Building Material Emissions Study

November 2003

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Preface

This study was conducted by the California Department of Health Services (DHS), beginning in late 2001 and ending in the spring of 2003. The research was conducted within the Indoor Air Quality Section of the Department's Environmental Health Laboratory Branch (EHLB). The study was funded by the California Integrated Management Board (CIWMB) through a contract with the Public Health Institute (PHI). Substantial in-kind support was provided by DHS. This final report was written by Mr. Leon Alevantis in fullfilment of the contract previously mentioned and was reviewed by DHS staff, PHI staff, CIWMB staff, and the advisory group members listed below. Manufacturers that submitted samples to us were also invited to comment on the draft report. First-person references in the text relating to the study refer to the tasks of the research team.

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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[*] 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:

[*] 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*		
		Rubber-based, 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*	*7*		*1*[2]
				2	*9*		
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*		

Section 1. Introduction

1.1 Background

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

Recycled content is defined in a few ways. Postindustrial recycled content is defined as "fragments of finished products or finished products of a manufacturing process, which has converted a resource into a commodity of real economic value, but does not include excess virgin resources of the manufacturing process." Postconsumer recycled content is "a finished material which would have been disposed of as a solid waste, having completed its life-cycle as a consumer item." (CIWMB, "Manufacturer Identification of Recycled Content," www.ciwmb.ca.gov/Publications/default.asp?pubid=889.) In other words, postconsumer recycled-content products contain materials that have been collected from end users. Postindustrial recycled-content products contain materials that have been collected from manufacturers or industry. "Total recycled content" refers to recycled content consisting of one or both of these types of materials.

While recycled-content products are being promoted for use in sustainable State buildings and high performance schools, little was known regarding chemical emissions from such products. Although there have been a number of studies that reported volatile organic compound (VOC) emissions from various building materials, these studies did not compare commonly used interior products containing low or no recycled content to their counterparts with postconsumer and high total recycled content.

This lack of data on whether or not recycled-content products used indoors may adversely affect indoor air quality (IAQ) prompted the CIWMB to approve and fund this study. As more information is collected on emissions of products with various amounts of recycled content, markets for products with increased recycled content that enhance IAQ could be expanded.

A study of standard product emissions compared to alternative product emissions is essential in the goal to increase sustainable construction in schools and State buildings. Alternative products as defined for this study not only include recycled-content products, but also take into consideration the definition of an environmentally preferable product as "a product that promotes healthy indoor environments…" (Public Resources Code section 42635). Such materials utilize increased amounts of recycled content or other environmental features with the goal of reducing impacts to the environment during their production and disposal. While a complete life cycle assessment approach would have been the most desirable approach for this study, the main emphasis focused on materials efficiency, including recycled-content products and their impact on IAQ.

1.2 School Classrooms

California continues to experience a tremendous growth of its student population. As a result, numerous State and local school bonds have been passed. More than $50 billion will be spent over the next several years for new school construction, including building more than 400 new schools.

[†] 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 (Strom-Martin, AB 75), Public Resources Code sections 42920–42928.

Although these estimates may be decreased due to the State's current budget crisis, they indicate the magnitude of planned public school construction.

About a third of classrooms currently in use in California are portable classroom units. More portable classrooms will likely be used in the future because they are an economical answer to the increasing demand for classrooms due to reduced class size and population growth.

As a result of the increased use of portable classroom units and indoor air quality concerns in these units, a "California Portable Classrooms Study" was originally proposed by Governor Davis and is part of a legislative mandate specified in AB 2872 (Shelley, 2000) and California Health and Safety Code section 39619.6. The Air Resources Board (ARB) and the Department of Health Services (DHS) jointly conducted this study in order to learn about differences in IAQ between permanent and portable classrooms from emissions of construction materials and furnishings used. (CARB, 2001) However, the California Portable Classrooms Study did not directly measure emissions from those materials that may be causing specific emissions of chemicals of concern—such as formaldehyde—in these classrooms. By contrast, the study presented herein reports specific emissions of chemicals of concern associated with certain building materials used in classroom construction.

1.3 State Facilities

State government owns and operates an immense inventory of public infrastructure—89 million square feet of building space—and leases 21 million square feet. Additionally, the State of California invests approximately $2 billion annually for the design, construction, and renovation of State facilities.

Recognizing the tremendous opportunities that exist to expand the State's sustainable building activities, Governor Davis issued Executive Order D-16-00 in August 2000 (State of California, 2000). This Executive Order directed the Secretary of the State and Consumer Services Agency, Ms. Aileen Adams, to develop a "road map" with recommended strategies on how the State could "…site, design, deconstruct, construct, renovate, operate, and maintain buildings that are models of energy, water, and materials efficiency while providing healthy, productive and comfortable indoor environments, and long-term benefits to Californians." To implement the Governor's Executive Order, the Secretary formally convened the Sustainable Building Task Force, a group consisting of more than 40 California State governmental agencies. In December 2001, the task force released its implementation plan entitled *Building Better Buildings: A Blueprint for Sustainable State Facilities* (State of California, 2001). These recommendations include, among others, specification and selection of environmentally preferred products for construction and diversion of waste from landfill disposal by increasing markets of products with high-recycled content. The study reported herein is part of this goal.

Given that interior finish materials in classrooms and State offices are generally similar, we did not differentiate between materials used in classrooms and those used in State offices. However, calculations of modeled concentrations were made for both typical classroom and State office applications.

1.4 Statutory Mandates

The CIWMB and DHS each have had long-standing mandates relevant to this study. These mandates are listed below:

1. The waste diversion mandate of the CIWMB was enacted to reduce the amount of waste generated by cities and counties going to California's landfills. Another subsequent CIWMB mandate, AB 75 or the State agency waste diversion law (Chapter 764, Statutes of 1999, Strom-Martin, Public Resources Code section 42921 [b]), was enacted to require that State agencies reduce waste by 50 percent by 2004.

In 1999, the CIWMB released a document entitled *Sustainable Building Implementation Plan* that outlines the Board's sustainable building goals including increased use of recycled-content products and waste reduction related to building construction. The plan states: "The principles of sustainable building are directly in line with the resource efficiency, waste diversion, and market development objectives of the CIWMB. Sustainable buildings have a high potential to improve the markets for used- and recycled-content materials, given the high levels of debris entering landfills as a result of construction and demolition activities in California." The first goal of the CIWMB listed in this plan is to "support the Integrated Waste Management Act of 1989 by improving resource efficiency, enhancing markets for used- and recycled-content building and landscaping products, and increasing diversion of materials from landfills."

2. Public Resources Code section 42642 directs the Division of the State Architect, in consultation with the CIWMB, to "develop and maintain on its Web site, a list of environmentally preferable products and a list of recycled products that may be used in the construction and modernization of school facilities."

3. Health and Safety Code section 105405 directs DHS to develop "guidelines for the reduction of exposure to VOCs from construction materials in newly constructed or remodeled office buildings." (California Health and Safety Code). In response to this mandate, DHS released a document in 1996 entitled *Reducing Occupant Exposure to Volatile Organic Compounds (VOCs) from Office Building Construction Materials: Non-Binding Guidelines*. This publication is intended for use by building professionals interested in reducing VOC concentrations in new construction. It summarizes existing knowledge and offers a rational framework on this subject.

   In addition to the mandates mentioned above, other State agencies and departments, such as ARB and the Office of Environmental Health Hazard Assessment (OEHHA), also have long-standing mandates on indoor air quality-related issues.

1.5 Development of Environmental Specifications

In 1999, the Legislature directed the Department of General Services (DGS) to incorporate sustainable building measures into the design and construction of a $392 million State office building complex in Sacramento known as the Capitol Area East End Complex (CAEEC). This five-building, 1.5 million square-foot complex, completed in the spring of 2003, is the largest single State government office construction project in California history.

A multi-agency "Green Team" was formed under the direction of Ms. Aileen Adams, the Secretary of the State and Consumer Services Agency. The Green Team consisted of representatives from DHS, CIWMB, the California Energy Commission (CEC), and ARB. With input from other State agencies, the Green Team worked with DGS to integrate sustainable building measures into the CAEEC. These measures included, among others, general requirements for enhanced IAQ, minimum recycled content of numerous building materials, energy efficiency, and other resource efficiency measures (Alevantis, 2002).

In 2000, DHS, CIWMB, and CEC, with input from other State agencies, the office furniture industry, and consultants, issued a benchmark environmental specification for procuring office furniture systems (Levin, et al., 2000). This specification includes criteria for IAQ, recycled content, and energy-efficient lighting. It was included in the DGS open-bidding process and subsequent three-year contract for Open Office Panel Systems.

The specification developed for office furniture systems was used as the basis for developing *Special Environmental Requirements* (Section 01350), an environmental specification for screening building materials by one of the two design and construction teams of the CAEEC (Bernheim, et al., 2002). These specifications include emissions-testing procedures and require certifications for recycled materials meeting the State Agency Buy Recycled Campaign (SABRC) requirements. Section 01350 has now been rewritten for use on other projects and is included in

two State publications: *Reference Specifications for Energy and Resource Efficiency* (CEC, 2001) and the *Collaborative for High Performance Schools: Best Practices Manual, Material Specifications* (CHPS, 2002). Appendix A of this report lists the entire text of this specification used in this study. The most current version can be downloaded at the following Web sites: www.chps.net or www.eley.com or www.ciwmb.ca.gov/GreenBuilding/Specs/Section01350/. More detailed information on California's recent sustainable building efforts can be found in Alevantis and Levin (2002) and Alevantis, et al. (2002).

1.6 Need for the Study

Although recycled-content products are promoted for use in sustainable State buildings and high performance schools, very limited data are available on emissions of building materials with high recycled content or with other environmental factors. Therefore, the main objective of this study was to measure and compare emissions from commonly used building materials, hereafter referred to as "standard" products, to their alternative sustainable counterparts, hereafter referred to as "alternative" products. Alternative products include higher amounts of recycled content and products marketed as containing no or low VOCs as well as being rapidly renewable.

