IX.

Description of Aerosol Coatings Categories and Proposed Reactivity Limits

Included in this chapter is a description of the aerosol coatings categories, with particular emphasis on the six 'general coating' categories and the ground traffic and marking coating category. For each of these seven categories, a brief description of the types of products included is provided. However, product category descriptions for the remaining 28 specialty coatings categories are not included in this report. Interested readers should consult the document titled "Initial Statement of Reasons for a Proposed Statewide Regulation to Reduce the Volatile Organic Compound Emissions from Aerosol Coatings and Amendments to the Alternative Control Plan for Consumer Products" (ARB, 1995) for an in depth discussion of individual product categories.

For all categories, we provide relevant data on numbers of products, sales, volatile organic compound (VOC) emissions, sales-weighted product category maximum incremental reactivity ($SWA\text{-}MIR_{prod}$) value, and total ozone formation. Because in these amendments we are proposing to achieve an ozone reduction equivalent to that associated with the previously adopted mass-based VOC limits (ARB, 1998a), we provide the VOC tons per day (tpd) reduction commitment and the corresponding ozone reduction. We also describe the proposed reactivity limits, the number of complying products, and complying marketshares. The general coatings categories and ground traffic marking coating category account for 86 percent of the total ozone formation from aerosol coatings. Together, the remaining 28 specialty coatings account for 14 percent of the total ozone formation.

In this Chapter , there is no detailed discussion on reformulation options. However, general reformulation options were described in Chapter VIII. ARB staff recognizes that an aerosol coatings product is a "package" and simply suggesting a lower reactive solvent for a currently used higher reactive solvent is inappropriate. As described in Chapter VIII, properly formulated aerosol coatings must provide for adequate solvency of the particular resin system and pigments. In addition, a combination of slower and faster evaporating solvents is required to allow for proper film formation once the product is applied. The propellant system must also be able to maintain pressure to expel the entire can contents.

However, even though specific reformulation options are not suggested here, as explained in Chapter VIII, given the wide variety and reactivities of the solvents and propellants available, staff concludes that the proposed limits are feasible. In fact, staff concluded that the proposed reactivity limits provide more reformulation options, at potentially less cost, by not necessarily requiring a reduction in total VOC content, but rather a reduction of the reactivity of the VOCs used (i.e. a reduction in the ozone formed from the VOCs). A further indication of the feasibility of the proposed reactivity limits is included in the following sections where we provide data on complying marketshares and the number of products that would currently comply with the proposed limits.

A. Description of the Seven Major Categories

Before providing a brief description of the six 'general coating' categories and the ground traffic and marking coating category, we begin by defining some of the terms used within this chapter. These definitions are reproduced from Chapter III for convenience. It is also important to remember the distinction we are making between VOC and reactive organic compound (ROC). "VOC," as defined in the mass-based regulation does not include the exempted compounds such as acetone. In our reactivity-based amendments, we are proposing to use the term "ROC" to clarify that all VOCs, including exempt compounds such as acetone, are considered for evaluating products' reactivities.

Reactivity related terms used in the following tables:

- $SWA\text{-}MIR_{prod}$ is the sales-weighted average maximum incremental reactivity of the products reported in an aerosol coatings category.
- $SWA\text{-}MIR_{VOC}$ is the sales-weighted average maximum incremental reactivity of the products ($SWA\text{-}MIR_{prod}$) divided by the sales-weighted average VOC content of the product category, as explained in Chapter IV. The $SWA\text{-}MIR_{VOC}$ is used to calculate the equivalent ozone reduction. The tpd VOC reduction commitment is based on reductions of VOCs (not including acetone).
- Total Ozone Formation is the potential amount of ozone (reported here in tpd) formed from emissions of the VOCs in the aerosol coatings category.
- Unadjusted Equivalent Ozone Reduction is the equivalent ozone reduction associated with the VOC reduction commitment. The unadjusted ozone reduction is calculated by multiplying the tpd VOC reduction by the $SWA\text{-}MIR_{VOC.}$
- Adjusted $SWA\text{-}MIR_{VOC}$ is the $SWA\text{-}MIR_{VOC}$ adjusted for the mechanistic uncertainty of ingredient MIR values.
- Adjusted Equivalent Ozone Reduction is the ozone reduction calculated by multiplying the tpd VOC reduction commitment by the adjusted $SWA\text{-}MIR_{VOC}$. This is the amount of ozone reduction that needs to be achieved by the proposed reactivity limit.

The data included in this section regarding sales and emissions reflect those reported in the 1997 ARB Aerosol Coatings Survey (ARB, 1998b).

1. Clear Coatings:

Product Category Description

Aerosol clear coatings are general use coatings that are colorless and contain resins, but no pigments or fillers other than flatting agents. Flatting agents (also called flatting pigments), may be included in the formulation to decrease the gloss of a clear coating without adding color to the film (for example to produce a flat, or "satin" clear finish).

Clear coating products are formulated as both solvent-based and water-based formulations. A variety of resin types are used, including alkyds, polyurethanes, acrylic and nitrocellulose lacquers. Although coating properties vary with individual formulations, certain resin types generally yield particular coating characteristics. For instance, polyurethane resins generally yield coatings that are hard and resistant to scratches and abrasion, while acrylic lacquers are known for their resistance to "yellowing."

