Winston H. Hickox
Agency Secretary

Air Resources Board

Alan C. Lloyd, Ph.D.
Chairman
2020 L Street • P.O. Box 2815 • Sacramento, California 95812 • www.arb.ca.gov

Gray Davis
Governor

March 23, 2000

Dear Sir or Madam:

Enclosed are some draft typical architectural coatings formulations that are above or below the proposed volatile organic compound (VOC) limits in the suggested control measure (SCM). These generic, non-confidential formulations were handed out during the afternoon of the March 16, 2000, architectural coatings workshop in Sacramento. We plan to use these formulations to estimate the potential ongoing materials costs of the proposed SCM. Specifically, we plan to compare the materials costs of typical coatings that exceed the proposed VOC limits with that of typical coatings that meet the proposed VOC limits in the SCM. The draft typical formulations are for comparative purposes only, and may not include additives and other ingredients used in small amounts. We are requesting your comments on the enclosed draft formulations by April 7, 2000. If you have concerns with the enclosed draft formulations, please specify alternative formulations or provide suggestions for modifying the formulations.

Thank you for your consideration. If you have any questions about the enclosed draft formulations or our cost analysis, please call Ms. Barbara Fry, Manager of the Measures Development Section, at (916) 322-8267, or by electronic mail at bfry@arb.ca.gov.

Sincerely,

Janette Brooks, Chief
Air Quality Measures Branch

Enclosure

cc: Barbara Fry, Manager
Measures Development Section

PRELIMINARY COMPLYING AND NONCOMPLYING FORMULATIONS FOR THE COST IMPACTS ANALYSIS

Note:

The following complying and noncomplying formulations are presented for purposes of the cost impacts analysis only (i.e., for estimating the incremental cost increase or decrease in raw material costs for pre-SCM and post-SCM implementation). These formulations are not intended to be taken as the only formulas manufacturers use or can use to comply with the proposed standards. These formulations reflect "typical" technologies available to manufacturers to comply with the proposed standards, but manufacturers are free to meet the standards in any way they find appropriate, provided the coatings have VOC contents no greater than specified in the table of standards. Thus, some manufacturers may choose completely different coating technologies to meet the standards, while others may produce coatings that resemble the formulations presented in the following tables.

The complying and noncomplying formulations are based on formulations reported in the AIM-SCM survey and publicly-available literature. To protect trade secrets, the formulations are generic versions of the actual products, but they are not identical to the actual products. The components shown in the formulations represent the major components of actual products. However, they are not complete formulations in that minor components (approximately 1% by weight or less each) are not shown, such as additives and other ingredients. Thus minor ingredients were either aggregated into the "All Other Ingredients" category or were excluded and the remaining major components normalized to sum to 100%.

While the following are generic formulations, they do reflect existing technologies and have compositions that use ingredients in proportions that are well within the proportions used by actual products that are reported to meet the proposed VOC standards. Thus, these formulations reflect technologically feasible formulations and are appropriate for purposes of the cost impacts analysis.

PRELIMINARY DRAFT
TYPICAL COMPLYING/NONCOMPLYING COATING PRODUCT FORMULA

Coating Category Name: Bituminous Roof Coatings - Fibrous - Waterborne

Proposed VOC Limit: 250

COMPLYING FORMULATION

Component	Unit Cost $/lb	Weight Percent (wt%)
Asphalt		45
Water		42
Fibers		3
Clay		10
Total		**100%**

NONCOMPLYING FORMULATION

Component	Unit Cost $/lb	Weight Percent (wt%)
Total		**100%**

PRELIMINARY DRAFT
TYPICAL COMPLYING/NONCOMPLYING COATING PRODUCT FORMULA

Coating Category Name: Bituminous Roof Coatings - Fibrous - Solventborne

Proposed VOC Limit: 250

COMPLYING FORMULATION

Component	Unit Cost $/lb	Weight Percent (wt%)
Asphalt		65
Water		2

Fibers		3
Clay		15
Mineral Spirits		15
Total		**100%**

NONCOMPLYING FORMULATION

Component	Unit Cost $/lb	Weight Percent (wt%)
Asphalt		55
Mineral Spirits		27
Fibers		3
Clay		15
Total		**100%**

