Executive Summary

Building Material Emissions Study

November 2003

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Executive Summary

Background

As a result of the growing student population and need to modernize schools, numerous State and local school bonds have been passed in California. It is anticipated that California will spend more than $50 billion over the next several years for new school construction, including building more than 400 new schools. Additionally, California invests approximately $2 billion annually for the design, construction, and renovation of State facilities. As building construction and operation costs continue to increase, coupled with the rise in environmental awareness among Californians, sustainable building practices have received increased attention as innovative and cost-effective alternatives to standard practices.

Procurement of recycled-content products is one sustainable feature promoted by the California Integrated Waste Management Board (CIWMB) for the design and construction of high-performance schools and for State construction projects. Besides creating markets for materials that have been collected through the recycling process, recycled-content products are an essential component of efforts by California local and State government[1] to meet and exceed the 50 percent waste diversion mandate.

While the CIWMB has promoted recycled-content products for use in sustainable buildings, little was known regarding specific chemical emissions from such products when they are used indoors. Although some studies have reported emissions from various building materials, none of these studies compared commonly used building products containing low or no recycled content (hereafter referred to as *standard products*) with their counterparts with higher amounts of recycled content, rapidly renewable materials, and/or products containing no or low volatile organic compounds (VOC) (hereafter referred to as *alternative products*). As a result of this lack of data and a general unfamiliarity with these products, many recycled-content products have been subject to greater scrutiny than their virgin counterparts.

The testing protocol used in this study was based on a specification developed by the State for screening sustainable building materials. The *Special Environmental Requirements* specification (Section 01350) was originally developed for scgreening building materials used in the construction of a 1.5-million-square-foot State office building complex in Sacramento. This specification includes emissions-testing procedures and certification requirements for recycled materials according to the State Agency Buy Recycled Campaign (SABRC). Section 01350 has now been rewritten for use on other projects and is included in two State-funded publications: *Reference Specifications for Energy and Resource Efficiency* (CEC, 2001) and the *Collaborative for High Performance Schools: Best Practices Manual* (CHPS, 2002).

Objectives

In order to determine the effect of materials with recycled content in relation to indoor air quality, it became clear that emissions data were required for standard building materials and their alternative sustainable counterparts. This concern prompted the CIWMB to fund a laboratory-based, three-phase study by the Public Health Institute (PHI), with the Department of Health Services (DHS) being the principal investigator. The study focused entirely on those building materials with indoor air quality implications and consisted of three phases:

[1] Legislation pertaining to local governments: California Integrated Waste Management Act (AB 939, Sher, Chapter 1095, Statutes of 1989 as amended [IWMA], Public Resources Code section 40000, et. seq.). Legislation pertaining to State government: Chapter 764, Statutes of 1999 (AB 75, Strom-Martin), Public Resources Code sections 42920–42928.

- Phase I focused on building materials used for permanent and portable classroom construction in California.
- Phase II focused on materials specific to State construction.
- Phase III focused on tire-derived flooring products.

The study had the following four main objectives:

1. To measure emissions from standard products, and compare them to those emitted from their alternative sustainable counterparts.
2. To measure chemical emissions from tire-derived resilient flooring and compare them to those emitted from their non-tire-derived counterparts.
3. To investigate the applicability of Section 01350 as a screening tool for standard and alternative building materials.
4. To identify additional chemicals of concern to the State using the test methods and reporting procedures described in Section 01350.

Alternative products, as defined for this study, do not only include recycled-content products, but also take into consideration the State's definition of an environmentally preferable product as "a product that promotes healthy indoor environments…." (Public Resources Code [PRC] section 42635). Such materials utilize increased amounts of recycled content and other environmental features with the goal of reducing impact to the environment during their production and disposal. While a complete life cycle assessment would have been the most desirable approach for this study, the main emphasis focused on the materials' efficiency, including recycled-content products and their impact on indoor air quality (IAQ). It is also important to note that some standard materials include various amounts of recycled content while some alternative materials include low recycled content, but enhanced IAQ features.

Methods

This study focused on a limited number of building materials available in the marketplace with potential IAQ implications. Since in most cases there is little difference between the types of materials used in classroom and State office building construction, we did not differentiate products based on these two construction applications. However, using the emission factors for each tested material, we did provide separate calculations for the types and concentration of expected chemicals that may be found indoors if the materials or products are installed in a typical classroom or State office.