The aerosol clear coatings category is the sixth largest aerosol coating category in terms of sales and VOC emissions according to the 1997 ARB Aerosol Coatings Survey. The category accounts for approximately five percent of the emissions from aerosol paints. Table IX-1 shows that the clear coatings category has a $SWA\text{-}MIR_{prod}$ of 1.66 grams ozone per gram of product. The 0.96 tpd of VOCs emitted from sales of 1.59 tpd of clear coatings (see Table IX-1) have the potential to produce 2.64 tpd of ozone (ARB, 1998b).

TABLE IX-1
CLEAR COATINGS*

Number of Products	Category Sales (tons/day)	VOC Emissions (tons/day)	$SWA\text{-}MIR_{prod}$ ($g\ O_3/g$ product)	$SWA\text{-}MIR_{VOC}$ ($g\ O_3/gVOC$)	Total Ozone Formation (tons/day)
120	1.59	0.96	1.66	2.75	2.64

* Based on ARB 1997 Aerosol Coatings Survey.

Proposed Reactivity Limit

As shown in Table IX-2, the mass-based VOC reduction commitment is 0.17 tpd. After adjusting for MIR value uncertainty (adjusted $SWA\text{-}MIR_{VOC}$), the calculated ozone reduction (i.e. the adjusted equivalent ozone reduction) is 0.52 tpd. To achieve this adjusted ozone reduction commitment, for clear coatings, the proposed reactivity limit is 1.54 grams ozone per gram product.

TABLE IX-2
CLEAR COATINGS PROPOSAL*

VOC Reduction (tons/day)	Adjusted SWA-MIR$_{VOC}$ (gO_3/g VOC)	Adjusted Equivalent Ozone Reduction (tons/day)	Reactivity Limit** (g O_3/g product)	Number of Complying Products	Complying Market Share (%)
0.17	3.00	0.52	1.54	45	45

* Based on ARB 1997 Aerosol Coatings Survey
** Proposed Effective Date is June 1, 2002.

Table IX-2 also show that there are currently 45 products that comply with the proposed reactivity limit. These 45 clear coating products represent a 45 percent complying marketshare (ARB, 1998b). The 45 products that currently would comply with the proposed limit include both solvent-based and water-based products (ARB, 1998b). In fact, the survey data show that all water-based (formulated with water and dimethyl ether (DME)) clear coatings are currently able to comply with this proposed limit. Given the significant complying marketshare and the variety of solvents available for reformulation, staff concludes that the proposed limit is feasible.

2. Flat Paint Products:

Product Category Description:

Flat aerosol coating products are aerosol coatings with a low gloss level, as described below, or products that are labeled as flat coatings, whether or not they meet the gloss level criterion for a flat coating. Flat aerosol coating products are primarily general use aerosol coatings that do not fall under one of the other coating categories. However, special-use flat paints would also fall under the flat paint category.

A coating must register a specular gloss level that is less than or equal to 15 on an 85^o meter, or less than or equal to 5 on a 60^o meter, to qualify as a "flat." The gloss level is measured by a special gloss meter which measures the amount of light reflected off the coating specimen. The gloss meter consists of a light source that directs a beam at the coating and measures the reflected light in the mirror direction. The degree of the angle used to describe the meter (e.g. 85^o meter) refers to the angle of the light beam which is reflected off the coating surface. The gloss value is a relative value compared to a known standard such as black glass.

Flat aerosol coating formulations vary with the intended use of the product, cost, and the individual color. One of the key components of the formulation, in terms of its effect on the properties of the dried paint film, is the resin. There are several types of resins that are used in flat aerosol paints. These include alkyds, acrylic and nitrocellulose lacquers, epoxies, polyurethanes, and various combinations of these resins. Alkyd resins are used most often and are usually "modified" with chemical groups which enhance particular properties such as drying time or hardness.

The flat aerosol coating category is the fourth largest aerosol paint category in terms of sales, and the fifth largest category in terms of VOC emissions. The category accounts for approximately eight percent of the emissions from aerosol paints. Table IX-3 shows that flat paint products category has a $SWA\text{-}MIR_{prod}$ of 1.52 grams ozone per gram of product. The 1.54 tpd of VOCs emitted from sales of 3.04 tpd of flat paint products (see Table IX-3) have the potential to produce 4.62 tpd of ozone (ARB, 1998b).

TABLE IX-3
FLAT PAINT PRODUCTS*

Number of Products	Category Sales (tons/day)	VOC Emissions (tons/day)	$SWA\text{-}MIR_{prod}$ (g O_3/g product)	$SWA\text{-}MIR_{VOC}$ (gO_3/gVOC)	Total Ozone Formation (tons/day)
117	3.04	1.54	1.52	3.00	4.62

* Based on ARB 1997 Aerosol Coatings Survey.

<u>Proposed Reactivity Limit</u>

As shown in Table IX-4, the mass-based VOC reduction commitment is 0.33 tpd. After adjusting for MIR value uncertainty (adjusted $SWA\text{-}MIR_{VOC}$), the calculated ozone reduction (i.e. adjusted equivalent ozone reduction) is 1.06 tpd. To achieve this adjusted ozone reduction commitment, for flat paint products, the proposed reactivity limit is 1.21 grams ozone per gram product.

