Coatings are not for residential use or for use in areas of industrial, commercial, or institutional facilities such as office space and meeting rooms.

(16) Lacquers: Clear wood finishes formulated with nitrocellulose or synthetic resins to dry by evaporation without chemical reaction, including clear lacquer sanding sealers.

- (17) **Magnesite Cement Coatings:** Coatings formulated for and applied to magnesite cement decking to protect the magnesite cement substrate from erosion by water.
- (18) **Mastic Texture Coatings:** Coatings formulated to cover holes and minor cracks and to conceal surface irregularities, and applied in a thickness of at least 10 mils (dry, single coat).
- (19) **Metallic Pigmented Coatings:** Coatings containing at least 0.4 pounds of metallic pigment per gallon of coating as applied.
- (20) **Multi-Colored Coatings:** Coatings which exhibit more than one color when applied and which are packaged in a single container and applied in a single coat.
- (21) **Opaque Stains:** All stains that are not classified as semi-transparent stains.
- (22) **Opaque Wood Preservatives:** All wood preservatives not classified as clear or semi-transparent wood preservatives or as below-ground wood preservatives.
- (23) **Pre-treatment Wash Primers:** Coatings which contain a minimum of 1/2% acid by weight, applied directly to bare metal surfaces to provide necessary surface etching.
- (24) **Primers:** Coatings formulated and applied to substrates to provide a firm bond between the substrate and subsequent coats.
- (25) **Residential Use:** Use in areas where people reside or lodge including, but not limited to single and multiple family dwellings, condominiums, mobile homes, apartment complexes, motels, and hotels.
- (25) **Roof Coatings:** Coatings formulated for application to exterior roofs and for the primary purpose of preventing penetration of the substrate by water, or reflecting heat and reflecting ultraviolet radiation. Metallic pigmented roof coatings which qualify as metallic pigmented coatings shall not be considered to be in this category, but shall be considered to be in the metallic pigmented coatings category.
- (27) **Sanding Sealers:** Clear wood coatings formulated for and applied to bare wood for sanding and to seal the wood for subsequent application of varnish. To be considered a sanding sealer a coating must be clearly labelled as such.
- (28) **Sealers:** Coatings formulated for and applied to a substrate to prevent subsequent coatings from being adsorbed by the substrate, or to prevent harm to subsequent coatings by materials in the substrate.
- (29) **Semi-Transparent Stains:** Coatings formulated to change the color of a surface but not conceal the surface.

- (30) Semi-Transparent Wood Preservatives: Wood preservative stains formulated and used to protect exposed wood from decay or insect attack by the addition of a wood preservative chemical registered by the California Department of Food and Agriculture, which change the color of a surface but do not conceal the surface, including clear wood preservatives.
- (31) Shellacs: Clear or pigmented coatings formulated solely with the resinous secretions of the lac beetle (*laccifer lacca*), thinned with alcohol, and formulated to dry by evaporation without a chemical reaction.
- (32) Solicit: To require for use or to specify, by written or oral contract.
- (33) Swimming Pool Coatings: Coatings formulated and used to coat the interior of swimming pools and to resist swimming pool chemicals.
- (34) Swimming Pool Repair Coatings: Chlorinated rubber based coatings used for the repair and maintenance of swimming pools over existing chlorinated rubber based coatings.
- (35) Traffic Coatings: Coatings formulated for and applied to public streets, highways, and other surfaces including, but not limited to curbs, berms, driveways, and parking lots.
- (36) Undercoaters: Coatings formulated and applied to substrates to provide a smooth surface for subsequent coats.
- (37) Varnishes: Clear wood finishes formulated with various resins to dry by chemical reaction on exposure to air.
- (38) Volatile Organic Compounds (VOC): Compounds of carbon which may be emitted to the atmosphere during the application of and/or subsequent drying or curing of coatings subject to this rule, except methane, carbon monoxide, carbon dioxide, carbonic acid, metallic carbides or carbonates, ammonium carbonate, 1,1,1-trichloroethane, methylene chloride, trichlorofluoromethane (CFC-11), dichlorodifluoromethane (CFC-12), chlorodifluoromethane (CFC-22), trifluoromethane (CFC-23), trichlorotrifluoroethane (CFC-113), dichlorotetrafluoroethane (CFC-114), and chloropentafluoroethane (CFC-115).
- (39) Waterproofing Sealers: Colorless coatings which are formulated and applied for the sole purpose of protecting porous substrates by preventing the penetration of water and which do not alter surface appearance or texture.

(c) STANDARDS

(1) Except as provided in Subsections (c)(2), (c)(3), and (c)(4), no person shall, within the District, supply, offer for sale, sell, apply, or solicit the application of any architectural coating which, at the time of sale or manufacture, contains more than 250 grams of volatile organic compounds per liter of coating (less water and exempt solvents, and excluding any colorant added to tint bases), or manufacture, blend, or repackage such a coating for use within the District.

(2) Except as provided in Subsections (c)(3) and (c)(4), no person shall, within the District, supply, offer for sale, sell, apply, or solicit the application of any architectural coating listed in the Table of Standards which contains volatile organic compounds (less water and exempt solvents, and excluding any colorant added to tint bases) in excess of the corresponding limit specified in the table, after the corresponding date specified, or manufacture, blend, or repackage such a coating for use within the district.

Table of Standards  
(grams of VOC per liter)

	Effective Dates			
	9/1/84	9/1/89	9/1/92	9/1/94
Below-Ground Wood				
Preservatives	--	600	350	
Bond Breakers	--	750	350 (9/1/90)	
Clear Wood Finishes				
Lacquer	--	680		
Sanding Sealers		550	350	
Varnish	500	350		
Concrete Curing Compounds	--	350		
Dry Fog Coatings		400		
Fire-Retardant Coatings				
Clear	--	650		
Pigmented	--	350		
Form-Release Compounds	--	250		
Graphic Arts (Sign) Coatings	--	500		
Industrial Maintenance Coatings	--	420	340	
Industrial Maintenance				
Anti-Graffiti Coatings	--	600	340	
High Temperature Industrial				
Maintenance Coatings	--	650	550	420
Magnesite Cement Coatings	--	600	450	
Mastic Texture Coatings	--	300		
Metallic Pigmented Coatings	--	500		
Multi-Color Coatings	--	580	420	
Opaque Stains	400	350		
Opaque Wood Preservatives	400	350		
Pre-treatment Wash Primers	--	780	780	420
Primers Sealers & Undercoaters	400	350		
Roof Coatings	--	300		
Semi-transparent Stains	--	350		
Semi-transparent and Clear				
Wood Preservatives	--	350		
Shellac				
Clear	--	730		
Pigmented	--	550		
Swimming Pool Coatings	--	650	340 (9/1/92)	
Repair and Maintenance				
Coatings	--	650	340 (9/1/97)	
Traffic Paints				
Public streets & highways	415	250		
Other surfaces	250	250		
Black traffic coatings	--	250		
Waterproofing Sealers	--	400		