A list of 11 material categories was developed with input from an advisory group consisting of practicing architects and other professionals with experience in school and State building construction, staff of the 10 largest California school districts, portable classroom manufacturers, and building product manufacturers. The categories include acoustical ceiling panels, carpeting, fiberboard, gypsum board, paints, particleboard, plastic laminates, resilient flooring (rubber and non-rubber-based), tackable wall panels, thermal insulation, and wall base. From these 11 categories we tested a total of 77 materials, 43 of which are considered alternative products.

Section 01350 requires a 10-day conditioning followed by a 96-hr emissions test of a 6 x 6 in sample in a small-size chamber. This measurement protocol was designed to simulate volatile organic compound (VOC) emissions 14 days after installation of materials in a classroom or State office. Measurements of the emission factors of the target chemicals obtained at the end of the 96-hr test are then used to model indoor air concentrations for a specific application. Section

01350 lists concentration limits for numerous chemicals with listed non-cancer chronic reference exposure levels (CRELs). Besides all chemicals on the CREL list, Section 01350 requires reporting the emission factors of: (a) any emitted chemical on the Toxic Air Contaminant (TAC) list or the Proposition 65 (Prop. 65) list at 96 hrs; (b) formaldehyde and total volatile organic compound (TVOC) emission factors at 24, 48, and 96 hrs; and (c) the ten most abundant compounds measured not on the CREL, Proposition 65, or TAC lists.

Since the list of chemicals in Section 01350 is very limited and represents only a small fraction of what is typically found in non-industrial environments, we used additional IAQ performance indicators to identify other potential chemicals at concentrations of concern. These indicators included (a) chemicals with known odor thresholds (b) an interim concentration limit for caprolactam; and (c) compounds with chromatography peaks exceeding 5 percent of the TVOC area. Based on the above criteria and the compounds detected during the analyses of the 77 materials, we developed a list of 121 target chemical compounds. Emphasis was placed on VOCs with known potential health or comfort impacts to occupants of classrooms and State offices.

TVOC emisssion factors were used as a tool to assist us in (a) determining compounds with chromatography peaks exceeding 5 percent of the TVOC area and (b) investigating further the chromatograms of those products that had TVOC emission factors much higher than the sum of the individual VOC emission factors reported using the above-described methodology. In such cases, we initiated further investigation of individual VOCs, even if these VOCs were not included in the concentration limits of Section 01350. We note that TVOC, as well as individual VOC emission factors, will vary depending on the sampling and analytical methods used. No single method currently in use can measure all organic compounds that may be of interest. In addition, TVOCs cannot be used to indicate potential health effects.

Emission factors were determined by laboratory testing in an environmental chamber. These emission factors can be used to estimate VOC concentrations in new or renovated construction projects. For this report, a standard size (40 x 24 x 8.5 ft) classroom with a ventilation rate of 0.9 air changes per hour (ach) and a standard size (10 x 12 x 8.5 ft) State office with a ventilation rate of 0.75 ach were used as default values. Building materials were evaluated by comparing the predicted concentrations to health- and comfort-based concentration limits. For these assumptions, the State office configuration is slightly more sensitive to VOC emissions than the classroom configuration.

Concentrations can be estimated for other size rooms or buildings, ventilation rates, or material-use scenarios. For example, the tire-derived resilient flooring products were also evaluated for use in a State boardroom and auditorium application.

Results

The following product category-specific results are based on the calculations from the emissions measured in this study. Only the numbers of chemicals exceeding Section 01350 concentration limits and other IAQ performance indicators are presented. The reader is referred to the main body of the report (see Section 3 for a detailed discussion and Section 4.1 for a summary) for the names of all these chemicals.

1. Acoustical Ceiling Panels (N=7)

Section 01350 Concentration Limits

Of the four standard products tested, one exceeded Section 01350 concentration limit for both the classroom and State office calculations. Of the three alternative products tested, none exceeded any concentration limits used in this report.

Additional IAQ Performance Indicators

None of the IAQ performance indicators were exceeded for both the classroom and State office calculations.

2. Carpeting (N=14)

Section 01350 Concentration Limits

Of the nine standard samples tested, three exceeded Section 01350 for the classroom and five exceeded Section 01350 concentration limits for the State office calculations. Of the five alternative products tested, two exceeded Section 01350 concentration limits for both the classroom and State office applications.