This study was developed as the outgrowth of discussions on this issue among CIWMB, DHS, and staff from other State agencies. The study focused entirely on those building materials with potential IAQ implications and consisted of three phases: (a) Phase 1 focused on building materials used for traditional and portable classroom construction in California; (b) Phase 2 focused on materials specific to State construction; and (c) Phase 3 focused on tire-derived flooring products.

Another objective of this study was to evaluate the appropriateness of a screening specification, known as Section 01350, for selecting building materials for use in classrooms and State office buildings.

Although Section 01350 has been applied to a number of projects, little is known on whether or not all chemicals of concern to the State are included in this specification. In order to address this concern, we investigated the applicability of Section 01350 as a screening tool for building materials and identified additional chemicals of concern to the State using the test methods and reporting procedures described in Section 01350.

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.

Section 2. Methodology

2.1 Material Category and Product Selection Process

Phase I (Classrooms)

To establish the material categories and specific product names for testing in Phase I, we adhered to the following four steps. At each step, the advisory group for the study was consulted and provided input.

1. We contacted three practicing architects with experience in school construction and a member of the Collaborative for High Performance Schools (CHPS) Professional Advisory Group. Based on these communications, we established an initial list of standard interior finish material categories for permanent classroom construction.

2. We contacted the 10 largest school districts in California and spoke with the person responsible for purchasing or specifying the carpeting for each district. Generally, this person was an architect, facility manager, or relocatable classrooms manager and was usually able to name the specific manufacturers and products specified by the school district. Some of these contacts described their district's desired or required carpet characteristics. Los Angeles Unified School District and Sacramento Unified School District also sent us their school district's actual specifications. We were successful in obtaining information from eight of these school districts. The districts' responses for carpeting are summarized in Table 1. Information on resilient flooring was also collected during these communications.

3. Next, we called the four major manufacturers of portable classrooms to inquire about the manufacturers of the interior finish materials they specify and install. Two of the four manufacturers responded with the names of the manufacturers and products they use for gypsum board, tackable wall panels, medium density fiberboard (MDF), carpet, and paint.

4. With input from the study's advisory group and the product manufacturers, we determined that the types of materials used in permanent classrooms were similar to those used in portable classrooms. Based on all of the information we collected on general use of building materials in classrooms, we developed a list with the material categories and the specific product brands to be tested.

Phases II and III (State Office Buildings)

During Phases II and III we evaluated numerous specifications for State-owned and leased projects. As a result of this effort we developed a preliminary list of products that are typical to State construction. We also conducted numerous conference calls with the members of the study's advisory group and received their input as to what materials and product brands are typically specified in State office buildings. Additionally, we received limited input from some product manufacturers as to what products their clients typically specify in mid-priced office buildings. Based on these communications, we finalized the list of standard products. A list of alternative products was developed through a search of several environmentally preferable product directories including Green Spec, ADPSR's *Architectural Resource Guide*, and CIWMB's Recycled Content Products Database. With input from the advisory group, a list of the 11 material categories and 77 standard and alternative products was finalized.

2.2 Description of Selected Building Materials

All the manufacturers of the products we tested were initially contacted via telephone. We requested samples of materials recently manufactured. In most cases, either the manufacturers or their local representatives complied with our request. However, in a few cases, manufacturers either delayed shipment of samples or declined to send samples. In some of these cases, we purchased products directly from the marketplace.

2.2.1 Age of Samples

Repeated efforts were made to obtain samples with known production dates from all manufacturers. About half of the products manufacturers we tested cooperated with us by providing samples and identified the samples' dates of manufacture. However, half of the manufacturers whose products we tested 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.

Below we summarize the age of samples between each product's manufacturing date and start of conditioning. Categories not listed below had unknown manufacturing dates. Appendix N lists all the details:

1. Acoustical ceiling panels: Of the nine distinct samples received, five were dated, and at the start of conditioning in the laboratory they were 3 to 37 days old.

2. Carpets: Of the 13 distinct samples received, 8 were dated, and at the start of conditioning in the laboratory, they were 4 to 34 days old, with the exception of 1 sample that was 634 days old.

3. Fiberboard: Of the five samples received and tested, only two were dated. The dates at the start of conditioning were 13 and 17 days.

4. Gypsum board, particleboard, plastic laminate, wall base, and tackable wall panels: None of the following samples were dated: four gypsum board samples, two particleboard samples, four plastic laminates, two wall base samples, and two tackable wall panels.

5. Paints: Manufacturing dates for paints are not as important as for the other products. This is because there is very little product emission from manufacturing to application, since these products are contained in sealed containers. Nevertheless, we were able to locate manufacturing dates for 9 of 10 products tested and the dates ranged from 75 to 730 days.

6. Resilient flooring (non-rubber): Of the 9 distinct samples received and tested, only 3 were dated, ranging from 54 to 174 days. One sample was 736 days at the start of conditioning, but an identical dated sample (54 days old) was received and tested at a later time.

7. Resilient flooring (rubber-based): Of the 14 distinct samples received and tested, 10 were dated, ranging from 45 to 111 days.

8. Thermal insulation: Of the four samples received and tested, two were dated. The dates at the start of conditioning were 50 and 57 days.

We note that some of the materials tested may or may not be available at the time this report is published. For example, some products may have been re-formulated, may be available only as a special order item, or may have been discontinued.

2.2.2 Product Descriptions

We tested materials in 11 major categories:

1. **Acoustical Ceiling Panels**: Most mineral board acoustical ceiling panels are manufactured with postindustrial waste. Products were considered alternative products if they contained more than 50 percent total recycled content. We tested a total of seven acoustical ceiling panels with the following general characteristics:

   Standard Products (N=4):

Four products with up to 45 percent recycled content.

Alternative Products (N=3)

a) One product with up to 60 percent total recycled content with 10 percent postconsumer recycled content.

b) One product with up to 70 percent total recycled content.

c) One product with up to 60 percent total recycled content with 20 percent postconsumer recycled content.

2. **Carpeting**: While it turned out that several of the standard products contained some recycled content, these products were selected for their typical use in classrooms and State construction. Alternative carpet products were selected based on the fact that they contain at least 50 percent total recycled content with at least 10 percent postconsumer content.

   We tested a total of 14 carpet samples with the following general characteristics:

   Standard Products (N=9)

   a) Six broadloom carpets. Two had no recycled content and four had up to 25 percent recycled content. All broadloom carpets were PVC-free and were certified by the Carpet and Rug Institute (CRI) "Green Label" Testing Program for carpets, herein referred to as "CRI-certified." Four products had 100 percent Nylon 6 face yarn, while the others were made with Nylon 6,6 face fiber.

   b) Three carpet tiles. One had up to 25 percent recycled contents and two had none. Two were PVC-free and one had PVC-backing. All were CRI-certified and one had 100 percent Nylon 6 face fiber.

   Alternative Products (N=5)

   a. One broadloom carpet with 50 percent total recycled content including 25 percent postconsumer recycled content. It was PVC-free, made with Nylon 6 face fiber, and CRI-certified.

   b. Four carpet tiles with between 45 and 100 percent postconsumer recycled content. Two had PVC backing and all four were CRI-certified. None of the alternative carpet tiles were made with Nylon 6 face fiber.

3. **Fiberboard**: Most standard fiberboard products contain at least 25–60 percent recycled content. Standard fiberboard contains urea formaldehyde binders. Alternative products were chosen for recycled content as well as their alternative binder (methylenediphenyl isocyanate) characteristics.

   We tested five fiberboard samples with the following characteristics:

   Standard Products (N=2)

   a. One wood-based MDF product with 25 percent postindustrial recycled content fibers and urea formaldehyde binder.

   b. One wood-based MDF product with 60 percent postindustrial recycled content fibers and urea formaldehyde binder.

   Alternative Products (N=3)

   a. Two wood-based MDF products made with 25 percent recycled content and methylenediphenyl isocyanate binder.

b. One low-density fiberboard product made with 100 percent postconsumer recycled newsprint.

4. **Gypsum Board**: According to our research for this study, all gypsum board products sold in California contain 100 percent recycled content in the face paper. Alternative products were chosen based on recycled content in the gypsum board core.

   We tested a total of four gypsum board samples with the following general characteristics (one additional product was tested that was used only as a substrate for all paint samples):

   Standard Products (N=2)

   Two products made with newly manufactured gypsum.

   Alternative Products (N=2)

   a. One product with 5 percent postindustrial recycled content.

   b. One product with a core made with 3 percent postconsumer recycled content.

5. **Paints**: Standard paints were chosen due to common use in State office buildings. Alternative paints were chosen if they contained at least 50 percent postconsumer recycled content or if they were advertised as containing no or low VOCs.

   Products advertised as low or no VOC are regulated under the Clean Air Act. The definition of VOCs under the Clean Air Act excludes numerous compounds of concern for IAQ simply because they are not reactive and, therefore, do not contribute significantly to the formation of photochemical smog. However, in indoor environments, all VOCs that have a potential impact on human health, comfort, or performance are important to consider. Therefore, the definition of VOCs under the Clean Air Act is not appropriate for indoor air considerations.

   We tested a total of 10 paints with the following general characteristics (all samples requiring primer were tested with the manufacturers' recommended product):

   Standard Products (N=4)

   a. One interior acrylic flat paint (one does not require primer and was tested as such).

   b. Three interior eggshell enamels.

   Alternative Products (N=6)

   a. Three interior latex eggshell "zero-VOC" paints.

   b. Three interior/exterior recycled latex paints made with 50 percent postconsumer recycled content paint.

6. **Particleboard**: Although standard particleboard contains some recycled content, it contains urea formaldehyde binder. An alternative product was selected based on high total recycled content and its alternative non-formaldehyde based binder (methylenediphenyl isocyanate) characteristics.

   We tested two particleboard samples with the following characteristics:

   Standard Product

   One product made with 25 percent recycled content.

   Alternative Product

   One product made with 90 percent recycled content and a non-formaldehyde based (methylenediphenyl isocyanate) binder.