(3) If anywhere on the container of any coating listed on the Table of Standards, on any sticker or label affixed thereto, or in any sales or advertising literature, any representation is made that the coating may be used as, or is suitable for use as a coating for which a lower VOC standard is specified in the table or in Subsection (c)(1), then the lowest VOC standard shall apply. This requirement does not apply to the representation of the following coatings in the manner specified:

- (i) High-Temperature Industrial Maintenance Coatings, which may be represented as metallic pigmented coatings for use consistent with the definition of high temperature industrial maintenance coatings;
- (ii) Lacquer Sanding Sealers, which may be recommended for use as sanding sealers in conjunction with clear lacquer topcoats;
- (iii) Metallic Pigmented Coatings, which may be recommended for use as primers, sealers, undercoaters, roof coatings, or industrial maintenance coatings; and
- (iv) Shellacs.

(4) Sale of a coating manufactured prior to the effective date of the corresponding standard in the Table of Standards, and not complying with that standard, shall not constitute a violation of Subsection (c)(2) until three years after the effective date of the standard, nor shall application of such a coating.

(5) All VOC-containing materials shall be stored in closed containers when not in use. In use includes, but is not limited to: being accessed, filled, emptied, maintained or repaired.

#### (d) ADMINISTRATIVE REQUIREMENTS

(1) Each container of any coating subject to this rule shall display the date on which the contents were manufactured or a code indicating the date of manufacture. Each manufacturer of such coatings shall file with the Air Pollution Control Officer and the Executive Officer of the California Air Resources Board, an explanation of each code.

(2) Each container of any coating subject to this rule shall display a statement of the manufacturer's recommendation regarding thinning of the coating. This recommendation shall not apply to the thinning of architectural coatings with water. The recommendation shall specify that the coating is to be employed without thinning or diluting under normal environmental and application conditions unless any thinning recommended on the label for normal environmental and application conditions does not cause a coating to exceed its applicable standard.

(3) Each container of any coating subject to this rule and manufactured after (one year from the date of adoption) shall display the maximum VOC content of the coating, as applied, and after any thinning as recommended by the manufacturer. VOC content shall be displayed as grams of VOC per liter of coating (less water and exempt solvent, and excluding any colorant added to tint bases). VOC content displayed may be calculated using product formulation data, or may be determined using the test method in Subsection (f)(1).

(4) Beginning (one year from the date of adoption), the labels of all industrial maintenance coatings shall include the statement "Not for Residential Use," or "Not for Residential Use in California," prominently displayed.

(e) EXEMPTIONS

The requirements of this rule do not apply to:

(1) Architectural coatings manufactured for use outside of the District or for shipment to other manufacturers for repackaging.

(2) Architectural coatings supplied in and applied from containers having capacities of one liter or less, which were offered in containers of such capacities prior to (the date of adoption of this rule).

(3) Architectural coatings sold in non-refillable aerosol containers having capacities of one liter or less.

(4) Emulsion-type bituminous pavement sealers.

(f) TEST METHODS

(1) Volatile Organic Compounds: Measurement of volatile organic compounds in architectural coatings shall be conducted and reported in accordance with EPA Test Method 24 (40 CFR 60, Appendix A), or an equivalent method approved by the air pollution control officer.

- Attachment B

Revisions to Technical Support Document

VII.

DISCUSSION OF PROPOSED AMENDMENTS

A. DEFINITIONS / STANDARD PROPOSALS

9. Graphic Arts Coatings (Revised from April 21)

RECOMMENDATION

Revise the graphic arts coating definition as follows:

Graphic Arts Coatings (Sign Paints): Coatings formulated for and hand-applied by artists using brush or roller techniques to indoor and outdoor signs (excluding structural components) and murals, including lettering enamels, poster colors, copy blockers, and bulletin enamels.

Proposed VOC Limit: 500 g/l

Current VOC Limit: Exempt (Current level about 500 g/l)

BASIS FOR RECOMMENDATION

Our first proposal was to establish the graphic arts standard at 400 g/l. However, discussions with respondents to the 1984 survey revealed errors in the reported VOC values, particularly with regards to thinning. In light of this new information, we raised the standard from the proposed 400 g/l to 500 g/l to allow artists the latitude necessary for thinning. To improve the clarity and enforceability of the rule, the definition has been expanded to include other applications of graphic arts coatings, including murals and use as copy blockers and specifically exclude those components of a sign that do not require graphic arts coatings.

ISSUES

This is a very small category with limited application and the 1984 survey may reflect usage of graphic arts coatings for non-architectural application. We intend to further investigate the use of graphic arts coatings on architectural structures and revisit this category in three years to investigate further emission reductions.

It was requested consideration be given to restructuring of the coating rules to better address the use of graphic arts coatings. Currently, graphic arts coatings are subject to several rules depending on the district in which it is being applied, what substrate they are applied to and where they are applied. As an example, in districts having metal parts and products rules, a graphic arts coatings applied to a metal sign in a shop situation would be subject the metal parts and products rule. If the same coating is applied to a wooden sign in a shop it would fall under district wood product rules, or if a plastic sign is painted in a shop situation, a plastic parts and product rule standard would have to be met. On the other hand, if a sign is painted after installation, it is considered an architectural structure and, regardless of the substrate, the graphic arts coating would be subject to an architectural coating rules. As can be seen from this example, suppliers of these coatings, coating users, and air pollution enforcement officials must interpret a myriad of rules when dealing with graphic arts coatings. The Technical Review Group recognizes the above problems but, and has tried to establish a definition which takes into account the needs of the sign-painting industry without allowing wholesale use of high-solvent paints, for jobs which do not legitimately constitute sign painting within the meaning of the rule.

#### 25. Industrial Maintenance Anti-Graffiti Coatings (New)

##### RECOMMENDATION

Include a special category for anti-graffiti coatings:

Industrial Maintenance Anti-Graffiti Coatings: Two-component clear industrial maintenance coatings formulated for and applied to exterior walls and murals to resist repeated scrubbing and exposure to harsh solvents.