Additional IAQ Performance Indicators

Of the nine standard samples tested, four exceeded the additional IAQ performance indicators. Of the five alternative products tested, one exceeded the additional IAQ performance indicators.

We also note that emissions from one carpet sample that bore the Carpet and Rug Institute (CRI) "Green Label" exceeded CRI's published 24-hr emissions criteria for the label. Another sample was just below these criteria. This is noteworthy since the test results reported here were obtained after the 10-day conditioning period followed by a 4-day test period specified in Section 01350, whereas CRI's tests are 24-hr-based with no prior conditioning.

3. Fiberboard (N=5)

Section 01350 Concentration Limits

Both standard products exceeded Section 01350 concentration limits only for the State office application. One of the three alternative products exceeded the concentration limit for one chemical (acetaldehyde) for the State office calculation. None of the other two alternative products exceeded any concentration limits for the classroom or State office calculations.

Additional IAQ Performance Indicators

None of the standard or alternative products exceeded the additional IAQ performance indicators.

4. Gypsum Board (N=4)

Section 01350 Concentration Limits

Both standard products exceeded Section 01350 concentration limits only for the State office calculations. Neither of the two alternative samples exceeded any concentration limits for the classroom or State office calculations.

Additional IAQ Performance Indicators

None of the standard or alternative products exceeded the additional IAQ performance indicators.

No significant difference in metal levels was found between standard and alternative products using energy-dispersive spectroscopy analysis. No mold spores were detected in any sample using scanning electron microscopy.

5. Paints (N=10)

Section 01350 Concentration Limits

Of the four standard paints tested, one exceeded Section 01350 concentration limits only for the State office calculations. Of the six alternative samples, none exceeded the Section 01350 concentration limits.

Additional IAQ Performance Indicators

Of the four standard paints tested, none exceeded the additional IAQ performance indicators for the classroom calculations and only one exceeded these indicators for the State office calculations. Of the six alternative samples, two exceeded these indicators for the classroom calculation and four exceeded these indicators for the State office calculation.

Neither of the two alternative paints tested, which are sold as "zero-VOC" and tested with "zero-VOC" primer, exceeded any indicators for both calculations. Of the three alternative recycled paints tested, all exceeded these indicators for the State office calculation.

6. Particleboard (N=2)

Section 01350 Concentration Limits

The standard product exceeded Section 01350 concentration limit only for the state office calculation, and the alternative product did not exceed any concentration limits for either the classroom or State office calculation.

Additional IAQ Performance Indicators

None of the standard or alternative products exceeded the additional IAQ performance indicators.

7. Plastic Laminates (N=4)

Section 01350 Concentration Limits

None of the two plastic laminates or two laminate assemblies exceeded any concentration limits for either the classroom or State office calculations.

Additional IAQ Performance Indicators

None of the standard or alternative products exceeded the additional IAQ performance indicators.

8. Resilient Flooring (N=23) (rubber and non-rubber based)

a. Non-Rubber Based (N=9)

Section 01350 Concentration Limits

Of the four standard products tested, two exceeded Section 01350 concentration limits for both the classroom and State office calculations. Of the five alternative products tested, three exceeded Section 01350 concentration limits for both classroom and State office calculations.

Additional IAQ Performance Indicators

None of the four standard products exceeded these indicators for either the classroom or the State office calculations. Of the five alternative products tested, two exceeded these indicators for both classroom and State office calculations.

b. Rubber-Based, Non-Tire-Derived (N=3)

Section 01350 Concentration Limits

Two of the three products exceeded Section 01350 concentration limits for both the classroom and State office calculations.

Additional IAQ Performance Indicators

None of the three products exceeded the additional IAQ performance indicators for either the classroom and State office calculations.

c. Rubber-Based, Tire-Derived (N=11)

Section 01350 Concentration Limits

Of the 11 products tested, 4 exceeded Section 01350 concentration limits for both the State office and classroom calculations.

Additional IAQ Performance Indicators

Of the 11 products tested, all exceeded the additional IAQ performance criteria for both the classroom and State office calculations. All emitted a large number of compounds that appeared as small peaks, in some cases numbering more than one hundred.