7. **Plastic Laminates**: Two commonly used laminates were chosen as standard products. These products were tested in assembly over a standard fiberboard product. The standard assembly followed typical construction practices and two of the four edges were not laminated. The alternative assembly had all four edges laminated. It was anticipated that laminating all four edges would reduce formaldehyde emissions from the standard fiberboard core.

   We tested a total of four plastic laminate samples and assemblies with the following general characteristics:

   Plastic Laminates Only (N=2)

   Two laminate samples were tested, one of which was made with 10 percent recycled content.

   Plastic Laminate Assemblies (N=2)

   One of the two laminate samples that were tested separately was also tested in assembly with the same fiberboard substrate (which was also tested separately).

8. **Resilient Flooring**: Standard resilient flooring was chosen based on common use in schools and state construction. At least one product contained some recycled content. Alternative resilient flooring was chosen based on containing at least 35 percent recycled content, as well as other environmental considerations such as PVC-free, and rapidly renewable. All tire-derived products were chosen with a minimum of 85 percent postconsumer recycled content.

   Non-Rubber-Based: We tested a total of nine resilient flooring non-rubber-based samples with the following general characteristics:

   Standard Products (N=4)

   a. Two vinyl composition tiles (VCT) and one sheet vinyl, all with no recycled content.

   b. Two VCTs with vinyl containing 10 percent recycled content.

   Alternative Products (N=5)

   a. Two linoleum sheet products with rapidly renewable ingredients.

   b. One tile (interlocking type) made of PVC and 100 percent recycled content.

   c. One PVC-free tile.

   d. One VCT with a base layer containing 35 percent recycled content.

   Rubber-Based: We tested 3 non-tire derived and 11 tire-derived resilient flooring rubber-based samples with the following general characteristics:

   Alternative Products (Non-Tire Derived) (N=3)

   Three samples were tested with thicknesses varying from 2 mm to 4 mm. All were sheet flooring. However, all sheet flooring products are available also as tiles. All samples were tested with adhesive. For most products, postconsumer recycled content varied from 5 percent to 100 percent.

   Alternative Products (Tire-Derived) (N=11)

   Eleven samples were tested with thicknesses varying from 2 mm to 10 mm. All were sheet flooring; two of which were tiles. However, all sheet flooring products are available also as tiles. All samples were tested with adhesive with the exception of one tile that because of its weight does not require adhesive. One sheet flooring sample was tested also with its manufacturer-recommended sealer. Total recycled content varied from 10 percent to 90 percent.

9. **Tackable wall panels**: We tested two tackable wall panels. One consisted of vinyl over wood fiberboard and the other consisted of fabric over fiberboard and gypsum board. The standard product was chosen due to typical use in classrooms. The alternative product contained no pressed wood, but was tested with recycled-content fiberboard.

10. **Thermal Insulation**: California state law requires fiberglass insulation to contain at least 30 percent recycled-content glass. (Public Resources Code section 19511). Since most standard products contain formaldehyde binders, alternative products were chosen based on their alternative binder characteristics. We tested four thermal insulation samples with the following characteristics:

    Standard Products (N=2):

    Two fiberglass-based batt insulation products, both with urea formaldehyde binder.

    Alternative Products (N=2):

    One fiberglass-based batt product with 20 percent postconsumer recycled content and no added formaldehyde, and a cellulose-based, spray wet-applied product with 80 percent recycled content cellulose.

11. **Wall Base**: We tested two standard 4-in wall base, rubber-based samples. No alternative products were tested.

In order to minimize the possibility of VOCs associated with product coloring process, in general we tested light-colored products for paints and resilient flooring. This did not apply to recycled paint, since recycled paint was not available in light colors.

Rubber-based resilient flooring is typically available in both roll and tile with the exact same material composition. Some rubber-based products described as tiles in this report are available only as a 36 x 36-in matt.

We selected adhesives and paints meeting the South Coast Air Quality Management District's VOC limits (SCAQMD Rule 1168 Adhesive and Sealant Applications available at www.aqmd.gov/rules/html/r1168.html and SCAQMD Rule 1113, Architectural Coatings available at www.aqmd.gov/rules/html/r1113.html). These limits are in grams of reactive VOCs per liter of product:

1. Carpet adhesive 50 g/L
2. Rubber flooring adhesive 60 g/L
3. VCT adhesive 50 g/L
4. Baseboard adhesive 50 g/L
5. Paint
    a) Primer: maximum VOC 200 g/L
    b) Flat: maximum VOC 100 g/L
    c) Non-flat: maximum VOC 150 g/L
    d) Recycled: maximum VOC 250 g/L
6. Contact adhesive: Before 1/1/03: 250 g/L. After 1/1/03: 80g/L

In indoor environments, all VOCs that have a potential impact on human health, comfort, or performance are important to consider. Products advertised as low- or no-VOC are regulated under the Clean Air Act. The definition of VOCs under the Clean Air Act excludes numerous compounds of concern to indoor air quality simply because they are not reactive and, therefore,

do not contribute significantly to the formation of photochemical smog. Therefore, the definition of VOCs under the Clean Air Act is not appropriate for indoor air considerations.

All the carpets tested were certified by the Carpet and Rug Institute's (CRI) "Green Label" Testing Program for Indoor Air Quality (www.carpet-rug.com). Carpet manufacturers use the CRI/IAQ Testing Program label for specific product types. Product types usually include multiple product lines of carpets. Products are re-tested quarterly. The current 24-hour emission criteria for the program are based on the following maximum emission factors:

1. Total Volatile Organic Compounds: 500 µg/m² ·hr
2. 4-PCH (4-Phenylcyclohexene): 50 µg/m² ·hr
3. Formaldehyde (to prove that none is used): 50 µg/m² ·hr
4. Styrene: 400 µg/m² ·hr

We note that the test results reported in this report were obtained after the 10-day conditioning period followed by the four-day test period as specified in Section 01350, whereas CRI's tests are performed after only 24 hours with no prior conditioning.

Tables 2 through 12 show the descriptions of the products that received and tested. Alternative products tested were chosen based on environmental and cost considerations. The products tested do not necessarily reflect all the products currently specified and used in State office building or school construction, nor do they represent all the alternative products available on the market today. However, we believe that the products tested provide a reasonable representation of the products used in California State office buildings and schools. In some product categories where only a limited number of manufacturers and products exist, such as in the case of tire-derived resilient flooring, we tested the majority of the products available in the market during the timeframe of this study.

2.3 Methods

2.3.1 Specimen Handling

Upon receipt of the test samples at the DHS laboratory we did one of the following:

a) Acoustical ceiling panels: Some samples were wrapped in foil; no special storage procedures were followed for samples wrapped in plastic shrink wrap.

b) Broadloom and tile carpet: Broadloom samples arrived in large rolls and were not transferred to another storage medium. Carpet tiles were wrapped in aluminum foil or left in original Mylar® bags.

c) Carpet tiles with self-adhesive: Samples arrived in Mylar® bags and were not transferred to another storage medium.

d) Resilient flooring samples: Samples were removed from their original packaging and placed in aluminum foil.

e) Tackable wall panels, fiberboard, and particleboard samples: Some samples were wrapped in foil; no special storage procedures were followed for samples wrapped in plastic shrink wrap.

f) Gypsum boards: Samples were wrapped in foil.

g) Paints: No special storage procedures were followed.

h) Plastic laminate: Samples were wrapped in foil.

i) Wall base: Samples were wrapped in foil.

j) Thermal insulation: Some samples were wrapped in foil; no special storage procedures were followed for samples wrapped in plastic.

k) Adhesives: No special storage procedures were followed.

These samples were stored at room temperature until they were placed in the conditioning chamber. Sample pieces were cut so that all edges were freshly cut.

2.3.2 Specimen Preparation

Specimens were prepared according to the procedures described in Section 01350 (see Appendix A) and work reported in the literature previously cited (Hodgson, 1999; Hodgson, et al., 2000, 2001, and 2002). 6 x 6 in specimens were prepared and placed on wire racks in a large chamber for a ten-day preconditioning period. Similar types of materials were conditioned at any given time. This 85 x 131 x 82 in (2.16 x 3.3 x 2.08m) chamber is temperature- and humidity-controlled. The chamber temperature was maintained at 23±2°C and the relative humidity was kept at 50±5 percent. The total airflow delivered to the chamber was 280 cfm (130 L/s), of which 93 cfm (44 L/s) was outdoor air resulting in an air change rate of 10 ach. The chamber was equipped with 95 percent efficiency filters, a HEPA unit, and two beds of activated charcoal (approximately 32 lbs). The chamber's ducting was configured for 35 percent outdoor air and 65 percent recirculated air and for filtration of the outdoor air stream.

Background levels of analytes in the chamber were measured as described in DHS SOP (Standard Operating Procedure) 116 (DHS, 2002a). Background samples of the conditioning chamber and the mini-chambers were performed periodically during the study. The background of the conditioning chamber was sampled prior to the beginning and after the end of the study. No quantifiable compounds were found in either sample. The background of the mini-chambers was sampled approximately once a month. Occasionally, minimal amounts of a few chemicals, such as tetradecane, pentadecane, decanal, and longifolene were found in the mini-chamber background.

If the material required adhesive for its installation, the manufacturer's recommended adhesive was used (in very few cases a comparable, VOC-compliant adhesive was used if the manufacturer's recommended adhesive was not compliant with SCAQMD's VOC requirements and the manufacturer could not recommend other VOC-compliant alternatives) and the procedures for the application of the adhesive were followed. We applied the adhesive on a 6 x 6-inch stainless steel plate which had a ¼-in raised lip around the edges and then placed the material to be tested on the plate containing the adhesive. The edges of the material (¼ in) and the edges of the stainless steel were covered with strips of low-VOC-emitting aluminum foil tape (3M® High Temp Flue Tape) leaving an actual exposed material surface area of 5.5 in x 5.5 in. Samples that required adhesive according to their manufacturer were assembled the day that conditioning began, that is, ten days before the emissions test started. Where adhesives were used, the amount of adhesive used was weighed and the mass recorded to the nearest 0.1 gram.