##### BASIS FOR RECOMMENDATION

The Air Resources Board directed the inclusion of this category at its meeting on May 12, 1989, at which it considered the suggested control measure for architectural coatings.

**26. Sanding Sealers (New)**

**RECOMMENDATION**

Include a special category for sanding sealers for use under varnishes, as follows:

Sanding Sealers: Clear wood coatings formulated for and applied to bare wood for sanding and to seal the wood for subsequent application of varnish. To be considered a sanding sealer a coating must be clearly labelled as such.

**BASIS FOR RECOMMENDATION**

The Air Resources Board directed the inclusion of this category at its meeting on May 12, 1989, at which it considered the suggested control measure for architectural coatings.

**B. ADMINISTRATIVE PROPOSALS**

**4. On-site Coating of Uninstalled Appurtenances**

(delete)

Table 6  
Estimated Statewide Emission Reductions

Coating Category	VOC Limit, g/l Proposed Rule	1984 Estimated Statewide Emissions Tons/Year	Estimated Emission Reductions Tons/Year	Future Effective VOC Limit, g/l	Additional Emission Reductions Tons/Year
Roof Coatings	300	3,331	318		
Metallic Pigmented Coatings	500	69	2		
Primers, Sealers & Undercoaters	350	2,552	400		
Enamel Undercoaters (Consolidate with P, S & U)	250	890	40		
Quick-Dry Primers, Sealers & Undercoaters (Consolidate with P, S & U)	350	485	165		
Specialty Flat (Consolidate with P, S & U)	350	60	13.8		
Industrial Maintenance (IM)	420	5,695	712	340	813
Clear Wood Finishes - Vernish	350	2,815	550		
- Lacquer	650	5,516	24		
Previously Exempt Categories					
Below Ground Wood Preservatives	350	4	0.2	350	2
Bond Breakers	800	444	0.8	350	185
Dry Fog Coatings	400	116	7.2		
Fire Retardant Coatings	650	14	<0.1		
Graphics Arts	500	82	<0.1		
Mastic Texture Coatings	300	485	16		
Multi-Colored Coatings	580	200	32	420	45
Shellac - Clear	750	164	<0.1		
- Pigmented	550	171	0.9		
Swimming Pool Coatings	650	181	8	340	74
Tile-Like Glaze (Consolidate with IM)	420	41	8	340	4.3
Quick Dry Enamels (Consolidate with Non-Flat)	250	645	280		
Food Preservatives	350	1,441	150		
Stains	350	<u>5,224</u>	<u>495</u>		
		Total: 29,845 (81 tons/day)	3,223 (8.8 tons/day)		1,123 (3.1 tons/day)

Notes

assumes VOC content reduced to, but not below, new standard; does not consider clean-up solvent reductions.

P, S & U = Primers, Sealers and Undercoaters

# CAPCOA

CALIFORNIA AIR POLLUTION CONTROL OFFICERS ASSOCIATION

June 13, 1989

DEPT  
RD JACOBS  
HATE PAST  
DEPT  
S BROWN  
DEPT-ELECT  
MARR  
TARY/CHIEF  
DIAL OFFICER  
LENS  
RESIDENT  
Ryerson  
RESIDENT  
Lowman  
RESIDENT  
Dut  
RESIDENT  
Egan  
RESIDENT  
Sommer  
VE  
W  
Wison  
Iern Drive  
Pore CA 95662  
4323

James D. Boya  
Executive Officer  
Air Resources Board  
P.O. Box 2815  
Sacramento, CA 95814

Dear Mr. Boya:

Subject: Suggested Control Measure for Architectural Coatings

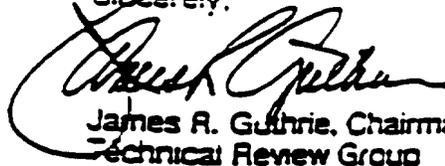
The TRG, as required by the Memorandum of Understanding between the CAPCOA and the ARB, has considered the changes the ARB made to the SCM for Architectural Coatings at the Board's May 12, 1989 public meeting.

The TRG finds the SCM as changed to be acceptable. The TRG also strongly recommends that the SCM be forwarded to appropriate air pollution control districts for their consideration. In reviewing the suggested control measure as revised by the Air Resources Board, individual TRG members expressed concern about two of the revisions. The Board changed the standards proposed for lacquers to remove the future effective standards with a request to review the limits prior to the proposed implementation dates. This will eliminate the reduction of approximately 2 tons per day of volatile organic compound emissions in 1993. The TRG plans to reevaluate this category by 1992 and, if appropriate, will ask the Board to consider establishing new lower standards for lacquers. The other concern expressed by several districts was the change made by the Board to increase the time from two years to three years to clear store shelves of noncomplying products. This change primarily reflects on the enforceability of the rule. The TRG will also review the impact of this change as part of its review to determine the opportunity for additional emission reductions.

The TRG will continue to work with ARB staff to develop information, to refine our emission inventory, and to improve our data base on volatile organic content of coatings. This information will provide the basis for the review of architectural coatings planned for 1992.

If you have any questions, feel free to contact me at (415) 771-6000, ext. 315.

Sincerely,



James R. Guthrie, Chairman  
Technical Review Group

JRG:big

cc: Stew Wilson, Glenn



**APPENDIX B**

**SURVEY QUESTIONNAIRE**



## AIR RESOURCES BOARD

2020 L STREET  
P.O. BOX 2815  
ACRAMENTO, CA 95812



February 3, 1993

Dear Sir or Madam:

The Air Resources Board (ARB) is conducting a survey of architectural and industrial maintenance (AIM) coatings sold in California. As you may know, surveys of architectural and industrial maintenance coatings by the ARB were previously conducted in 1985 and 1989. This survey, in which we are requesting 1990 data, will assist ARB to continually assess the volatile organic compound emissions in California from the use of AIM coatings.

Please complete the attached survey forms according to the instructions provided. If you do not sell any coating that is sold in California, complete only Form I. Please submit the completed survey to the ARB by March 19, 1993 at the following address:

California Air Resources Board  
P.O. Box 2815,  
Sacramento, CA 95812  
Attention: Solvents Control Section

This request for information is made pursuant to Sections 39607, 39701 and 41522 of the California Health and Safety Code, and Title 17, California Code of Regulations, Section 91100. These sections authorize the ARB to require the submission of information needed by the Board to estimate atmospheric emissions and to carry out its other statutory responsibilities. Information which you note as confidential shall be protected in accordance with Title 17, California Code of Regulations, Section 91000 to 91022 and the California Public Records Act (Government Code Section 6250 et seq.). If you are designating any information contained in your survey as confidential, please complete and sign the attached Confidentiality Information Submittal Form.