PRELIMINARY DRAFT
TYPICAL COMPLYING/NONCOMPLYING COATING PRODUCT FORMULA

Coating Category Name: Bituminous Roof Coatings - Non Fibrous - Waterborne

Proposed VOC Limit: 250

COMPLYING FORMULATION

Component	Unit Cost $/lb	Weight Percent (wt%)
Asphalt		47
Water		45
Clay		8
Total		**100%**

NONCOMPLYING FORMULATION

Component	Unit Cost $/lb	Weight Percent (wt%)

Total		**100%**

PRELIMINARY DRAFT
TYPICAL COMPLYING/NONCOMPLYING COATING PRODUCT FORMULA

Coating Category Name: Bituminous Roof Coatings - Non Fibrous - Solventborne

Proposed VOC Limit: 250

COMPLYING FORMULATION

Component	Unit Cost $/lb	Weight Percent (wt%)
Asphalt		63
Water		3
Mineral Spirits		18
Clay		16
Total		**100%**

NONCOMPLYING FORMULATION

Component	Unit Cost $/lb	Weight Percent (wt%)
Asphalt		60
Mineral Spirits		30
Clay		10
Total		**100%**

PRELIMINARY DRAFT
TYPICAL COMPLYING/NONCOMPLYING COATING PRODUCT FORMULA

Coating Category Name: Flat

Proposed VOC Limit: 100 g/l

COMPLYING FORMULATION

Component	Unit Cost $/lb	Weight Percent (wt%)
Resin*		13
Pigment and Extenders:		
Titanium dioxide		15
Silica/Silicates		15
Calcium carbonate		10
Texanol		2
Propylene glycol		2
Additives*		2
Water		41
Total		**100%**

*Note: VOC levels affect the specific resins and additives used

NONCOMPLYING FORMULATION

Component	Unit Cost $/lb	Weight Percent (wt%)
Resin*		13
Pigment and extenders:		
Titanium dioxide		15
Silica/silicates		15
Calcium carbonate		10
Texanol		3
Propylene glycol		5
Additives*		2
Water		37
Total		**100%**

*Note: VOC levels affect the specific resins and additives used

PRELIMINARY DRAFT
TYPICAL COMPLYING/NONCOMPLYING COATING PRODUCT FORMULA

Coating Category Name: Floor

Proposed VOC Limit: 100

COMPLYING FORMULATION

Component	Unit Cost $/lb	Weight Percent (wt%)
Epoxy Resin		30
Aliphatic amine		30
Titanium dioxide		20
Calcium carbonate		20
Total		**100%**

NONCOMPLYING FORMULATION

Component	Unit Cost $/lb	Weight Percent (wt%)
Petroleum Distillate		40
Alkyd Resin		40
Titanium dioxide		20
Total		**100%**

PRELIMINARY DRAFT
TYPICAL COMPLYING/NONCOMPLYING COATING PRODUCT FORMULA

Coating Category Name: Industrial Maintenance (solvent-borne to solvent-borne)

Proposed VOC Limit: 250

COMPLYING FORMULATION

Component	Unit Cost $/lb	Weight Percent (wt%)
Methyl ethyl ketone (MEK)		10
Bisphenol-A epoxy resin		40
Polyamine aliphatic + BTX aromatic solvent		10
Titanium dioxide		25
Kaolin/Talc silicates		15
Total		**100%**

NONCOMPLYING FORMULATION

Component	Unit Cost $/lb	Weight Percent (wt%)
Petroleum distillate solvent		30
Titanium dioxide		25
Alkyd resin		25
Hydrous aluminum silicates		8
Calcium carbonate		5
All other ingredients		7
Total		**100%**

PRELIMINARY DRAFT
TYPICAL COMPLYING/NONCOMPLYING COATING PRODUCT FORMULA

Coating Category Name: Industrial Maintenance (solvent-borne to water-borne)

Proposed VOC Limit: 250

COMPLYING FORMULATION

Component	Unit Cost $/lb	Weight Percent (wt%)
2-butoxyethanol/Diethylene glycol monoethyl ether		10
Titanium dioxide		18
Acrylic resin		25
Water		45
All other ingredients		2
Total		**100%**

NONCOMPLYING FORMULATION

Component	Unit Cost $/lb	Weight Percent (wt%)
Petroleum distillate solvent		30
Titanium dioxide		25
Alkyd resin		25
Hydrous aluminum silicates		8
Calcium carbonate		5
All other ingredients		7
Total		**100%**