Paint samples were prepared by applying a 4-in x 3/8-in nap disposable roller on a 6-in square piece of gypsum board. The gypsum board had been conditioned for 24 hours before the paint application. Paint was applied according to manufacturer's instructions. Primer was used when specified; otherwise the first coat of paint was used as a primer. Sample conditioning began after the last coat of paint was applied. Edges were always taped to provide a 5.5-in by 5.5-in surface. Paint samples were weighed to the nearest 0.1 gram after each coat application, with a final measurement after sample conditioning.

Following the 10-day conditioning period, the samples not requiring adhesive for their installation were placed in the stainless steel plates and taped as described above. Specimens were then transferred to one of two 11.5-L stainless steel canisters (nominal volume 10 L). The canister was then placed in a temperature-controlled incubator where the temperature was controlled at 23±1°C.

Section 01350 requires that fiberboard, particleboard, and acoustical ceiling panel specimens be suspended or supported in the chamber with all edges exposed and no masking. In order to more accurately represent the exposed undersurface of a countertop, or the exposed back surface of a cabinet, the alternative fiberboard and all particleboard specimens were prepared in the same manner as the flooring samples (that is, placing them on a 6 x 6-in stainless steel plate and taping the sample to the plate), thus covering ¼ in of the sample's perimeter.

Thermal insulation specimens were also suspended in the chamber and were tested with no masking and all the edges exposed.

2.3.3 Specimen Testing and Analysis

Once the specimen was placed in the temperature-controlled incubator, high purity nitrogen gas was supplied to the canister containing the sample as described in DHS/SOP 114 (California Department of Health Services, 2002b). The inlet stream was split into two equal flow streams and by passing one of these streams through a bubbler filled with high-purity water; a 50 percent relative humidity was achieved in the mixed air stream. Three samples were collected from a manifold outlet of each canister: two separate samples on two Tenax® tubes were collected for VOC analyses and another single sample on a DNPH tube was used for the aldehyde analyses. The average concentrations of the two Tenax® tubes are reported.

VOC samples were collected using a stainless steel desorption tube that is filled with a Tenax™ sorbent. Samples are collected for a period of 3 hours at a flow rate of 50mL/min, resulting in a 9 L sample volume.

Aldehyde samples were collected using a Waters Sep-Pak® XpoSure™ Aldehyde Sampler cartridge, which traps aldehydes in air by reacting them with DNPH, forming stable hydrazone derivatives. Aldehyde samples were collected for a period of 1 hour at a flow rate of 500 mL/min, resulting in a 30 L sample volume.

More details about the sampling and analytical methods used for VOCs and aldehydes can be found in DHS SOPs 116, 114, and 115 (DHS, 2002a, b, and c).

For quality assurance purposes and for a subset of the products tested, two identical "duplicate" material specimens were prepared from the same product and were tested separately. Duplicate samples were tested and analyzed for acoustical ceiling tiles, carpets, paints, particleboard, plastic laminate, and resilient flooring. Also, blank samples were collected from the mini-chambers without any sampling materials.

Samples for VOCs and aldehydes were collected at 24-, 48-, and 96-hr intervals after placing the samples in the mini-chambers.

VOCs (up to C-15—pentadecane) were analyzed by thermal desorption gas chromatography/mass spectroscopy (ATD-GC/MS). A mix of eight gas standards and 21 liquid standards in five concentration levels were analyzed by ATD-GC/MS as calibration standards. A response to a concentration curve was developed for each of the 29 compounds with chlorobenzene-d5 used as an internal standard. Calibration was performed quarterly, or as conditions merited. Other chemicals were identified using the NBS Mass Spectra Library. Concentrations of non-standard chemicals were calculated using the response factor for chlorobenzene-d5. The method of quantitation was noted on the individual reports. The estimated quantitation limit of a 9-L sample was approximately 4 $\mu g/m^3$.

Aldehydes (up to C10—decanal) were analyzed using High Performance Liquid Chromatography with UV detection following extraction of the Aldehyde sampler cartridges with acetonitrile. A mix of 20 Aldehyde-dnph derivatives were analyzed at five concentration levels as calibration standards. The calibration was checked daily. The quantitation limit for the Aldehyde-dnph derivative was about 0.1 ug/L. The estimated quantitation limit for individual aldehydes ranged

from approximately 5 μg/m^3 for formaldehyde to 15 μg/m^3 for decanal. It should be noted that aldehydes of five carbons or more were also detectable by ATD-GC/MS.

2.3.4 Data Analysis

For each analyzed sample an emission factor (EF) was calculated for each target compound at steady state conditions (ASTM, 1997) using the following equation:

$$EF = \frac{Q \bullet (C - C_o)}{A}$$

where:

EF = emission factor [μg/m^2·h]

Q = mini-chamber airflow rate [m^3/h]

C = mini-chamber concentration of the compound [μg/m^3]

Co = background mini-chamber concentration of the compound [μg/m^3]

A = exposed area of the material in the mini-chamber [m^2]

The emission factor for each compound was then converted to air concentration using the following equation:

$$C_m = \frac{EF \bullet A_t}{V \bullet ACH}$$

where:

C_m = modeled concentration of the compound [μg/m^3]

EF = emission factor of the compound [μg/m^2·h]

A_t = installed area of the material [m^2]

V = net volume of space served by air handler where material will be installed [m^3] (90 percent of the measured volume)

ACH = air change rate [h^{-1}]

Table 13 lists the parameters used for the surface area, building volume, and air change rate. The numbers are based on the following assumptions:

1. Typical Classroom: We assumed a 24 x 40-ft standard-size portable classroom with an 8.5-ft ceiling, with one 4 x 8-ft window and one 4 x 4 ft-window, and one 3 x 7 ft-door. The air change rate of 0.9 h^{-1} is based on the default value given in Section 01350. We assumed that one of the 24-ft walls had a 20-ft wide, 30-in deep countertop and a 4-ft wide floor-to-ceiling cabinet next to the countertop. Furthermore, we assumed that the surfaces underneath the countertop and the backside of the cabinet are bare (that is, non-laminated). We note that some manufacturers may laminate the underside of countertops to avoid warping due to moisture.

2. Typical State Office: We assumed a 10 x 12-ft private office with a 9 ft ceiling, and one 3 x 7-ft door. Section 01350's default ventilation rate of 0.75 ach was used. The particleboard, fiberboard, and plastic laminate surface area was based on State of California's Office Furniture Specification (Levin, et al., 2000) as depicted in Figure 1.

We note that the modeling calculations described above are simply an estimate of the potential effects due to VOC emissions from building materials. There are a number of factors that affect the actual concentrations in classrooms and offices resulting from the use of these materials. These factors include 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.

2.3.5 Target Compounds

The samples were analyzed qualitatively for all VOCs (up to 15 carbon chain length [C-15] for VOCs and C-10 for aldehydes) emitted by each of the tested materials. The list of chemicals in Section 01350 is based on Non-Cancer Chronic Reference Exposure Levels (CREL), a list that is very limited and represents only a small fraction of what is typically found in non-industrial environments. Therefore, we used additional IAQ performance criteria to identify other potential chemicals at concentrations of concern. Therefore, the samples were quantitatively analyzed for chemicals on the following lists:

1. CRELs: Non-cancer CREL of a chemical is the airborne concentration of that chemical that would pose no significant health risk to the general public, including sensitive individuals exposed to that concentration over their lifetime. Non-cancer CRELs are published by the Office of Environmental Health Hazard Assessment (OEHHA) of the Cal/EPA and are based on health considerations reported in the scientific literature (OEHHA, 2003). Section 01350 requires that modeled indoor air concentration of any chemical at 96 hr not exceed 50 percent of the CREL, with the exception of formaldehyde. The 50 percent concentration limit of CRELs for each building material was based on the fact that each CREL is the recommended airborne level from all sources and not just from a single source. The September 2002 CREL list was used in this report. The complete list of CRELs is available at: www.oehha.org/air/chronic_rels/allChrels.html.

   The current CREL for formaldehyde [2 ppb (3 µg/m³)] is close to typical ambient levels. In many urban areas this level is exceeded during certain atmospheric conditions. Requiring that level to be achieved in buildings is unrealistic at this time as it would restrict or eliminate the use of many common building materials. Products that might be affected include composite wood products (plywood, particle board, medium density fiberboard), many thermal and acoustic insulation materials (especially fiberglass products), many textiles, and some paints.

   Establishing such a low level as a requirement would also necessitate formaldehyde filtration devices in buildings located in urban areas. Therefore, Section 01350 includes a different requirement for this chemical. It requires that no single product's modeled concentration at 96 hr can contribute more than 50 percent of the total maximum 27 ppb concentration limit for this chemical. The 27 ppb concentration limit is based on OEHHA's current acute 1-hour Reference Exposure Level (REL) of 76 ppb (94 µg/m^3) (OEHHA, 1999), extrapolated to an 8-hour exposure. Appendix O lists all the criteria used for this interim reference exposure level. The State of California is working with manufacturers to reduce formaldehyde levels in building materials such as insulation and office systems furniture.

2. The Safe Drinking Water and Toxic Enforcement Act of 1986 (Proposition 65): Chemicals known to the State of California to cause cancer or reproductive toxicity effective January 25, 2002. Available at: www.oehha.org/prop65.html. We note that the mere presence of a chemical on the Proposition 65 list does not establish the requirement to provide a warning under Proposition 65 since the chamber setting may not be indicative of actual exposure scenarios. Chemical concentrations measured in a chamber test and then extrapolated to a concentration in an indoor setting, under the law do not establish the requirement to provide a warning under Proposition 65, since the chamber setting may not be indicative of actual exposure scenarios.

3. Toxic Air Contaminant (TAC) List: The TAC List is a list of 244 substances that have either been identified by the ARB as toxic air contaminants in California or are known or suspected to be emitted in California and have potential adverse health effects. The most recent published list at the time research was being conducted for this study was used (December 1999 version). Available at: www.arb.ca.gov/toxics/taclist.htm.