TABLE IX-4
FLAT PAINT PRODUCTS PROPOSAL*

VOC Reduction (tons/day)	Adjusted $SWA\text{-}MIR_{VOC}$ (gO_3/g VOC)	Adjusted Equivalent Ozone Reduction (tons/day)	Reactivity Limit** (g O_3/g product)	Number of Complying Products	Complying Market Share (%)
0.33	3.21	1.06	1.21	26	11

* Based on ARB 1997 Aerosol Coatings Survey.
** Proposed Effective Date is June 1, 2002.

Table IX-4 also show that there are currently 26 products that comply with the proposed reactivity limit. These 26 flat paint products represent a complying marketshare of 11 percent (ARB, 1998b). The 26 products that currently would comply with the proposed limit include both solvent-based and water-based products (ARB, 1998b). In fact, the survey data show that all water-based (formulated with water and DME) flat paint products are currently able to comply with this proposed limit. Given the reasonable complying marketshare and the variety of solvents available for reformulation, staff concludes that the proposed limit is feasible.

3. Fluorescent Coatings:

Product Category Description:

Fluorescent coatings are highly visible coatings which convert absorbed incident light energy into emitted light of a different hue. Ambient light contains electromagnetic radiation, including the short wavelength, high energy, nonvisible light known as ultraviolet (UV) radiation, the longer wavelength visible light, and the even longer wavelength, lower energy, nonvisible infrared radiation. The visible region contains the spectrum of colors ranging through violet, indigo, blue, green, yellow, orange and red. The dyes in fluorescent coatings absorb light in the UV and visible regions and emit it in a narrow range of longer wavelengths in the visible region. This light, when added to the normally reflected light, gives articles their color and makes them appear to glow in the daylight.

Fluorescent coatings are used for decorative purposes, as marking paints for construction and surveying, for safety uses, and in "upside-down" ground marking or striping paints. However, it should be noted that upside-down marking paints, whether fluorescent or not, fall under the ground traffic marking paint coating category rather than the fluorescent coating category.

The dyes used in fluorescent coatings provide the fluorescent quality of the coating, while the resin (acrylic or alkyd) acts as a binder and helps contribute to the color stability of the product. Fluorescent pigments used in aerosol paints are made by incorporating fluorescent dyes into an insoluble matrix, which is then ground to the desired particle size (Radiant Color).

Fluorescent paints are not used as protective coatings. The intense color of the coating is relatively short lived, as the pigments show poor durability in paint and fade quickly. Fluorescent coatings are low gloss and the resins in solvent-borne coatings are usually acrylic lacquers. Resins used in water-borne coatings include water reducible alkyds.

The aerosol fluorescent coatings category is the eleventh largest aerosol paint category in terms of sales and VOC emissions according to the 1997 ARB Aerosol Coatings Survey (ARB, 1998b). The category accounts for approximately one percent of the emissions from aerosol paints. Table IX-5 shows that the fluorescent coatings category has a SWA-MIR_{prod} of 1.63 grams ozone per gram of product. The 0.24 tpd of VOCs emitted from sales of 0.36 tpd of fluorescent coatings (see Table IX-5) have the potential to produce 0.59 tpd of ozone (ARB, 1998b).

TABLE IX-5
FLUORESCENT COATINGS*

Number of Products	Category Sales (tons/day)	VOC Emissions (tons/day)	SWA-MIR_{prod} ($g\ O_3$/g product)	SWA-MIR_{VOC} (gO_3/gVOC)	Total Ozone Formation (tons/day)
51	0.36	0.24	1.63	2.45	0.59

* Based on ARB 1997 Aerosol Coatings Survey.

Proposed Reactivity Limit

As shown in Table IX-6, the mass-based VOC reduction commitment is 0.03 tpd. After adjusting for MIR value uncertainty (adjusted SWA-MIR_{VOC}), the adjusted ozone reduction is 0.07 tpd. To achieve this adjusted ozone reduction commitment, for fluorescent coatings, the proposed reactivity limit is 1.77 grams ozone per gram product.

TABLE IX-6
FLUORESCENT COATINGS PROPOSAL*

VOC Reduction (tons/day)	Adjusted SWA-MIR_{VOC} (gO_3/g VOC)	Adjusted Equivalent Ozone Reduction (tons/day)	Reactivity Limit** (g O_3/g product)	Number of Complying Products	Complying Market Share (%)
0.03	2.63	0.07	1.77	44	64

* Based on ARB 1997 Aerosol Coatings Survey.
** Proposed Effective Date is June 1, 2002.

Table IX-6 also show that there are currently 44 products that comply with the proposed reactivity limit. These 44 fluorescent coatings represent a complying marketshare of 64 percent (ARB, 1998b). Given the significant complying marketshare and the variety of solvents available for reformulation, staff concludes that the proposed limit is feasible.