9. Tackable wall panels (N=2)

Section 01350 Concentration Limits

Neither of the products (one standard and one alternative) exceeded any concentration limits for either the classroom or State office calculations.

Additional IAQ Performance Indicators

None of the standard or alternative products exceeded the additional IAQ performance indicators.

10. Thermal Insulation (N=4)

Section 01350 Concentration Limits

One of the two standard products and one of the two alternative products exceeded Section 01350 concentration limits for the State office calculation.

Additional IAQ Performance Indicators

None of the standard or alternative products exceeded the additional IAQ performance indicators.

11. Wall Base (N=2)

Section 01350 Concentration Limits

Neither of the two standard products exceeded any concentration limits for either the classroom or the State office calculations. No alternative products were tested.

Additional IAQ Performance Indicators

None of the standard products exceeded the additional IAQ performance indicators.

As was mentioned earlier, one objective of this study was to measure emissions of tire-derived resilient flooring. Because these products were high-emitting compared to their alternative counterparts, we made additional calculations for this subcategory for building applications larger

than a classroom and State office. These applications were a State boardroom and an auditorium. It was intended that these additional calculations be used to understand how tire-derived resilient flooring products may perform if installed in larger areas such as gymnasiums and multi-purpose rooms. At the design ventilation rate for these areas (which is much higher than the ventilation rates for classrooms and offices), none of these products exceeded the concentration limit of the one Section 01350 chemical that was detected. For the auditorium, when a lower ventilation rate was used (ventilation systems of boardrooms and auditoriums typically vary the amount of ventilation based on occupancy), one product exceeded the Section 01350 concentration limit for one chemical for both the State boardroom and auditorium calculations, and three products exceeded the concentration limit for the same chemical for the State boardroom calculation.

The test results are summarized in Tables A–D (following this executive summary) and Tables 27–29 (in the main body of the report). Table A summarizes the number of samples that did and did not exceed Section 01350 concentration limits. Of the 77 products tested, when air concentrations were calculated for a State office, 28 product samples emitted one or more chemicals exceeding Section 01350 concentration limits. Of these 28 products, 15 were standard and 13 were alternative. Furthermore, of these 28 products, 25 exceeded concentration limits of only one chemical, 1 product exceeded limits of two chemicals, and 1 exceeded the limits for three chemicals. The most frequently exceeded limits were for naphthalene, formaldehyde, and acetaldehyde (Table 27).

Similarly, for the classroom calculations, 18 product samples emitted one or more chemicals exceeding Section 01350 concentration limits. Of these 18 products, 7 were standard and 11 were alternative.

Using additional IAQ performance indicators for odor threshold values, the interim concentration limit for caprolactam, and concentration limit for 2-butoxy-ethanol changes these results slightly. For the State office calculation, 2 additional standard and 4 alternative products exceeded these criteria (see Tables B–D and Table 29). The most frequently exceeded criteria were the limit for caprolactam, and odor thresholds for octanal and nonanal (Table 27).

Summary of Findings

1. Both standard and alternative products exceeded Section 01350 concentration limits more or less equally. Furthermore, alternative products performed similarly in both classroom and State office calculations, whereas for standard products twice as many products exceeded Section 01350 concentration limits for the State office calculations than they did for the classroom application.

2. The majority of the products that exceeded Section 01350 concentration limits did so by exceeding the limits of only one chemical.

3. Section 01350 concentration limits most frequently exceeded were naphthalene, formaldehyde, and acetaldehyde. Manufacturers should be encouraged to reduce emissions of these chemicals from their products.

4. When using additional IAQ performance indicators to Section 01350, more products were deemed as problematic. Modeled concentrations of standard products exceeded the concentration limits/criteria about equally as alternative products did.

5. The most frequently exceeded additional IAQ performance indicators were the interim concentration limit for caprolactam, and odor thresholds for octanal and nonanal.

6. With the exception of rubber-based resilient flooring, alternative products in this study performed about the same as standard products. One reason for this similarity is that several of the standard

products have similar characteristics with the alternative products, such as the amount and type of recycled content.

7. Although only 4 of the 11 tested tire-derived products exceeded Section 01350 for one chemical for the classroom and State office calculations, all 11 products emitted a large number of small peaks. In some cases, these peaks numbered more than 100. As most of these peaks constituted less than 1 percent of the total integrated area under the curve in the chromatogram, these chemicals were not reported.