PRELIMINARY DRAFT
TYPICAL COMPLYING/NONCOMPLYING COATING PRODUCT FORMULA

Coating Category Name: Lacquer - Clear

Proposed VOC Limit: 550 g/l

COMPLYING FORMULATION

Component	Unit Cost $/lb	Weight Percent (wt%)
Nitrocellulose	1.25	32
Acetone		39
Xylene		9
Isopropanol		4
Butyl Alcohol		5
2-butoxy ethanol		4
Butyl Acetate		7
Total		**100%**

NONCOMPLYING FORMULATION

Component	Unit Cost $/lb	Weight Percent (wt%)
Nitrocellulose	1.25	28
Xylene		3
2-butoxy ethanol		4
Isopropanol		8
Isobutyl Alcohol		7
Aromatic 100		4
VM&P Naptha		19
Butyl Acetate		9
Methyl Ethyl Ketone		13
Isobutyl Isobutyrate		5
Total		**100%**

PRELIMINARY DRAFT
TYPICAL COMPLYING/NONCOMPLYING COATING PRODUCT FORMULA

Coating Category Name: Lacquer - Pigmented

Proposed VOC Limit: 550 g/l

COMPLYING FORMULATION

Component	Unit Cost $/lb	Weight Percent (wt%)
Nitrocellulose	1.25	18
Titanium Dioxide		20
Acetone		30
Xylene		9
Isopropanol		3
Butyl Alcohol		2
2-butoxy ethanol		9
Butyl Acetate		7
Total		**100%**

NONCOMPLYING FORMULATION

Component	Unit Cost $/lb	Weight Percent (wt%)
Nitrocellulose	1.25	19
Titanium Oxide		18
Xylene		4
Isopropanol		9
Isobutyl Alcohol		3
VM&P Naptha		13
Butyl Acetate		12
Methyl Ethyl Ketone		15
Isobutyl Isobutyrate		7
Total		**100%**

PRELIMINARY DRAFT
TYPICAL COMPLYING/NONCOMPLYING COATING PRODUCT FORMULA

Coating Category Name: Multicolor coatings

Proposed VOC Limit: 250 g/l

COMPLYING FORMULATION

Component	Unit Cost $/lb	Weight Percent (wt%)
Water		40
Butyl cellosolve		7
Polyurethane resin		7
Carboxylated resin		16
Contact adhesive		20
Pigment (e.g., titanium dioxide)		8
Additives		2
Total		**100%**

NONCOMPLYING FORMULATION

Component	Unit Cost $/lb	Weight Percent (wt%)
Aromatic petroleum solvent		35
Mineral spirits		4
Yellow iron oxide		4
Soya alkyd		18
Phenolated alkyd		15
Styrene-butadiene resin		6
Chlorinated poly-phenyl resin		3
Chrome green oxide		5
Aluminum silicate		5
Additives		5
Total		**100%**

PRELIMINARY DRAFT
TYPICAL COMPLYING/NONCOMPLYING COATING PRODUCT FORMULA

Coating Category Name: Non-flat (this example is medium-gloss)

Proposed VOC Limit: 150 g/l

COMPLYING FORMULATION

Component	Unit Cost $/lb	Weight Percent (wt%)
Resin*		22
Pigment and Extenders:		
Titanium dioxide		19
Silica/Silicates		5
Calcium carbonate		2
Texanol		2
Propylene glycol		3
Additives*		2
Water		45
Total		**100%**

*Note: VOC levels affect the specific resins and additives used

NONCOMPLYING FORMULATION

Component	Unit Cost $/lb	Weight Percent (wt%)
Resin*		22
Pigment and Extenders:		
Titanium dioxide		19
Silica/Silicates		5
Calcium carbonate		2
Texanol		3
Propylene glycol		6
Additives*		2
Water		41
Total		**100%**

*Note: VOC levels affect the specific resins and additives used

PRELIMINARY DRAFT
TYPICAL COMPLYING/NONCOMPLYING COATING PRODUCT FORMULA

Coating Category Name: Primers, Sealers, Undercoaters

Proposed VOC Limit: 200 grams/liter

COMPLYING FORMULATION

Component	Unit Cost $/lb	Weight Percent (wt%)
Water		54
Acrylic resin		15
Titanium dioxide		13
Talc		12
Ethylene glycol		3
Additives		3
Total		**100%**