4. Metallic Coatings:

Product Category Description:

Metallic coatings are defined as topcoats which contain at least 0.5 percent elemental metallic pigment by weight and are labeled as "metallic," or with the name of a specific metallic finish such as "gold," "silver," or "bronze." Metallic coatings are defined as coatings containing at least 0.5 percent elemental metallic pigment because most metallic coatings have a metallic pigment content above this level. Below this level, coatings may have appearances more like a typical nonflat coating.

There are two forms of metallic coatings. One form, the "leafing" metallics, contain elemental metal as the sole pigment in the coating. Leafing refers to the distribution of the metallic pigment within the coating. In leafing pigments, the metallic pigment is carried to the surface of the paint film during drying and gives the appearance of an almost continuous film of metal. These coatings are designed to create the impression that the object coated is composed of gold, silver, brass, copper or aluminum.

The second form of metallic coating is known as "nonleafing." In nonleafing paints the metallic pigments do not form a continuous metallic layer on the surface of the coating. Rather, they are distributed within the paint film and produce a polychrome effect, when used in conjunction with semi-transparent colored pigments. The metallic pigment contained within the semi-transparent color causes the coating to sparkle. These colored metallics are often formulated to exactly match automobile finishes, and therefore fall into the exact match category. However, there are some nonleafing metallics that are not formulated as exact match coatings. If these coatings have an elemental metallic pigment content greater than 0.5 percent, and are labeled “metallic,” or with the name of a specific metallic finish such as “gold,” “silver,” or “bronze,” then they are categorized as metallics. Otherwise, they fall under the general flat or nonflat coatings.

As mentioned in the section on primers, “zinc-rich primers” (also called “galvanizing coatings”) may contain greater than 0.5 percent elemental metallic pigment, but are not classified as “metallic” coatings because they are not labeled “metallic,” or with the name of a specific metallic finish. These coatings are used for rust prevention and are very different from the decorative topcoats in the metallic category.

Metallic coating formulations are essentially all solvent-based formulations which differ from other types of aerosol paints in that the primary or sole pigment is elemental metal, rather than the standard colored pigments. Manufacturers of leafing metallics achieve the leafing effect by coating the metallic pigments with stearic acid, which serves as a lubricant to aid in bringing the metallic flake to the surface of the coating. Copper metallics are formulated using 100 percent copper, while bronze, brass and gold metallics are prepared by varying the ratios of copper and zinc in the metallic alloy pigment. Since copper tarnishes upon weathering, copper metallics and those metallics made with copper alloy pigments are not durable and are used primarily for interior applications. However, aluminum metallics have excellent durability and can be used for interior and exterior applications.

Metallic coatings are a significant segment of the aerosol paint market, as they are the fifth largest category in terms of sales and the fourth largest in terms of VOC emissions according to the 1997 Aerosol Coatings Survey. The category accounts for approximately nine percent of the emissions from aerosol paints. Table IX-7 shows that the metallic coatings category has a SWA-MIR_{prod} of 2.09 grams ozone per gram of product. The 1.65 tpd of VOCs emitted from sales of 2.33 tpd of metallic coatings (see Table IX-7) have the potential to produce 4.87 tpd of ozone (ARB, 1998b).

TABLE IX-7
METALLIC COATINGS*

Number of Products	Category Sales (tons/day)	VOC Emissions (tons/day)	SWA-MIR_{prod} (g O_3/g product)	SWA-MIR_{VOC} (gO_3/gVOC)	Total Ozone Formation (tons/day)
162	2.33	1.65	2.09	2.95	4.87

* Based on ARB 1997 Aerosol Coatings Survey.

<u>Proposed Reactivity Limit</u>

As shown in Table IX-8, the mass-based VOC reduction commitment is 0.21 tpd. After adjusting for MIR value uncertainty (adjusted SWA-MIR_{VOC}), the adjusted ozone reduction is

0.66 tpd. To achieve this adjusted ozone reduction commitment, for metallic coatings, the proposed reactivity limit is 1.93 grams ozone per gram product.

TABLE IX-8
METALLIC COATINGS PROPOSAL*

VOC Reduction (tons/day)	Adjusted SWA-MIR$_{VOC}$ (gO_3/g VOC)	Adjusted Equivalent Ozone Reduction (tons/day)	Reactivity Limit** (g O_3/g product)	Number of Complying Products	Complying Market Share (%)
0.21	3.07	0.66	1.93	54	27

* Based on ARB 1997 Aerosol Coatings Survey.
** Proposed Effective Date is June 1, 2002.

Table IX-8 also show that there are currently 54 products that comply with the proposed reactivity limit. These 54 metallic coatings represent a complying marketshare of 27 percent (ARB, 1998b). Given the significant complying marketshare and the variety of solvents available for reformulation, staff concludes that the proposed limit is feasible.

5. Non-Flat Paints:

Product Category Description:

Non-flat (or gloss) aerosol coating products are aerosol coatings with a specular gloss level greater than 15 on an 85^o meter, or greater than 5 on a 60^o meter (see the section on flat paint products for a description of gloss measurements). Aerosol paints labeled as “high gloss” paints do not qualify as non-flat unless the gloss criteria listed above are met. Non-flat aerosol paint products are primarily general use aerosol paints that do not fall under one of the other coating categories. However, special-use non-flat paints that exhibit the gloss level specified above, and do not fall under one of the other coating categories in the regulation, would also fall under the non-flat paint category.