4. Human Olfactory Thresholds as listed in Devos, et al. (1990): It is noted that odor is a highly complex biological response, especially in the case of chemical mixtures. Furthermore, these thresholds are not health-based and many chemicals that do not have odor thresholds may cause adverse health effects.

In addition, we used the following criteria to identify and quantify compounds not listed in the above four lists:

1. Compounds with emission factors exceeding 1.5 $\mu g/m^2 \bullet hr$ for VOCs except aldehydes. For aldehydes, the emissions factor cut off varied from 15 $\mu g/m^2 \bullet hr$ for formaldehyde to 36 $\mu g/m^2 \bullet hr$ for hexanal.

2. Identified and quantified compounds with chromatography peaks exceeding 5 percent of the Total Volatile Organic Compound (TVOC) area. TVOCs are calculated from the total ion current (TIC) from the GC/MS analysis. More specifically, we added the areas of the integrated peaks with retention times greater than five minutes, subtracting from the sum the area of the internal standard, chlorobenzene-d5, and then calculated the concentration using the response factor of chlorobenzene-d5. We note that (a) some aldehydes, including formaldehyde and acetaldehyde, are not detected by the ATD-GC/MS methodology used in the study and therefore are not included in the TVOC calculation, (b) there are many different ways for analyzing and calculating TVOCs, the term generally refers to a summation of integrated areas of the total ion current, then comparing it to some reference, and (c) TVOC is at best an inexact measurement and should be used with caution. The reader is referred to ECA (1997), Hodgson (1995) and Wallace, et al. (1991) for more details on this subject.

3. Ten most abundant compounds not listed on the CREL, Proposition 65, or TAC lists.

Using the above criteria, we established a list of 121 chemicals for all the samples we analyzed. This list is shown in Table 14. Seven of these were on both the Proposition 65 and TAC lists and all had a CREL. Four additional chemicals were only on the Proposition 65 list—one of these four did not have a CREL. Twenty-one additional chemicals were only on the TAC list—five of these did not have a CREL.

In addition, materials with a large number of peaks below the 5 percent TVOC were so identified.

TVOC was used as a tool to assist us in 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 and 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 health potential effects (ECA, 1997).

It is important to note that although the health impacts of a single chemical may be known, the combined health effects of mixtures of chemicals are not known. For example, a chemical by itself may not cause a health effect, but could induce a health reaction in the presence of other chemicals or other chemicals could even potentiate its effect.

2.3.6 Scanning Electron Microscopy and Energy-Dispersive Spectroscopy Analyses for Gypsum Board Samples

Analyses were done to investigate whether or not recycled content gypsum board products contain metal and/or mold spore contamination. Such a contamination was expected to occur from recycling postconsumer gypsum boards containing lead paint or mold spores. These types of contamination were based on the perception that postconsumer recycled content in the gypsum core would be contributed by demolition construction waste. Through the course of this study, we found that most postconsumer recycled content contained in the core of gypsum board products sold in the U.S. is derived from clean construction waste.

Samples were in the form of 1.5 in x 6 in sections that had been scored and broken off of larger wallboard pieces. All samples were first examined under the low-power stereomicroscope to determine overall gross composition. Small portions were then scraped from the core and paper regions of each sample. Scrapings were transferred onto aluminum stubs with carbon substrates and examined using an FEI XL30 Environmental Scanning Electron Microscope (SEM) with back-scattered electron (BSE) detector and a Noran VANTAGE X-Ray Analysis System. The surface of each SEM stub was then scanned for metal-containing particles.

Section 3. Results and Discussion

As was described in Section 2.3, the *Special Environmental Requirements* (Section 01350) was the methodology used for this study. The chemicals identified using this methodology that exceeded the concentration limits listed in Section 01350 are summarized in the 11 material categories below. Other chemicals of concern are also identified and screening criteria or limits are listed for these chemicals. While Section 01350 lists concentration limits for those chemicals with CRELs, it also requires identification of additional chemicals meeting certain criteria that are not on the CREL list. However, Section 01350 does not advise the user on how these data should be interpreted for selecting building materials. Practitioners selecting building materials should take into consideration the presence of these additional chemicals of concern. Health effects of selected chemicals emitted from building materials can be found in Appendix O.

Concentrations above Section 01350 concentration limits or the odor thresholds are so indicated. In addition, target chemicals on the Prop. 65 or TAC lists are also shown. Abundant compounds not on the CREL, Prop. 65, TAC, or odorous compounds on the Devos, et al. (1990) lists are also identified.

3.1 Acoustical Ceiling Panels

Appendix B shows the individual test results for all the acoustical ceiling panels. Table 15a summarizes the emissions rates at 96 hr for selected chemicals. Using the emission rates of Table 15a, the surface area, and air change rate assumptions listed in Tables 13a and 13b, modeled concentrations were calculated for a typical classroom and a State office. These calculated concentrations are shown in Tables 15b and 15c and are summarized below.

Section 01350 Concentration Limits

Target chemicals with concentrations exceeding Section 01350 concentration limits:

Formaldehyde: One standard ceiling panel (SACP29M5) exceeded Section 01350 concentration limit for this chemical for both the classroom and State office calculations. In addition, one standard panel (SACP33M5) and one alternative panel (AACP26M10) had formaldehyde levels over 50 percent of Section 01350 concentration limit.

Additional IAQ Performance Indicators:

Odor Thresholds:

Nonanal: None exceeded the odor threshold, but two samples (AACP25M14 and SACP29M5) had concentrations of this chemical over 50 percent of the odor threshold.

3.1.1 Summary of Findings for Acoustical Ceiling Panels

Based on the limited number of samples tested, it appears that both standard and alternative products tested performed similarly. Formaldehyde was measured in two of the four standard products and in two of the three distinct alternative samples but only one standard sample exceeded the Section 01350 concentration limit for both the State office and classroom calculations.

We also note that samples AACP25M14 and AACP28M14 were the same product and were 14 and 35 days old, respectively, from the time of manufacturing until the start of sample conditioning. The first sample was tested with only one side exposed, whereas the second sample was tested with all sides exposed. Although the second sample was tested with all sides exposed, it emitted chemicals at much lower rates than the first sample that was tested with only one side exposed. This observation indicates that the emission rates of the chemicals were decaying rapidly due to age and it is confirmed by the individual test reports for 24-, 48-, and 96-hr as shown in Appendix B. Similar observations can be made for identical samples AACP26M10 and

AACP27M10 that were 3 and 24 days old at the start of sample conditioning and were tested with one and all sides exposed, respectively.

3.2 Carpets

Appendix C shows the individual test results for all the carpet samples. Table 16a summarizes the emissions rates at 96 hr for selected chemicals. Using the emission rates of Table 16a, the surface area, and air change rate assumptions listed in Tables 13a and 13b modeled concentrations were calculated for a typical classroom and a State office. These calculated concentrations are shown in Tables 16b and 16c and summarized below. It is important to note that all flooring products requiring adhesive were tested with adhesive using the procedures described in Section 01350. Only two samples were tested with and without adhesive (samples SC18M4/SC5M4 and SC19M4/SC4M4).

Section 01350 Concentration Limits

Target chemicals with concentrations exceeding Section 01350 concentration limits:

Acetaldehyde: One standard carpet (SCT35M16) and one alternative product (ACT36M16) exceeded the concentration limit for both the classroom and State office calculations. Both carpets were from the same manufacturer.

Formaldehyde: One standard carpet (SCT35M16) exceeded the concentration limit for both the classoom and the State office calculations. This is a CRI-certified carpet and formaldehyde is one of the three chemicals tested under this program. CRI specifies a maximum emission factor of 50 $\mu g/m^3hr$ for this chemical "to prove that none is used" as was explained in Section 2.2 of this report. The results indicate that the emission factor of SCT35M16 was just below this maximum. The emission factor of one alternative product (ACT36M16) was also 30 percent of the CRI maximum emission factor. Formaldehyde emission rates for all other samples were below detection.

Using the CRI's formaldehyde emission factor for the classroom calculation resulted in an air concentration of 24 $\mu g/m^3$. Similarly, for the office calculation, the concentration was 27 $\mu g/m^3$. Section 01350 concentration limit for this chemical is 16.5 $\mu g/m^3$. Therefore, the CRI maximum emission factor for formaldehyde resulted in air concentrations above the Section 01350 concentration limit for the classroom and State office calculations. It is important to note that most of the carpet samples tested in this study were prepared with adhesive. No adhesive is applied to carpets tested under the CRI protocol.

Naphthalene:

Standard Carpets: One standard carpet (SC6M2) exceeded the concentration limit for both the classroom and State office calculations. Two additional carpets from manufacturer 4 (SC18M4 and SC19M4) exceeded both classroom and State office calculations when tested with adhesive. One standard product (SCT35M16) exceeded the concentration limit for both the classroom and the State office calculation. Another standard product (SC34M15) exceeded the concentration limit for the State office calculation only.

Alternative Carpet: One alternative carpet (AC9M1) exceeded the concentration limit for both the classroom and State office calculations.

Additional IAQ Performance Indicators

Target chemicals on either the Prop. 65 or the TAC list:

Caprolactam: See Appendix O for the health effects of this chemical and for the interim State of California concentration limit of 100 $\mu g/m^3$ of this chemical. The following carpets exceeded this concentration limit:

Standard Carpets: Both samples from manufacturer 4 when tested without adhesive (SC5M4 and SC4M4), one of the samples from manufacturer 15 (SC34M15), and one of the samples from manufacturer 16 (SCT35M16) exceeded the interim concentration limit for both the classroom and State office calculations. All carpets were made with Nylon 6 face fibers. When SC5M4 was tested with adhesive (SC18M4) it exceeded the limit for the office calculation, but it was just below the limit for the classroom calculation.

Alternative Carpet: Alternative sample from manufacturer 1 (AC9M1) exceeded the interim concentration limit for this chemical for both the classroom and State office calcualtions. It was also made with Nylon 6 face fibers.