Limitations

This study provides the reader with a better understanding on how Section 01350 can be used for screening building materials. Although this study does address chemicals of concern detected for each product, practitioners should request that manufacturers provide emissions data specific to the products they are considering for a specific project. Since specific names of manufacturers and products tested are not mentioned in this report, the results of this study should not be used to make specific product recommendations and selections.

The following limitations of this study need to be considered:

1. Due to the limited number of samples tested, the results of this study should not be used to make generalizations about the emissions of recycled-content products versus their standard counterparts. Depending on the surface area and average weekly ventilation rate for a specific application of a building material, both standard and alternative products may emit chemicals at concentrations of concern. Categorical generalizations about their relative impacts on IAQ can only be made when a larger probability-based survey is made of available standard and alternative products. Furthermore, the impacts of batch-to-batch variations of products need to be studied.

2. Although the same laboratory-measured emissions factors can be used for other applications, the resulting predicted concentrations are likely to be different from the ones presented in this report. This is because the calculated concentrations will depend on the amount of the material used in each application and the assumed weekly average ventilation rate. It is important to note that if the emissions measured in this study are used to model the use of the products in buildings, the emissions may be lower or higher than those measured. This can be due to a number of variables such as time between completion of construction and occupancy, building ventilation rates before and during occupancy, age of material between manufacturing and installation, or storage, delivery, and construction practices.

3. There may be additional chemicals of concern being emitted from the products studied. These chemicals may not have been found or identified using the sampling and analyses methods used in the study.

4. Repeated efforts were made to obtain samples with known production dates from all manufacturers. About half of the manufacturers whose products were tested provided samples and identified the samples' dates of manufacture. However, the other half did not agree to provide samples, so testing was performed on products obtained from commercial sources and the manufacturing dates were not known. The samples obtained from commercial sources were more likely to be representative of those a contractor or consumer might acquire in the marketplace. Therefore, the emissions from undated samples may be more realistic in terms of the actual "real world" exposures. However, caution should be used in making comparisons to newly manufactured products supplied by manufacturers.

5. All flooring products requiring adhesive were tested with adhesive using the procedures described in Section 01350. Therefore, the chemicals emitted from such assemblies are a combination of chemicals emitted by each flooring product and its adhesive and may be different from the chemicals emitted if the flooring product is tested without adhesive. The emission factors of some chemicals emitted from a flooring product may be reduced when this product is tested with adhesive, whereas chemicals emitted from the adhesive may increase with time especially after sufficient diffusion time is allowed (such as the 14-day period specified by Section 01350).

Conclusions

The calculated air concentrations, based on (a) a standard-size classroom and State office and (b) the laboratory-derived emissions factors suggest the following general conclusions:

1. Low-emitting, sustainable building materials are available within each of the categories studied.

2. Many products tested emitted chemicals at rates that result in calculated concentrations that exceed the concentration limits and screening criteria used in this study.

3. Limits were exceeded more or less equally by both standard and alternative products. Most products exceeded the Section 01350 limits for only one chemical.

4. Manufacturers should be encouraged to reduce emissions of naphthalene, formaldehyde, and acetaldehyde from their products.

5. Many identified chemicals do not have Section 01350 concentration limits or other guidelines. There is a need to develop health-based concentration levels for those chemicals that are of concern.

6. Variations within and between product categories suggest that individual products must be tested to determine compliance with the criteria used.

7. Some of the results reported in this study are inconsistent with those reported by industry-supported product certification programs, such as CRI's Green Label testing program for carpets and paint manufacturers' low- or no-VOC labels. These inconsistencies can be attributed to (a) the differences in the sampling and analytical techniques employed by these programs and those used in this study; or (b) to the definitions upon which these labels are based. Other researchers have reported similar discrepancies between their findings and those of industry-supported programs. Based on the results of this study, manufacturers are encouraged to conduct product testing according to Section 01350 through independent laboratories.

8. CRI's Green Label specifications were originally intended primarily for carpets with SBR latex backing. Since many of the carpet products in the market today do not have such backing, the use of the CRI Green Label for such carpets needs to be re-evaluated.

9. Results of product emission tests in this study should not be assumed to apply to other similar products.

10. Results of the product emission tests in this study should not be assumed to be similar to comparable products used in completed classrooms or State offices where other products not measured in the study are used and different installation, ventilation, and other conditions may prevail.