Non-flat aerosol paints are primarily general-use products employed for a wide variety of purposes where a glossy finish is desired. Some typical uses include protecting objects from rust and corrosion, “touching-up” finishes, and coating small objects or objects that would be hard to coat with a brush, such as wicker. Some are sold as general, all-purpose products, while others have specific qualities such as rust protection, unique decorator colors, water-borne formulas, specific resin types, such as epoxies or polyurethanes, or quick dry times.

Non-flat aerosol paint formulations are very similar to the formulations of flat aerosol paint products, as discussed previously. However, non-flat paints have a higher concentration of resin relative to the total paint solids content. This higher concentration of resin gives non-flat paints higher gloss than flat paint products. The higher concentration of resin may also account for the somewhat higher VOC levels and lower total solids levels relative to non-flat aerosol paints, since resins contribute greater viscosity to paint formulations than other paint solids.

The non-flat aerosol paint category is by far the largest category of aerosol paints with respect to sales and emissions according to the 1997 ARB Aerosol Coatings Survey. The category accounts for approximately 44 percent of the emissions from aerosol paints. Table IX-9 shows that the non-flat paints category has a $SWA\text{-}MIR_{prod}$ of 1.62 grams ozone per gram of product. The 8.13 tpd of VOCs emitted from sales of 15.13 tpd of non-flat coatings (see Table IX-9) have the potential to produce 24.51 tpd of ozone (ARB, 1998b).

TABLE IX-9
NON-FLAT PAINTS*

Number of Products	Category Sales (tons/day)	VOC Emissions (tons/day)	$SWA\text{-}MIR_{prod}$ ($g\ O_3/g$ product)	$SWA\text{-}MIR_{VOC}$ ($gO_3/gVOC$)	Total Ozone Formation (tons/day)
805	15.13	8.13	1.62	3.01	24.51

* Based on ARB 1997 Aerosol Coatings Survey.

Proposed Reactivity Limit

As shown in Table IX-10, the mass-based VOC reduction commitment is 1.37 tpd. After adjusting for MIR value uncertainty (adjusted $SWA\text{-}MIR_{VOC}$), the adjusted ozone reduction is 4.46 tpd. To achieve this adjusted ozone reduction commitment, for non-flat paints, the proposed Reactivity limit is 1.40 grams ozone per gram product.

TABLE IX-10
NON-FLAT PAINTS PROPOSAL*

VOC Reduction (tons/day)	Adjusted $SWA\text{-}MIR_{VOC}$ (gO_3/g VOC)	Adjusted Equivalent Ozone Reduction (tons/day)	Reactivity Limit** ($g\ O_3/g$ product)	Number of Complying Products	Complying Market Share (%)
1.37	3.26	4.46	1.40	302	36

* Based on ARB 1997 Aerosol Coatings Survey.
** Proposed Effective Date is June 1, 2002.

Table IX-10 also show that there are currently 302 products that comply with the proposed reactivity limit. These 302 non-flat paint products represent a complying marketshare of 36 percent (ARB, 1998b). The 302 products that currently would comply with the proposed limit include both solvent-based and water-based products (ARB, 1998b). In fact, the survey data show that all water-based (formulated with water and DME) non-flat paints are currently able to comply with this proposed limit. Given the significant complying marketshare and the variety of solvents available for reformulation, staff concludes that the proposed limit is feasible.

6. Primer Coatings:

Product Category Description:

A primer is a coating formulated to be applied to a surface to provide a bond between that surface and subsequent coats. As such, primers contribute to the overall effectiveness of an entire coating system. Primers bond the substrate to subsequent coatings by providing a rough, slightly porous surface which adheres to both slick surfaces and glossy topcoats. An aerosol paint must be labeled as a “primer” to fall under this category.

Due to differences in formulation and function, auto body primers are specifically excluded from the general primer category. General primers reportedly cannot be topcoated with automotive topcoats because the solvents in these topcoats will cause “lifting” of general purpose primers.

Primers can fulfill a variety of functions. Depending on the type of product, primers must be able to protect against deterioration such as flaking, peeling, blistering, and corrosion from chemicals and environmental conditions. Primers can also help fill and level irregular substrates prior to subsequent coats such as basecoats or topcoats. In addition, primers can provide good hiding power for subsequent recoating of a substrate.

Primers are formulated similar to flat paint products. General primers often utilize some type of modified alkyd resin system and often have a higher solids content compared with other coatings to provide better hiding and build. Some primers with specialized functions have unique formulations. For example, zinc-rich primers (or galvanizing coatings) are generally very high solids formulations containing zinc pigments. These primers can provide protection against corrosion for iron or steel surfaces.

The primer coating category is the second largest category in terms of sales and emissions according to the 1997 ARB Aerosol Coatings Survey. The category accounts for approximately 10 percent of the emissions from aerosol paints. Table IX-11 shows that the primer coatings category has a SWA-MIR_{prod} of 1.33 grams ozone per gram of product. The 1.82 tpd of VOCs emitted from sales of 3.56 tpd of primer coatings (see Table IX-11) have the potential to produce 4.73 tpd of ozone (ARB, 1998b)

TABLE IX-11
PRIMER COATINGS*

Number of Products	Category Sales (tons/day)	VOC Emissions (tons/day)	SWA-MIR_{prod} (g O_3/g product)	SWA-MIR_{VOC} (gO_3/gVOC)	Total Ozone Formation (tons/day)
153	3.56	1.82	1.33	2.60	4.73

* Based on ARB 1997 Aerosol Coatings Survey.