If you have any questions concerning the survey, please call Peggy Vanicek, Manager of the Solvents Control Section, at (916) 322-8283 or Peter Liu, Air Resources Engineer, Solvents Control Section, at (916) 327-1516.

Sincerely,

A handwritten signature in black ink, appearing to read "Dean C. Simeroth".

Dean C. Simeroth, Chief  
Criteria Pollutants Branch  
Stationary Source Division



# Architectural and Industrial Maintenance Coatings Survey

- Survey Packet -



CALIFORNIA ENVIRONMENTAL PROTECTION AGENCY  
 **Air Resources Board**



## **SURVEY PACKET CONTENTS**

**California Air Resources Board - Architectural and Industrial Maintenance Coatings Survey**

The Survey Packet contains the following:

### **Survey Instructions**

- |   |    |
|---|----|
| 1. General Instructions for Completing the Survey Forms | 2  |
| 2. Instructions for Completing Survey Form II           | 3  |
| 2. Definition of Survey Terms                           | 6  |
| 3. Calculations   | 10 |
| 4. Example of Completed Survey Form II                  | 12 |

### **Appendices - Survey Forms**

- A. Survey Form I
- B. Survey Form II
- C. Confidential Information Submittal Form

You can request a Quattro-Pro 3.0 software Survey Form II by mailing an unformatted 3" diskette with a self addressed diskette mailer to:

California Air Resources Board  
P.O. Box 2815,  
Sacramento, Ca. 95812  
Attention: Solvents Control Section

## **GENERAL INSTRUCTIONS FOR COMPLETING THE SURVEY FORMS**

**California Air Resources Board - Architectural and Industrial Maintenance Coatings Survey**

Please complete the attached survey forms. Please answer the applicable questions on Form I even if you do not sell, or manufacture for sale, any architectural or industrial maintenance coatings to California. Complete Form II for all architectural or industrial maintenance coating products that you have sold, or sold to another party for sale, in California in 1990. Please photocopy Form II if additional copies are necessary.

In reporting products for the survey, coatings in a coating category can be reported either individually or as a group. However, you may group coatings in a category together only if the following conditions are met:

- (1) The coatings have VOC contents (less water and less exempt compounds) that are within one VOC range. VOC ranges are defined on page 2.
- (2) The coatings have the same carrier technology (e.g. solvent-based, water-based, 100% solids, etc.)

In reporting the grouped coatings as one entry, the sales weighted average VOC and solids contents should be reported. Pages 10-11 contain equations that can be used to calculate sales weighted average, VOC content and solids content. Page 12 contains an example of a completed Form II.

Please Return the completed survey to the following address by March 19, 1993:

California Air Resources Board  
Stationary Source Division  
P.O. Box 2815  
Sacramento, CA 95812  
Attn: Solvents Control Section

If you have any questions or other requests please call:

Peter Liu	(916) 327-1516
Julie Billington	(916) 327-0650
Peggy Vanicek	(916) 322-8283

## INSTRUCTIONS-FOR COMPLETING SURVEY FORM II

California Air Resources Board - Architectural and Industrial Maintenance Coatings Survey

Please follow the instructions below to complete items (A) through (N) on Survey Form II for all architectural and industrial maintenance coatings that your company have sold in California, or sold to another party for sale in California, in 1990. See page 12 for an example of a completed Form II.

- (A) **Entry Number** - Enter an integer starting from 1 for each entry into the survey form.
- (B) **Coating Code** - Enter the code from the list below which best represents the reported coatings' coating category (see pages 6-9 for definitions of the categories below).

<u>Code</u>	<u>Coating</u>	<u>Code</u>	<u>Coating</u>
1.0	Anti-Graffiti Coating	18.0	Opaque Stains
2.0	Below-Ground Wood Preservatives	19.0	Opaque Wood Preservatives
3.0	Bond Breakers	20.0	Pre-treatment Wash Primers
	Clear Wood Finishes:	21.0	Primers Sealers and Undercoaters
4.1	Lacquers	22.0	Quick Dry Primers, Sealers and Undercoaters
4.2	Sanding Sealers		
4.3	Varnishes	23.0	Roof Coatings
5.0	Concrete Curing Compounds	24.0	Semi-transparent Stains
6.0	Dry Fog Coatings	25.0	Semi-transparent and Clear Wood Preservatives
	Fire Retardant Coatings:		Shellacs:
7.1	Clear	26.1	Clear
7.2	Pigmented	26.2	Pigmented
8.0	Flats	27.0	Swimming Pool Coatings
9.0	Form-Release Compounds	28.0	Swimming Pool Repair Coatings
10.0	Graphic Arts (sign) Coatings	29.0	Traffic Paints
11.0	High Temperature Coatings		Waterproofing Sealers:
12.0	Industrial Maintenance Coatings	30.1	Clear
13.0	Magnesite Cement Coatings	30.2	Pigmented
14.0	Mastic Texture Coatings	31.0	Other (Note the other coating category in (N) Comments)
15.0	Metallic Pigmented Coatings		
16.0	Multi-color Coatings		
	Nonflats:		
17.1	High Gloss		
17.2	Medium Gloss		
17.3	Low Gloss		
17.4	Quick Dry Enamels		

- (C) **VOC Content Range** - Enter the VOC range code from below for the coating or group of coatings being reported as one entry. The VOC content referred to here is the regulatory VOC content, less water and less exempt compounds. This can be estimated from the chemical composition data or determined by EPA Method 24, 40 CFR Part 60, as amended in Federal Register Vol. 57, No. 133, July 10, 1992, or ASTM D 3960-92.