Of the 14 carpets tested, 6 were made with Nylon 6 fibers. In all these samples caprolactam was detected. In three of these samples, when tested with adhesive, the interim concentration limit was exceeded. Two more samples tested without adhesive also exceeded the interim concentration limit.

Based on the findings of this study, it appears that the polymerization process of caprolactam to nylon polymer may not be 100 percent efficient, thus allowing some of the un-polymerized caprolactam into the final product.

1-Methyl-2-Pyrrolidinone (n-methyl pyrrolidinone): This is a Prop. 65 reproductive toxicant with developmental effects.

It was measured in the alternative carpet tile product of manufacturer 3 (ACT7M3) at concentrations of 30 percent of TVOC.

Target chemicals exceeding the odor thresholds:

Decanal: The standard carpet of manufacturer 16 (SCT35M16) exceeded the odor threshold for this chemical both for the classroom and State office.

Nonanal: One of the products from manufacturer 4 when tested without adhesive (sample SC4M4) exceeded the odor threshold for this chemical both for the classroom and State office. One of the two standard carpets of manufacturer 15 (SC34M15) also exceeded the odor threshold both for the classroom and State office. One standard carpet (SCT40M17) exceeded the odor threshold for the State office calculation and was just below the odor threshold for the classroom calculation.

Octanal: The standard carpet of manufacturer 16 (SCT35M16) exceeded the odor threshold for both the classroom and State office.

4-Phenylcyclohexene (PCH): This compound is responsible for the "new" carpet smell. This chemical is emitted from the SBR latex adhesive used on the secondary backing of carpets. One of the two standard products of manufacturer 4 when tested with and without adhesive (samples SC19M4 and SC4M4) had levels exceeding the odor threshold for 4-PCH. In addition, the standard carpet from manufacturer 15 (SC34M15) also exceeded the odor threshold for this chemical. The levels of these three samples exceeded the odor thresholds for both the classroom and State office. Finally, the standard product from manufacturer 16 (SCT35M16) exceeded the odor threshold for the State office calculation and was just below the threshold for the classroom calculation.

It is worth noting that all four samples that either exceeded or had levels of 4-PCH just below the odor threshold were CRI-certified (4-PCH is one of the three chemicals tested under this program). CRI specifies a maximum emission factor of 50 $\mu g/m^3hr$ for this chemical as was explained in Section 2.2 of this report. Results indicate that the emission factor of SC4M4 was above this maximum, and when SC4M4 was tested with adhesive (SC19M4) the emission factor was 50 percent of the CRI maximum. Another standard product (SC34M15) was also 50 percent of this maximum. The emission factor of sample SCT35M16 was 10 percent of the CRI maximum. The emission factors of all

other samples were below detection. One of the two standard products that exceeded the odor threshold for 4-PCH for both the classroom and State office calculations was tested with and without adhesive. Test results indicate this standard product exceeded the CRI maximum emission factor when it was tested without adhesive.

Using the CRI's 4-PCH emission factor for the classroom calculation resulted in an air concentration of 24 $\mu g/m^3$. Similarly for the office calculation the concentration was 27 $\mu g/m^3$. The odor threshold used in this study was 2.5 $\mu g/m^3$. Therefore, the CRI maximum emission factor results in air concentrations about 10 times higher than the odor threshold used in this study for the classroom and state office calculations. It is important to note that most of the carpet samples tested in this study were prepared with adhesive. No adhesive is applied to carpets tested under the CRI protocol.

Other target chemicals:

2-ethyl Hexanoic Acid: The emissions of one standard carpet tile (SCT8M3) were dominated by a single compound: 2-ethyl hexanoic acid. It was measured at concentrations 62 percent of TVOC. 2-ethyl hexanoic acid is a potent eye and throat irritant and a metabolite of the widely used plasticizer, di-(2-ethylhexyl)phthalate (DEHP), a known human carcinogen. Appendix O discusses the health effects of this chemical. Although an odor threshold for this specific chemical is not listed in Devos, et al. (1990), straight-chain carboxylic acids generally have an odor threshold of the same order as the straight-chain aldehydes. Therefore, this chemical, a C-8 carboxylic acid, most likely is in concentrations above acceptable odor thresholds. For comparison, the odor threshold for octanoic acid, an isomer of 2-ethyl hexanoic acid, is approximately 25 $\mu g/m^3$.

Other VOCs:

Standard samples: SC34M15 emitted various terpenes, and cyclic and branched alkanes. These included α-pinene, dimethyl-decanes, and a few tentatively identified branched cyclohexanes.

SC39M15 emitted many long chain alkylbenzenes and branched alkanes. The alkylbenzenes included compounds such as butylhexylbenzene, propylheptylbenzene and ethyloctylbenzene. The branched alkanes included many isomers in the 11 to 15 carbon range (dimethyl decane, dimethyl undecane, etc.).

SC40M17 emitted a large number of alkyl benzenes. These alkylbenzenes had various 10 and 11 carbon chains, such as 1-butylhexylbenzene and 1-propyloctylbenzene.

Alternative sample: ACT36M16 emitted many branched alkanes in the 8 to 13 carbon range.

3.2.1 Summary of Findings for Carpet Products

Based on the limited number of carpet samples tested, it appears that both recycled content and standard carpets were emitting chemicals of concern. Of the nine distinct standard carpets tested, four exceeded Section 01350 concentration limits for the classroom and five exceeded the limits for the State office calculations. Of the five alternative samples tested, two exceeded Section 01350 concentration limits for both the classroom and State office calculations.

When applying additional IAQ performance indicators, four standard products exceeded one or more of the following indicators: interim concentration limit for caprolactam, odor thresholds for decanal, nonanal, octanal, and 4-PCH. One of the five alternative products exceeded the interim concentration limit for caprolactam. All carpets tested in this study were CRI-certified. While CRI tests for formaldehyde, CRI also claims that the 50 $\mu g/m^3hr$ maximum allowable emission factor is "to prove that none is used." Test results indicate that one standard and one alternative product emitted formaldehyde, both of which were below CRI's maximum allowable emission

factor. However, the standard product exceeded the Section 01350 concentration limits for the State office calculation. Another chemical tested under the CRI program is 4-PCH. Three standard products emitted this chemical and one of these products when tested without adhesive exceeded the CRI maximum emission factor of 50 $\mu g/m^3hr$ for this chemical. Test results also indicated that the standard product that exceeded the CRI emission factor also exceeded this study's additional IAQ performance indicators for odor threshold when tested both with and without adhesive. One more carpet below the CRI requirement for 4-PCH also exceeded the IAQ performance indicators for odor threshold.

Some of the carpet results are inconsistent with those reported by CRI's Green Label program. These inconsistencies can be attributed to the differences in the sampling and analytical techniques employed by CRI and those used in this study and by the majority of laboratotries doing IAQ analysis for research purposes. For example, test results were obtained after the 10-day conditioning period followed by the 4-day test period, whereas CRI's tests are performed after only 24 hours with no prior conditioning.

Sampling periods of short duration (that is, 24 hrs) could result in higher variability of the results due to a variety of factors including sink effects of the chamber, desorption from the surface of tested materials of VOCs that may have been sorbed during the final stages of manufacturing or during the transport process, insufficient time for diffusion of VOCs through the product—particularly when adhesives were used in the application of products in assemblies. Other researchers have reported similar discrepancies between their findings and those of industry-supported programs. It is also important to note that CRI's specifications were originally intended primarily for carpets with SBR latex backing. Since many 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.

It is also important to note that 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. CRI's testing is done without application of any adhesives. In addition, the 10-day pre-conditioning followed by a 4-day test is significant because some adhesives might not diffuse quickly enough to appear after 24 hours, but might after 14 days.

3.3 Fiberboard

Appendix D shows the individual test results for the fiberboard samples. Table 17a summarizes the emissions rates at 96 hr for selected chemicals including aldehydes. Using the emission rates of Table 17a, the surface area, and air change rate assumptions listed in Tables 13a and 13b, we calculated the modeled concentrations for a typical classroom and State office. These calculated concentrations are shown in Tables 17b and 17c and are summarized below.

Section 01350 Concentration Limits

Target chemicals with concentrations exceeding Section 01350 concentration limits:

Acetaldehyde: One alternative product (AMDF21M12) exceeded the Section 01350 concentration limit for the office calculation and did not exceed the Section 01350 concentration limit for the classroom calculation.

Formaldehyde: Both standard medium density fiberboard products (SMDF51M11 and SMDF52M11) emitted formaldehyde levels, which exceeded the Section 01350 concentration limit for the State office calculations and did not exceed the Section 01350 concentration limit for the classroom calculation.

As explained in Section 2.3.2, the alternative fiberboard specimens were tested with only one side exposed while the other sides were taped in order to more accurately represent the exposed undersurface of a countertop, or the exposed back surface of a cabinet. The standard fiberboard

samples were tested with all sides exposed. Therefore, the results reported for standard fiberboard are likely to be different than those that would have been measured had the samples been taped, thus allowing only one side to be exposed.

3.3.1 Summary of Findings for Fiberboard Products

Both standard medium density fiberboard samples exceeded Section 01350 concentration limits only for the State office calculation. One of the three alternative low-density fiberboard products exceeded Section 01350 concentration limits for the office calculation. The other two alternative products did not exceed Section 01350 concentration limits for both the classroom and State office calculations.

3.4 Gypsum Board

Appendix E shows the individual test results for the gypsum board samples. Table 18a summarizes the emissions rates at 96 hr for selected chemicals. Using the emission rates of Table 18a, the surface area, and air change rate assumptions listed in Tables 13a and 13b, the modeled concentrations were calculated for a typical classroom and State office. These calculated concentrations are shown in Table 18b and are summarized below.