Proposed Reactivity Limit

As shown in Table IX-12, the mass-based VOC reduction commitment is 0.41 tpd. After adjusting for MIR value uncertainty (adjusted SWA-MIR_{VOC}), the adjusted ozone reduction is 1.13 tpd. To achieve this adjusted ozone reduction commitment, for primer coatings, the proposed reactivity limit is 1.11 grams ozone per gram product.

TABLE IX-12
PRIMER COATINGS PROPOSAL*

VOC Reduction (tons/day)	Adjusted SWA-MIR_{VOC} (gO_3/g VOC)	Adjusted Equivalent Ozone Reduction (tons/day)	Reactivity Limit** (g O_3/g product)	Number of Complying Products	Complying Market Share (%)
0.41	2.77	1.13	1.11	31	29

* Based on ARB 1997 Aerosol Coatings Survey.
** Proposed Effective Date is June 1, 2002.

Table IX-12 also show that there are currently 31 products that comply with the proposed reactivity limit. These 31 primer coating products represent a complying marketshare of 29 percent (ARB, 1998b). Given the significant complying marketshare and the variety of solvents available for reformulation, staff concludes that the proposed limit is feasible.

7. Ground Traffic/Marking Paints:

Product Category Description:

Ground traffic or marking paints are used to apply striping or marking to outdoor surfaces such as streets, golf courses, parking lots, athletic fields, and construction sites. Paints included in this category are often labeled as traffic paints, marking paints, athletic paints, and marking chalk. The individual names refer to the applications for which the products were designed. As an example, traffic paint is designed to give long-lasting marking of traffic lanes or parking lots, whereas athletic paint is primarily for temporary use at recreational sites such as golf courses or soccer fields. All of these paints are commonly referred to as “upside-down” paints because they are applied in an inverted spray position. Unlike “regular” spray paints, upside-down spray paints do not have a dip tube. Lack of a dip tube allows for the inverted spray position. All upside-down paints can be applied either by hand or with a striping machine, a simple pushing device that allows accurate striping of surfaces and has an adjustable spray width. Traffic and other marking paints come in many different colors, including fluorescent colors, and are available as water- and solvent-based formulations.

Ground traffic or marking paints are used by utility locators, forestry workers, landscapers, contractors, surveyors, and others whose work requires marking of surfaces or objects. Upside-down paints can be applied to a variety of surfaces including asphalt, concrete, steel, grass, soil, wood and other surfaces. Depending upon the purpose of the marking and the type of surface, the applicator needs to choose a suitable upside-down paint. For example, applying traffic striping on high traffic concrete or asphalt streets requires a paint that withstands the wear from tires, rain, sun, and other environmental factors for a considerable period of time. A product used for the striping of a soccer field, on the other hand, may only need to last several weeks or months and should be formulated to not harm the grass or turf upon which it is applied. Generally speaking, paints marked as traffic paints are for more permanent applications whereas marking and athletic stripe paints or chalks are chosen for more temporary jobs, such as the marking of power cables or gas lines at a construction side or the outlines of a landscape design. Although they are typically used for less permanent markings, athletic and marking paints often have to withstand environmental factors such as rain and sun for several months.

Ground traffic or marking paints are available as solvent-based and water-based formulations, and as fluorescent and nonfluorescent paints. Water-based traffic and marking paint can be formulated as emulsions (using hydrocarbon propellants), or as solutions (using dimethyl ether propellant). For a description of fluorescent paints, please refer to the "fluorescent paint" category discussion in this chapter. Ground traffic marking paints are typically high in solids to prevent them from being absorbed into porous substrates.

The ground traffic/marking paints category is the third largest aerosol paint category in terms of sales and VOC emissions according to the 1997 ARB Aerosol Coatings Survey. The category accounts for approximately nine percent of the emissions from aerosol paints. Table IX-13 shows that ground traffic/marking paints category has a SWA-MIR_{prod} of 1.35 grams ozone per gram of product. The 1.70 tpd of VOCs emitted from sales of 3.2 tpd of ground traffic/marking paints (see Table IX-13) have the potential to produce 4.32 tpd of ozone (ARB 1998b).

TABLE IX-13
GROUND TRAFFIC/MARKING PAINTS*

Number of Products	Category Sales (tons/day)	VOC Emissions (tons/day)	SWA-MIR_{prod} (g O_3/g product)	SWA-MIR_{VOC} (gO_3/gVOC)	Total Ozone Formation (tons/day)
111	3.20	1.70	1.35	2.55	4.32

* Based on ARB 1997 Aerosol Coatings Survey.

Proposed Reactivity Limit

As shown in Table IX-14, the mass-based VOC reduction commitment is 0.28 tpd. After adjusting for MIR value uncertainty (adjusted SWA-MIR_{VOC}), the adjusted ozone reduction is 0.78 tpd. To achieve this adjusted ozone reduction commitment, for ground traffic/marking paints, the proposed reactivity limit is 1.18 grams ozone per gram product.