<u>Range</u>		<u>Range</u>		<u>Range</u>	
<u>Code</u>	<u>g/l</u>	<u>Code</u>	<u>g/l</u>	<u>Code</u>	<u>g/l</u>
1	0 - 50	6	251 - 300	11	501 - 550
2	51 - 100	7	301 - 350	12	551 - 600
3	101 - 150	8	351 - 400	13	601 - 650
4	151 - 200	9	401 - 450	14	651 - 700
5	201 - 250	10	451 - 500	15	701 and above

- (D) **Number of Products Grouped** - Enter the number of individual coatings that are grouped as one entry. Color varieties of a coating that do not vary significantly in VOC contents should not be considered individual coatings. Enter 1 if you are reporting one coating individually.
- (E) **Interior/Exterior** - Indicate whether the coating or coatings are designed for exterior or interior application by entering "E" or "I" accordingly. Enter "D" for dual purpose interior/exterior products.
- (F) **Specialty Substrate or Surface** - Answer "Yes" only if the coating(s) reported are products formulated for and designed to be applied on specific substrates or surfaces that is not already specified by the coating category definition. Note the specialty substrates or surfaces in (N) Comments. Answer "No" if the coating(s) are used for multiple substrates and surfaces.
- (G) **Carrier Technology** - Enter the code from the list below which represent the carrier technology of the coating(s).
- |  |                |
|--|----------------|
| 1. Solvent-based                       | 3. Water-based |
| 2. Solvent-based with Exempt Compounds | 4. 100% Solids |

(H) **Resin Code** - Enter a code or codes from the list below which best represent the primary resin type(s) of the coating(s) reported.

- |                        |                        |                          |
|------------------------|------------------------|--------------------------|
| (1) Acrylics           | (7) Epoxies            | (14) Urethanes,          |
| (2) Alkyds             | (8) Oleoresins         | Polyurethanes            |
| (3) Modified Alkyds    | (9) Phenolics          | (15) Vinyls              |
| (4) Amines, Amides     | (10) Polyesters        | (16) Vinylidene Chloride |
| (5) Cellulosic         | (11) Shellacs          | (17) Other (Note other   |
| (6) Chlorinated Rubber | (12) Silicone, Silanes | resin type in            |
|                        | (13) Styrenic          | (N) Comments.)           |

- (I) **% Volume Solids** - Enter the sales weighted average solids content of the coating(s) as percent of total coating volume. See page 10-11 for equations.
- (J) **VOC of Material** - Enter the sales weighted average VOC content of the coating(s), as supplied, in grams of VOC per liter of Material. Do not report VOC content on a less water basis as would be for compliance determination. See page 10 for equation.
- (K) **VOC Maximum Thinning** - Enter the sales weighted average VOC content at maximum recommended thinning of the coating(s) in grams of VOC per liter of Material. "Maximum Recommended Thinning" is the highest level of thinning by VOC containing solvents that is recommended by information appearing on the coating can, label, or any other accompanying literature from the manufacturer. See page 10 for equation.
- (L) **VOC Less Water Less Exempt** - Enter the sales weighted average regulatory VOC content of the coatings(s), as applied, in grams of VOC per liter of coating, less water and less exempt compounds. This may be determined from the chemical composition data or by EPA Method 24, 40 CFR Part 60, as amended in Federal Register Vol. 57, No. 133, July 10, 1992, or ASTM D 3960-92. See page 10 for equation.
- (M) **Annual Sales** - Enter the California sales of the coating, in gallons per year, from the calendar year 1990. Report the sales of coatings sold in Small Containers, which are those one liter (1.1 quarts) or less, separately from those sold in larger containers. Include all coatings that your company sold in California or sold to another party for sale in California during the calendar period of reporting.
- (N) **Comments** - Enter any information that was designated as comments for (B), (F), (H). Enter also any information that you wish to provide in addition to those entered into (B) through (M). Reference the comment with its corresponding entry number from (A) and its corresponding reporting item code (e.g. (B), (F), or (H)).

## DEFINITION OF SURVEY TERMS

### California Air Resources Board - Architectural and Industrial Maintenance Coatings Survey

**Anti-Graffiti Coatings:** Industrial maintenance coatings formulated for and applied to exterior surfaces to resist repeated scrubbing and exposure to harsh solvents and cleaners used to remove graffiti.

**Architectural Coatings:** Coatings applied to stationary structures and their appurtenances, to mobile homes, to pavements, or to curbs.

**Below-Ground Wood Preservatives:** Coatings formulated to protect below-ground wood from decay or insect attack and which contain a wood preservative chemical registered by the California Department of Pesticide Regulation.

**Bituminous Coating:** Black or brownish coating materials which are soluble in carbon disulfide, which consists mainly of hydrocarbons, and which are obtained from natural deposits or as residues from the distillation of crude oils or of low grades of coal.

**Bond Breakers:** Coatings applied between layers of concrete to prevent the freshly poured top layer of concrete from bonding to the layer over which it is poured.

**Clear Wood Finishes:** Clear and semi-transparent coatings, including lacquers and varnishes, applied to wood substrates to provide a transparent or translucent solid film.

**Concrete Curing Compounds:** Coatings applied to freshly poured concrete to retard the evaporation of water.

**Dry Fog Coatings:** Coatings formulated only for spray application such that overspray droplets dry before subsequent contact with other surfaces.

**Exempt Compounds:** Any compound which has been specified as exempt compounds in the definition for "Volatile Organic Compounds."

**Fire-Retardant Coatings:** Coatings which have a flame spread index of less than 25 when tested in accordance with ASTM Designation E-84-87, "Standard Test Method for Surface Burning Characteristics of Building Material," after application to Douglas Fir according to the manufacturer's recommendations.

**Flat Architectural Coatings:** Coatings which register a gloss of less than 15 on an 85 degree meter or less than 5 on a 60 degree meter.

**Form Release Compounds:** Coatings applied to a concrete form to prevent the freshly poured concrete from bonding to the form. The form may consist of wood, metal, or some material other than concrete.

**Graphic Arts Coatings (Sign Paints):** Coatings formulated for and hand-applied by artists using brush or roller techniques to indoor and outdoor signs (excluding structural components) and murals, including lettering enamels, poster colors, copy blockers and bulletin enamels.

**High Temperature Coatings:** Industrial maintenance coatings formulated for and applied to substrates exposed continuously or intermittently to temperatures above 400° F.

**Industrial Maintenance Coatings:** High performance coatings formulated for and applied to substrates in industrial, commercial, or institutional situations that are exposed to one or more of the following extreme environmental conditions:

- (i) immersion in water, waste water, or chemical solutions (aqueous and non-aqueous solutions), or chronic exposure of interior surfaces to moisture condensation;
- (ii) acute or chronic exposure to corrosive, caustic or acidic agents, or to chemicals, chemical fumes, chemical mixtures, or solutions;
- (iii) repeated exposure to temperatures in excess of 250° F;
- (iv) repeated heavy abrasion, including mechanical wear and repeated scrubbing with industrial solvents, cleansers, or scouring agents; or
- (v) exterior exposure of metal structures.

Industrial Maintenance Coatings are not for residential use or use in areas of industrial, commercial, or institutional facilities which do not experience industrial environmental conditions such office space and meeting rooms.