11. Further testing is needed to determine the extent to which the products tested in this study are representative of the product types or categories from which they were selected.

12. Further refinement and testing of rubber-based resilient products is necessary before these products can be promoted for wide use in most indoor environments. The additive health effects associated with the numerous compounds (numbering in the hundreds in some cases) detected at low concentrations in these products needs to be examined. These products may be used in larger spaces such as gymnasiums and multi-purpose rooms provided that (a) the proper design ventilation rates are supplied to these spaces and (b) design ventilation rates are maintained continuously during partial and full occupancy loads.

13. From the additional IAQ performance indicators established for this study, the interim concentration limit for caprolactam was exceeded most frequently, followed by the odor thresholds for octanal and nonanal.

14. The emissions from samples obtained from manufacturers directly after production and products obtained from commercial sources may differ significantly, and results should be interpreted cautiously. While all study samples were conditioned for 10 days before commencing the 96-hr test period, some significant differences in environmental history may exist between and among samples obtained from diverse sources. The emissions in a short-term test may be affected by product age, packaging, storage, transport, environmental conditions, exposure to emissions from similiar or dissimilar products, and other factors. Longer-term tests may be less affected by such differences. Certainly the 10-day conditioning period specified in Section 01350 decreases the potential differences, but it cannot completely eliminate them.

15. It is important that all manufacturers cooperate fully in studies or testing programs whose results may be used to compare the tested products. Further research on the differences between new and aged building products is also necessary.

This report does not address sustainability criteria other than recycled content and emissions of VOCs of finished building products. For example, this report does not address emissions generated during the manufacturing of each product, disposal of these products at the end of their useful life, environmental effects of product transportation between manufacturing plants and job sites, packaging, etc. Furthermore, this report does not address other components for maintaining healthy indoor environments such as ventilation and microbial contamination.

Table A. Summary of Number of Samples That Did and Did Not Exceed Section 01350 Concentration Limits for a Typical State Office and Classroom

Material Category			Did Not Exceed Section 01350[1]		Did Exceed Section 01350		Total Samples
			Standard	Alternative	Standard	Alternative	
Acoustical Ceiling Panels			3	3	1	0	7
Carpets		State office	4	3	5	2	14
		classroom	5		4		
Fiberboard		State office	0	2	2	1	5
		classroom	2	3	0	0	
Gypsum Board		State office	0	2	2	0	4
		classroom	2		0		
Paints		State office	3	6	1	0	10
		classroom	4		0		
Particleboard		State office	0	1	1	0	2
		classroom	1		0		
Plastic Laminates			3	1	0	0	4
Resilient Flooring	Non-Rubber-Based		2	2	2	3	9
	Rubber-Based, Non-tire-Derived		None tested	1	None tested	2	3
	Rubber-Based, Tire-Derived	State office	None tested	7	None tested	4	11
		class-room					
Tackable Wall Panels			1	1	0	0	2
Thermal Insulation		State office	1	1	1	1	4
		classroom	2	2	0	0	
Wall Base			2	None tested	0	None tested	2
Totals (State office)			19	30	15	13	77
			49		28		
Totals (classroom)			27	32	7	11	
			59		18		

[1] Numerous products that did not exceed Section 01350 concentration limits exceeded other IAQ performance indicators such as odor thresholds values, interim concentration limit for caprolactam, concentration limit for 2-butoxy-ethanol, and contained chemicals on the Proposition 65 and/or Toxic Air Contaminant (TAC) lists. The reader is advised to utilize additional screening criteria listed in this report (see Table 29). Furthermore, there may be chemicals of concern not found or identified using the measurement techniques utilized in this study.