TABLE IX-14
GROUND TRAFFIC/MARKING PAINTS PROPOSAL*

VOC Reduction (tons/day)	Adjusted SWA-MIR$_{VOC}$ (gO_3/g VOC)	Adjusted Equivalent Ozone Reduction (tons/day)	Reactivity Limit** (g O_3/g product)	Number of Complying Products	Complying Market Share (%)
0.28	2.78	0.78	1.18	64	24

* Based on ARB 1997 Aerosol Coatings Survey.
** Proposed Effective Date is January 1, 2003.

Table IX-14 also show that there are currently 64 products that comply with the proposed reactivity limit. These 64 ground traffic/marking paints products represent a complying marketshare of 24 percent (ARB, 1998b). Given the significant complying marketshare and the variety of solvents available for reformulation, staff concludes that the proposed limit is feasible.

B. Description of Remaining Specialty Categories

<u>Product Category Description</u>:

Table IX-15 summarizes the following information for each of the remaining 28 aerosol specialty coating categories as reported in the ARB Aerosol Coating Survey:

- the number of products;
- the sales (in tpd);
- the VOC emissions (in tpd);
- the sales-weighted average MIR, for the product category;
- the sales-weighted average MIR of the VOCs ; and
- the ozone formation potential.

The 28 specialty coating categories shown in Table IX-15 account for about 14 percent of the total emissions from aerosol paints. As shown in Table IX-15, the VOC emissions from many of these categories are very small. To maintain the confidentiality of proprietary data, we do not provide the estimated sales and emissions for categories with fewer than four products reported in the survey. We do not discuss each of these 28 categories in detail as we did with the seven categories in the previous section . However, detailed discussions of each of these categories (including product description, use, marketing, and formulation) are provided in the ARB staff report entitled "Initial Statement of Reasons for a Proposed Statewide Regulation to Reduce Volatile Organic Compound Emissions from Aerosol Coating Products and Amendments to the Alternative Control Plan Regulation for Consumer Products," February 3, 1995 (ARB, 1995).

TABLE IX-15
EMISSIONS SUMMARY FOR 28 SPECIALTY CATEGORIES*

Category	Number of Products	Category Sales (tons/day)	VOC Emissions (tons/day)	SWA-MIR$_{prod}$ (g O_3/g product)	SWA-MIR$_{VOC}$ (g O_3/g VOC)	Total Ozone Formation (tons/day)
Art Fixatives or Sealants	15	0.33	0.23	1.56	2.24	0.51
Auto Body Primers	19	0.50	0.25	1.69	3.35	0.85
Automotive Bumpers & Trim Products	70	0.35	0.30	1.59	1.89	0.56
Aviation or Marine Primers	< 10	**	**	**	**	**
Aviation Propeller Coatings	< 10	**	**	**	**	**
Corrosion Resistant Brass, Bronze, or Copper Coatings	< 10	**	**	**	**	**
Exact Match Finishes, Engine Enamel	29	0.38	0.18	1.52	3.13	0.58
Exact Match Finishes, Automotive	316	0.72	0.39	1.68	3.11	1.21
Exact Match Finishes, Industrial	32	0.14	0.07	1.18	2.50	0.17
Floral Sprays	16	0.55	0.23	0.78	1.84	0.43
Glass Coatings	4	**	**	**	**	**
High Temperature Coatings	65	0.70	0.48	2.04	3.01	1.43
Hobby/Model/Craft Coatings, Enamel	34	0.15	0.10	1.10	1.59	0.17
Hobby/Model/Craft Coatings, Lacquer	5	0.01	<0.01	2.48	3.37	0.02
Hobby/Model/Craft Coatings, Clear or Metallic	17	0.14	0.11	1.56	2.00	0.22
Marine Spar Varnishes	< 10	**	**	**	**	**
Photograph Coatings	< 10	**	**	**	**	**
Pleasure Craft Finish Primers/Surfacers/Undercoaters	< 10	**	**	**	**	**
Pleasure Craft Topcoats	< 10	**	**	**	**	**
Shellac Sealers, Clear	< 10	**	**	**	**	**
Shellac Sealers, Pigmented	< 10	**	**	**	**	**
Slip-Resistant Coatings	7	0.01	0.01	1.15	2.82	0.01
Spatter/Multicolor Coatings	22	0.21	0.10	0.77	1.56	0.16
Vinyl/Fabric/Leather/Polycarbonate	20	0.33	0.25	1.67	2.27	0.55
Webbing/Veiling Coatings	4	**	**	**	**	**
Weld-Through Primers	8	0.05	0.02	1.16	2.49	0.06
Wood Stains	4	**	**	**	**	**
Wood Touch-Up/Repair/ Restoration Coatings	<10	**	**	**	**	**
Total	710	5.06	2.96	1.45***	2.48***	7.34

* Based on ARB 1997 Aerosol Coatings Survey.
** Information not provided to protect confidentiality of proprietary information.
*** Calculated value based on total ozone formation, VOC emissions, and sales data.