**Lacquers:** Clear wood finishes formulated with nitrocellulose or synthetic resins to dry by evaporation without chemical reaction, including clear lacquer sanding sealers.

**Magnesite Cement Coatings:** Coatings formulated for and applied to magnesite cement decking to protect the magnesite cement substrate from erosion by water.

**Mastic Texture Coatings:** Coatings formulated to cover holes and minor cracks and to conceal surface irregularities, and applied in a thickness of at least 10 mils (dry, single coat).

**Metallic Pigmented Coatings:** Coatings containing at least 0.4 pounds of metallic pigment per gallon of coating as applied.

**Multi-Colored Coatings:** Coatings which exhibit more than one color when applied and which are packaged in a single container and applied in a single coat.

**Nonflat Architectural Coatings:** Coatings which register a gloss of 15 or greater on an 85 degree meter or 5 or greater on a 60 degree meter.

**Nonflats - high gloss:** Nonflat coatings which register a gloss of 70 or greater on a 60 degree meter.

**Nonflats - medium gloss:** Nonflat coatings which register a gloss of 20 or more but less than 70 on a 60 degree meter.

**Nonflats - low gloss:** Nonflat coatings which register a gloss greater than 5 but less than 20 on a 60 degree meter.

**Nonflats - Quick Dry Enamels:** Non-flat coatings which comply with the following:

- (i) capable of being applied directly from the container by brush or roller under normal conditions, normal conditions being temperatures between 60°F and 80°F.
- (ii) when tested in accordance with ASTM D 1640, they shall: set to touch in two hours or less, dry hard in eight hours or less, and be tack free in four hours or less by the mechanical test method.
- (iii) shall have a 60 degrees F dried film gloss of 70 or above on a 60 degree meter.

**Opaque Stains:** All stains other than semi-transparent stains

**Opaque Wood Preservatives:** All wood preservatives other than clear, semi-transparent or below-ground wood preservatives.

**Pre-treatment Wash Primers:** Coatings which contain a minimum of 0.5% acid by weight, applied directly to bare metal surfaces to provide necessary surface etching.

**Primers:** Coatings formulated and applied to substrates to provide a firm bond between the substrate and subsequent coats.

**Quick Dry Primers, Sealers and Undercoaters:** Primers, sealers and undercoaters which are dry to touch in one-half hour and can be recoated in two hours, when tested in accordance with ASTM D1640.

**Roof Coatings:** Coatings formulated for application to exterior roofs and for the primary purpose of preventing water penetration, or reflecting heat or ultraviolet radiation.

**Sanding Sealers:** Clear wood coatings formulated for and applied to bare wood for sanding and to seal the wood for subsequent application of varnish.

**Sealers:** Coating formulated for and applied to a substrate to prevent subsequent coatings from being absorbed by the substrate, or to prevent harm to subsequent coatings by materials in the substrate.

**Semi-transparent Stains:** Coatings formulated to change the color of a surface but not to conceal the surface.

**Semi-transparent and Clear Wood Preservatives:** Wood preservative stains which protect exposed wood from decay or insect attack by the use of a preservative chemical registered with the California Department of Pesticide Regulation, and which may change the color of a surface but do not conceal the surface.

**Shellacs:** Clear or pigmented coatings formulated solely with the resinous secretions of the lac beetle (*laccifer lacca*), thinned with alcohol, and forms a film by solvent evaporation without chemical reaction.

**Swimming Pool Coatings:** Coatings formulated and used to coat the interior of swimming pools and is compatible with swimming pool water chemistry.

**Swimming Pool Repair Coatings:** Chlorinated rubber based coatings used for the repair and maintenance of swimming pools over existing chlorinated rubber based coatings.

**Traffic Coatings:** Coatings formulated for and applied to public streets, highways and other surfaces traveled by vehicle traffic.

**Undercoaters:** Coatings formulated and applied to substrates to provide a smooth surface for subsequent coats.

**Varnishes:** Clear wood finishes formulated with various resins to dry by chemical reaction on exposure to air.

**Volatile Organic Compound (VOC):** Any compound containing at least one atom of carbon, except methane, carbon monoxide, carbon dioxide, carbonic acid, metallic carbides, or carbonates, ammonium carbonate, and including the following exempt compounds which have been determined to have negligible photochemical reactivity: 1,1,1-trichloroethane, methylene chloride, trichlorofluoromethane (CFC-11), dichlorodifluoromethane (CFC-12), chlorodifluoromethane (HCFC-22), trifluoromethane (HFC-23), 1,1,1-trichloro-2,2,2-trifluoroethane (CFC-113), 1-chloro-1,1-difluoro-2-chloro-2,2-difluoroethane (CFC-114), chloropentafluoroethane (CFC-115), 2,2-dichloro-1,1,1-trifluoroethane (HCFC-123), 1,1,1,2-tetrafluoroethane (HFC-134a), 1,1-dichloro-1-fluoroethane (HCFC-141b), 1-chloro-1,1-difluoroethane (HCFC-142b), 2-chloro-1,1,1,2-tetrafluoroethane (HCFC-124), pentafluoroethane (HFC-125), 1,1,2,2-tetrafluoroethane (HFC-134), 1,1,1-trifluoroethane (HFC-143a), 1,1-difluoroethane (HFC-152a), the following classes of perfluorocarbons: (A) cyclic, branched, or linear, completely fluorinated alkanes; (B) cyclic, branched, or linear, completely fluorinated ethers with no unsaturations; (C) cyclic, branched or linear, completely fluorinated tertiary amines with no unsaturations; and (D) sulfur-containing perfluorocarbons with no unsaturations and with the sulfur bonds only to carbon and fluorine.

**Waterproofing Sealers:** Coatings which are formulated and applied for the sole purpose of protecting porous substrates by preventing the penetration of water, and which do not alter the appearance or texture of the substrate.

## - CALCULATIONS

### California Air Resources Board - Architectural and Industrial Maintenance Coatings Survey

#### VOC Content Calculations

The following are equations that can be used to calculate the VOC content entries to (J) and (L) in the Survey Form.