Table B. Flooring Products: Number of Chemicals Exceeding Concentration Limits and Other Criteria for the State Office Calculation

Material Category	Standard or Alternative			Product ID	Section 01350 Concentration Limits	Target Chemicals Present		Odor Threshold Values	Interim Concentration Limits
						Prop. 65	TAC list		
Carpeting	Standard			**2**			*8*		
				6	*1*	*3*	*10*		
						2	*9*		
				8		*1*	*5*		
				18 & 5	*1*	*3*	*12*		*1*[1]
							4		
				19 & 4	*1*	*2*	*12*	*2*	*1*[1]
							5		
				34	*1*	*3*	*13*	*2*	*1*[1]
				35	*3*	*4*	*11*	*3*	*1*[1]
				39			*3*		
				40			*3*	*1*	
	Alternative			**7**		*2*	*6*		
				9	*1*	*4*	*12*		*1*[1]
						5	*12*		
				36	*1*	*2*	*8*		
						4	*10*		
				37			*6*		
				38			*6*		
Resilient Flooring	Standard			**11**		*1*			
				13		*3*	*11*		
				79	*2*	*1*	*5*		
						2	*6*		
				80 & 87	*1*	*3*	*4*		
						1	*3*		
	Alternative	Non-rubber-based		**12**	*1*	*4*	*13*	*1*	*1*[2]
				14	*1*	*1*	*10*		
				15		*1*	*9*		
				81		*2*	*4*		
				90	*1*	*2*	*4*	*2*	
		Rubber-based	Non-tire-derived	**70**	*1*		*2*		
							2		
				75		*2*	*4*		
				84	*1*	*3*	*7*		
			Tire-derived	**64**			*1*		
				65			*2*		
				66		*1*	*3*		
				67		*1*	*3*		
				71		*1*	*5*		
				72	*1*	*3*	*9*		
				73	*1*	*1*	*6*		

Table B. Flooring Products: Number of Chemicals Exceeding Concentration Limits and Other Criteria for the State Office Calculation

Material Category	Standard or Alternative	Product ID	Section 01350 Concentration Limits	Target Chemicals Present		Odor Threshold Values	Interim Concentration Limits
				Prop. 65	TAC list		
		74			*3*		
		76	*1*	*2*	*7*		
		77	*1*	*3*	*8*		
		85 & 86		*2* *2*	*7* *9*		*1*[2]
Wall Base Board	Standard	**78**		*2*	*8*		
		83		*2*	*8*		

[1] Caprolactam
[2] 2-butoxy-ethanol

Table C. Composite Wood Products: Number of Chemicals Exceeding Concentration Limits and Other Criteria for the State Office Calculation

Material Category	Standard or Alternative	Product ID	Section 01350 Concentration Limits	Target Chemicals Present		Odor Threshold Values	Interim Concentration Limits
				Prop. 65	TAC list		
Fiberboard	Standard	**51**	*1*	*1*	*1*		
		52	*1*	*1*	*2*		
	Alternative	**20**		*5*	*14*		
		21	*1*	*5*	*14*		
		24		*4*	*10*		
Particleboard	Standard	**23**	*1*	*2*	*7*		
	Alternative	**22**		*2*	*8*		
				2	*7*		
Plastic Laminates	Standard Laminate Only	**55**		*1*	*3*		
		56		*2*	*3*		
	Standard Assembly	**61**		*2*	*4*		
		62		*2*	*6*		
				1	*5*		
Tackable Wall Panels	Standard	**16**		*1*	*6*		
	Alternative	**17**		*2*	*6*		

Table D. Wall and Ceiling Products: Number of Chemicals Exceeding Concentration Limits and Other Criteria for the State Office Calculation

Material Category	Standard or Alternative	Product ID	Section 01350 Concentration Limits	Target Chemicals Present		Odor Threshold Values	Interim Concentration Limits
				Prop. 65	TAC list		
Acoustical Ceiling Panels	Standard	**29**	*1*	*1*	*4*		
		31			*1*		
		32			*3*		
		33		*1*	*5*		
	Alternative	**25 & 28**		*1*	*2*		
				1	*2*		
		26 & 27		*1*	*5*		
		30		*1*	*6*		
				1	*5*		
Gypsum Board	Standard	**57**	*1*	*1*	*1*		
		58	*1*	*1*	*1*		
	Alternative	**59**					
		60		*1*	*1*		
Paints	Standard	**41**		*1*	*1*	*1*	
		42					
		45			*1*		
		46	*1*		*2*		
	Alternative	**43**					
		44				*1*	
		47			*1*		
		48			*1*	*1*	
		49			*2*	*1*	
		50			*2*	*1*	
Thermal Insulation	Standard	**54**	*1*	*1*	*1*		
		68		*2*	*3*		
	Alternative	**53**	*1*	*1*	*1*		
		69		*2*	*8*		