Proposed Reactivity Limits and Compliance:

Table IX-16 summarizes the following information for each of the remaining 28 aerosol specialty coating categories:

- VOC reduction commitment in tpd;
- the adjusted sales-weighted average MIR value using the data reported in the ARB Aerosol Coatings survey;
- the adjusted ozone reduction in tpd;
- the proposed January 1, 2003, reactivity limits;
- number of products that comply with the proposed January 1, 2003, limits using the data reported in the ARB Aerosol Coatings Survey; and
- complying market share at the proposed limits using the data reported in the ARB Aerosol Coatings survey.

TABLE IX-16
PROPOSED REACTIVITY LIMITS AND COMPLIANCE
FOR 28 SPECIALTY CATEGORIES*

Category	VOC Reduction (tons/day)	Adjusted SWA-MIR$_{VOC}$ (gO_3/g VOC)	Adjusted Equivalent Ozone Reduction (tons/day)	Reactivity Limit** (g O_3/g product)	Number of Complying Products	Complying Market Share (%)
Art Fixatives or Sealants	0.04	2.35	0.10	1.80	7	47
Auto Body Primers	0.04	3.62	0.13	1.57	12	64
Automotive Bumpers and Trim Products	0.04	1.97	0.08	1.75	34	73
Aviation or Marine Primers	0.00	3.28	0.00	1.98	< 10	100
Aviation Propeller Coatings	0.00	2.76	0.00	2.47	< 10	100
Corrosion Resistant Brass, Bronze, or Copper Coatings	<0.01	2.83	0.00	1.78	0	0
Exact Match Finishes: Engine Enamel	0.01	3.42	0.04	1.72	8	72
Exact Match Finishes: Automotive	0.04	3.17	0.14	1.77	276	62
Exact Match Finishes: Industrial	<0.01	2.67	0.00	2.07	30	99
Floral Sprays	0.01	1.95	0.01	1.68	13	87

* Proposed effective date for speciality coating is January 1, 2003.

TABLE IX-16 (Continued)
PROPOSED REACTIVITY LIMITS AND COMPLIANCE
FOR 28 SPECIALTY CATEGORIES*

Category	VOC Reduction (tons/day)	Adjusted SWA-MIR_{VOC} (gO_3/g VOC)	Adjusted Equivalent Ozone Reduction (tons/day)	Reactivity Limit** (g O_3/g product)	Number of Complying Products	Complying Market Share (%)
Glass Coatings	<0.01	2.49	0.00	1.42	0	0
High Temperature Coatings	0.07	3.15	0.22	1.83	28	42
Hobby/Model/Craft Coatings: Enamel	<0.01	1.73	0.01	1.47	32	94
Hobby/Model/Craft Coatings: Lacquer	<0.01	3.65	< 0.01	2.70	< 10	60
Hobby/Model/Craft Coatings: Clear or Metallic	<0.01	2.13	0.02	1.60	13	34
Marine Spar Varnishes	0.00	1.90	< 0.01	0.87	< 10	100
Photograph Coatings	<0.01	1.31	< 0.01	0.99	< 10	39
Pleasure Craft Finish Primers/Surfacers/ Undercoaters	0.00	2.10	0.00	1.05	< 10	100
Pleasure Craft Topcoats	0.00	0.62	0.00	0.59	< 10	100
Shellac Sealers: Clear	0.00	1.71	0.00	0.98	< 10	100
Shellac Sealers: Pigmented	0.00	1.89	0.00	0.94	< 10	100
Slip-Resistant Coatings	0.00	2.89	0.00	2.41	7	100
Spatter/Multicolor Coatings	<0.01	1.74	< 0.01	1.07	12	89
Vinyl/Fabric/Leather/ Polycarbonate	0.03	2.34	0.08	1.54	16	31
Webbing/Veiling Coatings	0.00	1.03	0.00	0.83	< 10	100
Weld-Through Primers	<0.01	2.55	0.01	0.98	< 10	67
Wood Stains	0.00	1.71	0.00	1.38	< 10	100
Wood touch-Up/Repair/Restoration Coatings	<0.01	1.38	< 0.01	1.49	< 10	> 90
Total	0.31	N/A	0.86	N/A	N/A	N/A

* Proposed effective date for speciality coating is January 1, 2003.

We believe the proposed reactivity limits for many of these categories may function as a cap, and will require less reformulation efforts than the seven larger categories mentioned previously. Given the high complying marketshares in almost all categories, staff concludes that the proposed reactivity limits are feasible.

REFERENCES

ARB. (1995), Initial Statement of Reasons for a Proposed Statewide Regulation to Reduce the Volatile Organic Compound Emissions from Aerosol Coatings and Amendments to the Alternative Control Plan for Consumer Products. February 3, 1995.

ARB. (1998a), Initial Statement of Reasons for the Proposed Amendments to the Regulations for Reducing Volatile Organic Compound Emissions from Aerosol Coatings, Antiperspirants and Deodorants, and Consumer Products. October 2, 1998.

ARB. (1998b) Air Resources Board Aerosol Coatings Survey. November 25, 1997.

Radiant Color. Telephone conversation with ARB staff. May 18, 1998. (Radiant Color)