NONCOMPLYING FORMULATION

Component	Unit Cost $/lb	Weight Percent (wt%)
Talc		35
Tall oil alkyd resin		25
Mineral spirits		24.5
Titanium dioxide		12
Additives		3.5
Total		**100%**

PRELIMINARY DRAFT
TYPICAL COMPLYING/NONCOMPLYING COATING PRODUCT FORMULA

Coating Category Name: Quick-Dry Enamel

Proposed VOC Limit: 250 g/l

COMPLYING FORMULATION
(This is a high-gloss latex)

Component	Unit Cost $/lb	Weight Percent (wt%)
Resin*		26
Pigment and Extenders:		
Titanium dioxide		20
Silica/Silicates		0
Calcium carbonate		0
Texanol		3
Propylene glycol		7
Additives*		2
Water		42
Total		**100%**

NONCOMPLYING FORMULATION
(This is a solvent-based alkyd)

Component	Unit Cost $/lb	Weight Percent (wt%)
Alkyd resin		32
Pigment and extenders:		
Titanium dioxide		25
Silica/Silicates		0
Calcium carbonate		5
Additives		2
Mineral spirits		36
Total		**100%**

PRELIMINARY DRAFT
TYPICAL COMPLYING/NONCOMPLYING COATING PRODUCT FORMULA

Coating Category Name: Quick-Dry Primers, Sealers, Undercoaters

Proposed VOC Limit: 200 grams/liter

COMPLYING FORMULATION

Component	Unit Cost $/lb	Weight Percent (wt%)
Water		40
Vinyl Acrylic Resin		30
Titanium dioxide		10
Calcium carbonate		9
Magnesium silicate (talc)		7
Ethylene glycol		3
Additives		1
Total		**100%**

NONCOMPLYING FORMULATION

Component	Unit Cost $/lb	Weight Percent (wt%)
V.M.&P. Naphtha		29
Talc		22
Vinyl toluene resin		21
Titanium dioxide		12
Mineral spirits		7
Kaolin		5
Soya alkyd		2
Additives		2
Total		**100%**

PRELIMINARY DRAFT
TYPICAL COMPLYING/NONCOMPLYING COATING PRODUCT FORMULA

Coating Category Name: Stains

Proposed VOC Limit: 250

COMPLYING FORMULATION

Component	Unit Cost $/lb	Weight Percent (wt%)
Water		60
Crystalline Silica		12
Acrylic Resin		7
Alkyd Resin		7
Iron Oxide		14
Total		**100%**

NONCOMPLYING FORMULATION

Component	Unit Cost $/lb	Weight Percent (wt%)
Mineral Spirits		35
Refined Linseed Oil		50
Alkyd Resin		8
Iron Oxide		7
Total		**100%**

PRELIMINARY DRAFT
TYPICAL COMPLYING/NONCOMPLYING COATING PRODUCT FORMULA

Coating Category Name: Swimming Pool and Swimming Pool Repair and Maintenance

Proposed VOC Limit: 340 g/l

COMPLYING FORMULATION

Component	Unit Cost $/lb	Weight Percent (wt%)
Mineral spirits		20
Epoxy resin		30
Titanium dioxide		30
Polyamide resin		20
Total		**100%**

NONCOMPLYING FORMULATION

Component	Unit Cost $/lb	Weight Percent (wt%)
Xylene		45
Titanium dioxide		17
Talc		26
Chlorinated rubber		12
Total		**100%**

PRELIMINARY DRAFT
TYPICAL COMPLYING/NONCOMPLYING COATING PRODUCT FORMULA

Coating Category Name: Waterproofing Sealers

Proposed VOC Limit: 250

COMPLYING FORMULATION

Component	Unit Cost $/lb	Weight Percent (wt%)
Water		80
Acrylic Polymer		15
Texanol		2
Ethylene glycol		2
Crystalline Silica		1
Total		**100%**

NONCOMPLYING FORMULATION

Component	Unit Cost $/lb	Weight Percent (wt%)
Petroleum Distillate		40
Calcium carbonate		30
Alkyd Resin		30
Total		**100%**