VOC
Exempt
Water
Solids

$$VOC_{Actual} = \frac{W_s - W_w - W_e}{V_m} \quad (J)$$

$$VOC_{less\ water,\ less\ exempt} = \frac{W_s - W_w - W_e}{V_m - V_w - V_e} \quad (L)$$

Where:

- $W_s$  = Weight of volatile materials (VOC + water + exempt compounds), in grams
- $W_w$  = Weight of water in the coating, in grams
- $W_e$  = Weight of exempt compounds, in grams
- $V_m$  = Volume of the coating, in liters
- $V_w$  = Volume of water in the coating, in liters
- $V_e$  = Volume of exempt compounds in the coating, in liters

#### VOC After Maximum Thinning

The following equation can be used to calculate the entry to (K) for coatings thinned with VOC containing solvents.

$$VOC_{After\ Maximum\ Thinning} = \frac{Volume\ of\ Coating \times VOC_{Coating} + Volume\ of\ Thinner \times VOC_{Thinner}}{Volume\ of\ Coating + Volume\ of\ Thinner} \quad (K)$$

- Where:
- $VOC_{coating}$  = Actual VOC content of coating, in grams per liter of material
  - $VOC_{thinner}$  = Actual VOC content of thinner, in grams per liter of material

#### Percent Volume of Solids

The following are two equations that can be used to calculate the percent volume of solids for reporting to item (I) in the survey form. The choice of equation depends on the type of information that is known about the coating.

- (1) If the weight and density of all of the solid (nonvolatile) materials are known, then the following equation may be used:

$$Percent\ Volume\ of\ Solids = \frac{Weight\ of\ Solids}{Density\ of\ Solids \times Volume\ of\ Coating\ Material} \times 100 \quad (I_1)$$

### Percent Volume of Solids (Continued)

- (2) If instead, only the volatile components of a coating (VOC, water and exempt compound) are known, the percent volume of solids may be estimated by the following equation.

$$\text{Percent Volume of Solids} = \left( 1 - \frac{W_w}{D_w \times V_m} - \frac{W_v}{D_v \times V_m} - \frac{W_e}{D_e \times V_m} \right) \times 100 \quad (I_2)$$

Where:

- $W_w$  = Weight of water in the coating, in grams
- $W_v$  = Weight of VOC in the coating, in grams
- $W_e$  = Weight of exempt compounds in the coating, in grams
- $D_w$  = Density of water, in grams per liters
- $D_v$  = Density of VOC, in grams per liters
- $D_e$  = Density of exempt compounds, in grams per liters
- $V_m$  = Volume of the coating, in liters

### Sales Weighted Average Calculation

The Sales Weighted Average (SWA) is an average value for grouped coatings, calculated by weighing the individual values by their sales. For this survey, the SWA should be used to report entries to (I), (J), (K), and (L) for coatings that are grouped as one entry. Coatings can be grouped only if their VOC contents are within the same VOC range and if they are based on the same carrier technology. The following equation can be used to calculate Sales Weighted Average.

$$SWA = \frac{(Value_1 \times Sales_1 + Value_2 \times Sales_2 + \dots + Value_n \times Sales_n)}{Sales_1 + Sales_2 + \dots + Sales_n}$$

Where:

- $Value_{(1,2,\dots,n)}$  = Coating characteristic values (e.g. VOC contents, Percent Volume of Solids) for products 1,2,...n
- $Sales_{(1,2,\dots,n)}$  = Sales for products 1,2,...n

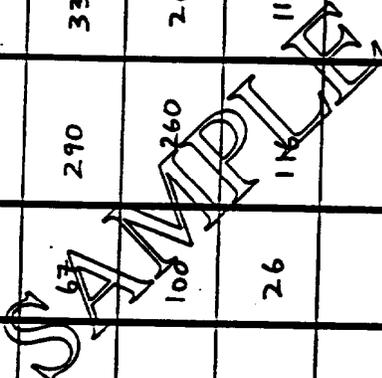
### Conversion Factors

grams/Liter	= 120 x lbs/gallon
gallon	= 3.8 x liter
lbs	= 454.5 x grams

**EXAMPLE OF COMPLETED SURVEY FORM II (see page 13 for the data used for the entries)**

Instructions for completing this form are in Pages 3-5 of the Survey Packet. Confidential? Yes  No

(A) Entry #	(B) Coating Code (1.0-31.0)	(C) VOC Range Code (1-15)	(D) Number of Grouped Coatings	(E) Inter./Ester. (I, E, D)	(F) Specialty Substrate/Surface (Y or N)	(G) Carrier Technology (1-4)	(H) Resin Code(s) (1-17)	(I) % Volume Solids	(J) VOC of Material (g/l)	(K) VOC Maximum Thinning (g/l)	(L) VOC Less Water Less Exempt (g/l)	(M) 1990 California Sales (Gallons)	
												Sold in Containers Larger than 1 liter or 1.1 Quart	Sold in Small Containers 1 liter or less
1	17.2	5	3	I	N	3	1, 15	43	104	104	160	230,000	-
2	12.0	7	1	E	N	1	1, 14	67	290	338	338	51,000	-
3	30.1	6	1	E	Y	4	12	100	260	260	260	40,000	10,000
4	8.0	5	2	I	Y	3	1, 15	26	116	116	239	25,000	-



\* If the Code for "Other" is entered into either (B) or (H), note the "other" as a comment in (N) below.  
 \*\* If you answered "Yes" to (F), enter the specialty substrate or surface as a comment in (N) below

(N) Comments: Reference each comment with its "Entry #" from (A) and reporting item code (e.g. (B), (F) or (H)). Continue on the back if additional space is necessary.

Entry #: (3) (3) (K) (L) VOC by ASTM D5015-10 + BAQMD 31 Entry #: (4) (F) Ceiling Paint

- SAMPLE ONLY -

EXAMPLE OF COMPLETED SURVEY FORM II

California Air Resources Board - Architectural and Industrial Maintenance Coatings Survey

The following is the data that corresponds to the codes entered into the example Survey Form II on the previous page. This data is provided only to help you understand how the survey form should be completed. You do not have to provide such data for the survey.