Section 01350 Concentration Limits

Target chemicals with concentrations exceeding Section 01350 concentration limits:

Formaldehyde: Both standard samples (SGB57M31 and SGB58M10—excluding sample SGB91M51 which was used as a substrate for paint samples) emitted formaldehyde levels, which exceeded Section 01350 concentration limit for the State office calculations and were below the Section 01350 concentration limit for the classroom calculation.

Results of the Scanning Electron Microscopy and Energy-Dispersive Spectroscopy Analyses Appendix P shows the results of these analyses. All samples showed trace levels of metals, including strontium, copper, zirconium, zinc, manganese, uranium, chromium, lead, tin, nickel, and cobalt. Some of these metals were present in combinations suggesting man-made alloys, while others are likely trace impurities from the gypsum mining process. No significant difference in metal levels was found between standard and alternative samples. Cellulose fibers found in the virgin cores may be an indicator or source of contamination. No mold spores were detected at the scanning magnifications in either the standard or alternative samples.

3.4.1 Summary of Findings for Gypsum Board Products

Both standard products exceeded Section 01350 concentration limits for the State office calculation and were below the concentration limits for the classroom calculation. Alternative products that contained recycled content in the gypsum core did not exceed Section 01350 concentration limits for either the State office or classroom calculations. Since all gypsum board contains 100 percent recycled content in the face paper, the alternative products with recycled content in the core performed better than the standard products.

3.5 Paints

Appendix F shows the results for all the paint samples. Table 19a summarizes the emissions rates at 96 hr for selected target chemicals. Using the emission rates of Table 19a, and the surface area and air change rate assumptions listed in Table 13a and 13b, the modeled concentrations were calculated for a typical classroom and State office. These calculated concentrations are shown in Table 19b and are summarized below.

Section 01350 Concentration Limits

Target chemicals with concentrations exceeding Section 01350 concentration limits:

Ethylene glycol: One of the standard paint samples (SPNT46M23) exceeded the concentration limit for this compound for the standard State office calculation but was below the concentration limit for the classroom calculation.

Additional IAQ Performance Indicators

Target chemicals on either the Prop. 65 or the TAC list:

2-(2-Butoxyethoxy) ethanol: (also known as Diethyl glycol monobutyl ether or DEGBE) was emitted by four alternate paints (APNT47M23, APNT48M24, APNT49M25 and APNT50M26) and by two standard paints (SPNT45M22 and SPNT46M23).

Target chemicals exceeding the odor thresholds:

Decanol: One of the alternate paints (APNT48M24) exceeded the odor threshold for this chemical for the standard State office, but was below the threshold for the classroom.

Nonanal: One standard (SPNT41M18) and one alternate (APNT44M20) exceeded the odor threshold for this compound for the standard State office, but was below the threshold for the classroom.

Octanal: Two alternate paints (APNT49M25 and APNT50M26) exceeded the odor threshold for this chemical for both the classroom and State office calculations.

Other target chemicals:

2,2'-oxybis-ethanol: It was measured in one of the standard samples (SPNT45M22) at concentrations 40 percent of TVOC.

2,2,4-trimethyl-1,3-pentanediol monoisobutyrate: It was measured in all four standard paint samples and all six alternative samples at concentrations 22 to 68 percent of the TVOC.

3.5.1 Summary of Findings for Paints

Based on the limited number of paints tested, it appears that both alternative paints sold as "zero-VOC" and tested with a "zero-VOC" primer (APNT43M19 and APNT47M23) were much lower emitting than all the other paints. Of the six alternative products tested, three were sold as low- or zero- VOC (that is, APNT43M19 and APNT47M23 and another product tested with only a zero-VOC finish coat only, that is, APNT44M20) and three were made with 50 percent postconsumer recycled content (APNT48M24, APNT49M25, and APNT50M26).

All four standard paints did not exceed Section 01350 concentration limits for the classroom calculation. One standard product (SPNT46M23) exceeded Section 01350 concentration limits for one chemical for the State office calculation. None of the alternative paints tested exceeded Section 01350 concentration limits for either the classroom or State office calculation.

When applying the additional IAQ performance indicators all four standard products were below all criteria for the classroom calculation and only two of the four were below all criteria for the State office calculation. One of these standard products also exceeded the odor threshold for nonanal nearly two-fold for the State office calculation. Similarly, four of the six alternative paints were below all criteria for the classroom calculation and only two of the six alternative paints were below these criteria for the State office calculation. The finish coats of three of the four alternative products that were below the IAQ performance indicators for the classroom calculation were "zero-VOC". One "zero-VOC" alternative paint tested with a non-"zero-VOC" primer (APNT44M20) exceeded the odor threshold for nonanal for the State office by threefold. Concentrations of octanal were higher than the odor thresholds for two recycled paints and for both the classroom and State office calculations. The third recycled paint exceeded the odor threshold for decanol for the State office calculation. Since the recycled paints tested were not available in light colors as opposed to all the other paints tested that were selected in light colors, the color pigments added to these paints may have contributed to higher emissions.

3.6 Particleboard

Appendix G shows the results for the particleboard samples. Table 20a summarizes the emissions rates at 96 hr for selected target chemicals including aldehydes. Using the emission rates of Table 20a, and the surface area and air change rate assumptions listed in Table 13a and 13b, the modeled concentrations were calculated for a typical classroom and State office. These calculated concentrations are shown in Tables 20b and 20c and are summarized below.

Section 01350 Concentration Limits

Target chemicals with concentrations exceeding Section 01350 concentration limits:

Acetaldehyde: The standard particleboard (SPB23M11) exceeded the concentration limit for the State office calculation and was below the Section 01350 concentration limit for the classroom calculation.

As explained in section 2.3.2 all particleboard specimens were tested with only one side exposed. The other sides were taped in order to more accurately represent the exposed undersurface of a countertop, or the exposed back surface of a cabinet. Therefore, the results reported here are likely to be lower than those that would have measured had the specimens been suspended in the chamber with all sides and edges exposed.

3.6.1 Summary of Findings for Particleboard Products

One standard particleboard exceeded the concentration limit for acetaldehyde for the State office calculation. Neither the standard nor the alternative products exceeded Section 01350 for use in a classroom.

3.7 Plastic Laminates and Assemblies

Appendix H shows the results for the two plastic laminates and the two laminate assemblies. Laminate assemblies consisted of plastic laminate SPLAM56M30 and fiberboard SMDF52M11. Table 21a summarizes the emissions rates of acetone, formaldehyde, and phenol. Using these emissions rates and the information from Table 13a and 13b, the concentrations were caclucated for a typical classroom and State office. Tables 21b and 21c show these calculated concentrations.

None of the chemicals exceeded any concentration limits. Sample SMDF52M11 that was used as a substrate for the assemblies had formaldehyde levels exceeding 50 percent of Section 01350 concentration limit when tested separately for the classroom and exceeded Section 01350 concentration limit for this chemical for the State office. When two of the four edges of the assembly were not laminated (SPASM61M30), formaldehyde was not detected. However, when the assembly was fully laminated (APASM62M30), detectable amounts of formaldehyde were measured.

3.8 Resilient Flooring

Given the large number of resilient flooring products tested, we divided these products into two sub categories: 4 standard non-rubber-based products, 5 alternative non-rubber-based products, and 14 alternative rubber-based-products. The alternative rubber-based products category includes 11 tire and 3 non-tire-derived products. The results for each subcategory are discussed below. It is important to note that all flooring products requiring adhesive were tested with adhesive using the procedures described in Section 01350.

3.8.1 Standard and Alternative Non-Rubber Resilient Flooring Products

Appendix I shows the results for all the resilient non-tire derived flooring samples. Table 22a summarizes the emissions rates at 96 hr for selected target chemicals. Using the emission rates of Table 22a and the surface area and air change rate assumptions listed in Table 13a and 13b, the

modeled concentrations were calculated for a typical classroom and State office. These calculated concentrations are shown in Tables 22b and 22c.

Section 01350 Concentration Limits

Target chemicals with concentrations exceeding Section 01350 concentration limits:

Acetaldehyde: One of the standard VCT products (SRFT87M46) exceeded the concentration limit for this chemical in both the classroom and State office calculations. Both alternative linoleum products (ARF12M6 and ARF90M5) exceeded the concentration limit for this chemical by a factor of four in both the classroom and State office calculations.

Formaldehyde: One of the standard VCT products (SRFT79M44) exceeded the Section 01350 concentration limit for both the classroom and State office calculations.

Naphthalene: One standard VCT sample (SRFT79M44) exceeded Section 01350 concentration limit for this compound in both the State office and classroom calculations.

Phenol: One of the alternative resilient flooring tile samples (PVC-based interlocking tiles—sample ARFT14M7) exceeded the concentration limit for this compound for both the State office and classroom.

Additional IAQ Performance Indicators

Target chemicals on either the Prop. 65 list or the TAC lists:

2-Butoxy-Ethanol (Ethylene glycol monobutyl ether): One of the two linoleum samples (sample ARF12M6) exceeded the concentration limit value (1/2 CREL from the TAC list) for both the classroom and State office calculations.

2-(2-Butoxyethoxy)-Ethanol (or diethylene glycol monobutyl ether): It was measured in the alternative tile product (PVC-based interlocking tiles—sample ARFT14M7) at concentrations 4.5 percent of the TVOC.

Propionaldehyde: Both alternative linoleum samples (ARF12M6 and ARF90M5) had concentrations 10 percent of TVOC or higher in both the classroom and State office calculations.

Target chemicals exceeding the odor thresholds:

Octanal: Both alternative linoleum samples (ARF12M6 and ARF90M5) exceeded the odor threshold for this chemical in both the classroom and State office.

Trans-2-Decenal: One of the alternative linoleum samples (ARF90M5) exceeded the odor threshold for this compound in both the classroom and State office calculations.

In addition, the linoleum samples emitted numerous other odorous chemicals with concentrations of about half the recommended odor thresholds. These chemicals include: hexanal, nonanal, nonanoic acid, octanoic acid, pentanal, and pentanoic acid.