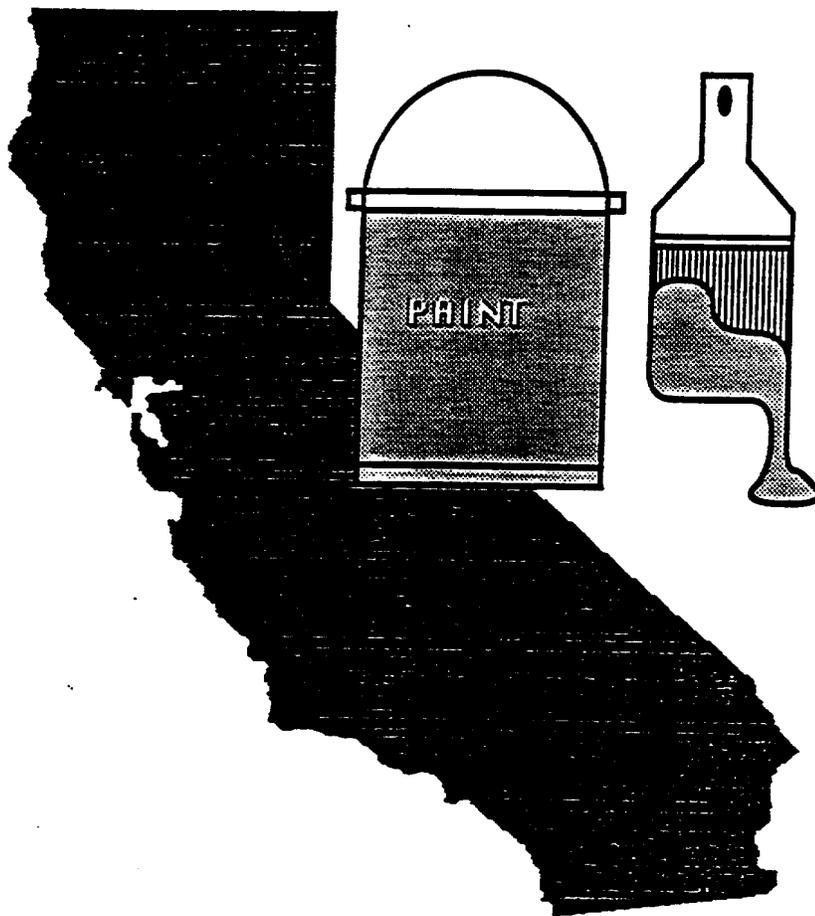
- | <u>Item #</u> | <u>Coating Description</u>   |
|---------------|--|
| 1.            | (B) Interior nonflat - medium gloss; (C) VOC range: 201-250 g/l less water and less exempt compounds ; (D) 3 products grouped; (E) Interior; (F) No specialty substrate or surface, multipurpose paint; (G) Water-based latex emulsion; (H) Vinyl acrylic resins; (I) % volume solids: product I = 40, product II = 38, product III = 48, Sales Weighted Average (SWA) = 43; (J) VOC of Material (g/l): I = 80, II = 100, III = 120, SWA = 104; (K) No thinning; (L) VOC less water and less exempt: I = 120, II = 160, III = 180, SWA = 160 ; (M) Sales in > 1 liter containers (gal): I = 50,000, II = 80,000, III = 100,000, Total = 230,000. |
| 2.            | (B) Industrial maintenance; (C) VOC range: 301-350 g/l; (D) 1 individual product; (E) Exterior; (F) Multipurpose coating; (G) Solvent-based; (H) Two component acrylic aliphatic urethane resins; (I) % Volume solids = 67; (J) VOC of Material = 290 g/l; (K) VOC after maximum thinning = 338 g/l (thinned by 10% or 0.1 gal thinners per gallon of coating, thinner VOC = 820 g/l); (L) Same as in (K); (M) Sales in > 1 liter containers (gal) = 58,000.   |
| 3.            | (B) Clear waterproofing sealer; (C) VOC range: 251-300; (D) 1 individual product; (E) Exterior; (F) Designed for specific substrates; (G) 100 % solids; (H) Silanes; (I) % Volume Solid = 100; (J) VOC emission of material = 260 g/l; (K) Same as in (J); (L) Same as in (J); (M) Sales in > 1 liter containers (gal) = 40,000, Sales in < 1 liter containers = 10,000 gal.; (N) For use on concrete and masonry only; VOC determined by ASTM D 5095-90 and Bay Area Air Quality Management District Method 31.   |
| 4.            | (B) Interior flat; (C) VOC range (g/l): 201-250; (D) 2 products grouped; (E) Interior; (F) For use on ceilings; (G) Water-based latex emulsion; (H) Vinyl acrylic resins; (I) % Volume solids: product I = 25, product II = 28, SWA = 26; (J) VOC of material: I = 110, II = 125, SWA = 116; (K) No recommended thinning; (L) VOC less water less exempt(g/l): I = 230, II = 250, SWA = 239; (M) Sales in > 1 L containers: I = 20,000, II = 15,000, total = 35,000; (N) For use on ceilings only.   |



# Architectural and Industrial Maintenance Coatings Survey

- Appendices (Survey Forms) -

Complete the Following Survey Forms and Return to ARB



CALIFORNIA ENVIRONMENTAL PROTECTION AGENCY

 **Air Resources Board**

Return by March 19, 1993 to:

California Air Resources Board  
P.O. Box 2815  
Sacramento, CA 95812  
Attn: Solvents Control Section





















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# REPORT DOCUMENTATION PAGE

1. AGENCY USE ONLY (Leave Blank) PB95147583		2. REPORT DATE September 1994	3. REPORT TYPE AND DATES COVERED Final Report	
4. TITLE AND SUBTITLE  Survey of Emissions from Solvent Use Volume 1: Aerosol Paints Volume 2: Architectural Coatings			5. FUNDING NUMBERS  A132-086	
6. AUTHOR(S)  John E. Orban, Philip R. Sticksel, Tamara J. Collins, Nicholas R. Sasso, and Darlene E. Wells				
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)  Battelle 505 King Avenue Columbus, OH 43201			8. PERFORMING ORGANIZATION REPORT NUMBER	
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)  California Air Resources Board Research Division 2020 L Street Sacramento, CA 95814			10. SPONSORING/MONITORING AGENCY REPORT NUMBER  ARB/R-94/ 555	
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12a. DISTRIBUTION/AVAILABILITY STATEMENT  Release unlimited. Available from National Technical Information Service. 5285 Port Royal Road Springfield, VA 22161			12b. DISTRIBUTION CODE	
13. ABSTRACT (Maximum 200 Words)  The ARB conducted surveys of sales in California for both aerosol paints and architectural coatings. Information requested for architectural coatings included coating category, type of use, and product composition, including weight percent of VOCs. Information requested for aerosol paints included coating category, sales by size of container, type of application, and product composition (such as carrier technology and VOC content). Battelle processed the survey data and prepared a computer database, reviewed the data for accuracy and completeness, contacted representatives of participating companies to resolve problems, and summarized the results. The results will help the ARB understand the marketplace for these source categories, and evaluate the emissions and cost impacts of proposed emission control measures.				
14. SUBJECT TERMS  aerosol paints, architectural coatings, solvent emissions, paint sales survey.			15. NUMBER OF PAGES	
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