Other target chemicals:

One of the standard samples (SRF13M5) emitted many long-chain saturated and unsaturated alcohols, glycols, and hydrocarbons. Identified compounds included 1-(2-methoxypropoxy)-2-propanol, 3,3'-oxybis-2-butanol, 4-methyl-2-dodecene, and 1-tetradecene. Tentative identification of a few other compounds included diopropylene glycol, 2-(2-hydroxypropoxy)-1-propanol, and 4-octene. Long-chain alcohols are odorous.

One of the alternative samples (ARFT14M7) emitted many long-chain saturated and unsaturated hydrocarbons, most of which were below the five percent of area cutoff.

Exceptions were tetradecane and pentadecane, with each representing about 8 percent of the total area of the total ion chromatogram. (These are reported in Appendix I.)

3.8.2 Alternative Rubber-Based (Tire and Non Tire-Derived) Resilient Flooring Products

Appendix J shows the results for all the resilient flooring samples. Products ARRF70M38, ARRF75M41, and ARRF84M42 are non-tire-derived—all others are tire-derived. Table 23a summarizes the emissions rates at 96 hr for selected target chemicals.

Using the emission rates of Table 23a and the surface area and air change rate assumptions listed in Tables 13a and 13b, the modeled concentrations were calculated for a typical classroom and State office. These calculated concentrations are shown in Tables 23b and 23c. In addition, for the tire-derived products only, we used the assumptions listed in Table 13c and calculated the modeled concentrations for two large-space applications: a typical State boardroom and a State auditorium.

We note that resilient flooring is not typically used in boardrooms and auditoriums where acoustics are a concern. Resilient flooring is specified in multi-purpose rooms, gymnasiums, and some theater-type settings. The calculations presented here merely give the reader an understanding of how modeled concentrations for the auditorium and boardroom differ from the modeled concentrations for the classroom and State office when higher dilution volumes, product surface area, and ventilation rates are used. It was also intended that boardroom and auditorium modeled concentrations be used to understand how tire-derived resilient flooring may perform if installed in larger areas such as gymnasiums and multi-purpose rooms. Calculations for the State boardroom and auditorium were made at two ventilation rates: 3.5 ach and 0.75 ach. The 3.5 ach represents a typical design ventilation rate for high occupancy areas such as auditoriums. The 0.75 represents a typical design ventilation rate for low-occupancy areas, such as general office space. These calculated concentrations are shown in Tables 23d and 23e.

Section 01350 Concentration Limits

Target chemicals with concentrations exceeding Section 01350 concentration limits:

Naphthalene: Two non-tire derived products (ARRF70M38 and ARRF84M42) and four tire-derived products (ARRF72M35, ARRFT73M34, ARRF76M41, and ARRF77M49) exceeded Section 01350 concentration limit for this compound for the classroom and State office calculations. None of the tire-derived products exceeded any limits for the board room and auditorium calculations at the 3.5 ach ventilation rate. When the 0.75 ach ventilation rate was used for the State board room calculations, four of the tire-derived products (ARRF72M35, ARRFT73M34, ARRF76M41, and ARRF77M49) exceeded the concentration limit for this chemical. For the State auditorium, ARRF72M35 exceeded the concentration limit when the 0.75 ach ventilation rate was used.

Additional IAQ Performance Indicators

Target chemicals on either the Prop. 65 or TAC lists:

2-Butoxy-Ethanol (Ethylene glycol monobutyl ether): When the tire-derived product ARRF85M42 was tested with sealer (sample ARRF86M42), the concentration of this chemical exceeded the limit (1/2 CREL from the TAC list) for both the classroom and State office calculations, and the State board room application at 0.75 ach.

1-Methyl-2-Pyrrolidinone: It was measured in three tire-derived products (ARRF72M35, ARRF76M41, and ARRF77M49).

1,2,4-Trimethylbenzene: (Pseudocumene) was emitted from eight products (ARRF71M37, ARRF72M35, ARRFT73M34, ARRF75M41, ARRF76M41, ARRF77M49, ARRF85M42, and ARRF86M42.

Other target chemicals:

α,α dimethylbenzemethanol: It was measured in one tire-derived sample (ARRF72M35) at concentrations 6 percent of the TVOC.

Other chemicals: In general, all the alternative rubber-based resilient flooring products emitted a large number of compounds that appeared as small peaks, in some cases numbering more than a hundred. As most of these peaks constituted less than 1 percent of the total area percent, they were not reported in Appendix J. The chemicals emitted varied from product to product; generally, they were branched and cyclic alkanes and alkenes, such as isomers of methyl octane, dimethyl nonane and dimethyl Cyclohexane; alkyl-benzenes, such as tetramethylbenzene, and diethylbenzene; and a few of the smaller polyaromatic hydrocarbons such as methyl naphthalene and dimethyl naphthalene isomers. In addition, several samples had a late eluting peak, probably a long-chain ester or a glycol ether (these peaks are listed as "Unidentified" in Appendix J).

3.8.3 Summary of Findings for Resilient Flooring Products

Based on the limited number of non-rubber resilient flooring samples tested, there appears to be a difference in emissions between the standard and alternative products.

Two of the four tested standard resilient flooring products emitted target chemicals above Section 01350 concentration limit values. Of the five alternative non-rubber-based resilient flooring samples tested, three (including both linoleum samples) exceeded Section 01350 concentration limit values. Both linoleum flooring samples emitted a number of chemicals of concern at concentrations either above or below the concentration limit values.

Of the three alternative, rubber-based, non-tire-derived products tested, two exceeded Section 01350 concentration limit values.

Of the 11 rubber-based, tire-derived products tested, 4 exceeded Section 01350 concentration limit values. All 11 products emitted a large number of small peaks. Based on the samples tested, we conclude that most alterative rubber-based resilient products appear to have significant emissions of numerous VOCs. Given that there are numerous chemicals at small amounts, rubber-based products are not recommended for classroom and office space applications. In larger applications, such as gymnasiums and multi-purpose rooms, some products may be used only if the design ventilation rate for these spaces is provided even during times of partial occupancy. At lower ventilation rates, only one product (ARRFT73M34) was below the concentration limits for individual VOCs and only for the auditorium application.

Although only 4 of the 11 tested tire-derived products exceeded Section 01350 for one chemical for the State office and classroom calculations, all 11 products emitted a large number of small peaks, in some cases numbering more than a hundred. The additive health effects associated with these compounds detected at low concentrations in these products, needs to be examined. Therefore, based on this study's findings, further refinement and testing of such products appears necessary before resilient rubber-based products can be promoted for wide use in most indoor environments.

We note that 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.

3.9 Tackable Wall Panels

Appendix K shows the results for the two wall-panel samples for the classroom. Since these products are not typically used in State offices, we did not make calculations for these applications. Table 24a summarizes the emissions rates of naphthalene and 2-ethyl hexanoic acid. Using these emissions rates and the information from Table 13a, concentrations were caclucated for a typical classroom. Table 24b shows these calculated concentrations.

Naphthalene concentrations for both standard and alternative products were almost identical and were less than the Section 01350 concentration limit values (slightly more than half the recommended values). 2-ethyl hexanoic acid was detected in the standard panel only. As was discussed in Section 3.2, the odor threshold for octanoic acid, an isomer of 2-ethyl hexanoic acid, is approximately 25 ug/m^3.

3.9.1 Summary of Findings for Tackable Panel Products

Based on the two tackable wall-panel samples tested (one standard, one alternative), both were low-emitting, with the alternative product being lower emitting than the standard product.

3.10 Thermal Insulation

Appendix L shows the results for the thermal insulation products tested. Table 25a summarizes the emissions rates and Table 25b shows the calculated concentrations for the classroom and State office. We note that one of the two alternative products tested (AINS69M48) was an 80 percent recycled- content cellulose-based product that is spray, wet-applied. All the other three products were fiberglass-based batts.

We note that products installed in wall cavities are not directly exposed to building air. In such installations, the effect on building air concentrations depends on wall tightness and pressure differentials between the cavity and the occupied space. On the contrary, insulation products (such as batts) installed in a return air ceiling plenum do come in direct contact with building air.

As was explained in Section 2.3.2 thermal insulation specimens were suspended in the chamber and were tested with no masking and all the edges exposed. For the modeled concentration calculations, the surface area of only one face of the insulation was used (see Table 13).

One of the two standard products (SINS54M28) exceeded the Section 01350 concentration limit for formaldehyde levels for the State office application. One of the two alternative products (AINS53M27) sold as formaldehyde-free also exceeded the concentration limit for the State office calculation only. Both of these products had concentrations of formaldehyde at least 35 percent of Section 01350 concentration limit for the classroom application.

3.10.1 Summary of Findings for Thermal Insulation

Based on the four thermal insulation samples tested (two standard, two alternative), there appears to be little difference between standard and alternative products.

3.11 Wall Base

Appendix M shows the results for the wall base products tested. Table 26a summarizes the emissions rates and Table 26b shows the calculated concentrations for the classroom and State office. Neither of the two standard products exceeded any concentration limits. However, one of these two products (SWB83M50) emitted many branched and cyclic hydrocarbons, mostly in the 9-carbon to 14-carbon range. Several of these compounds have been tentatively identified, including 2,6-dimethyl nonane, 2-methyl decane, 3-methyl decane, 4-methyl decane, 5-methyl decane, pentyl-cyclohexane, and 2,6-dimethyl undecane.

Section 4. Summary and Conclusions

4.1 Summary of Results of State Office and Classroom Calculations

Section 4.1.1 summarizes the results of the 11 categories for the State office calculations. For some products, the State office calculations resulted in different results than the classroom calculations. The results of these products are discussed in Section 4.1.2. In addition, calculations of tire-derived flooring concentrations for State boardroom and auditorium applications are presented in Section 4.1.3.

4.1.1 State Office Calculations

1. Acoustical Ceiling Panels

We tested a total of seven acoustical ceiling panels:

Standard Products (N=4)

Product 29: Exceeded Section 01350 for one chemical (formaldehyde).
Products 31, 32, and 33: Did not exceed any concentration limits.

Alternative Products (N=3)

Products (25/28), (26/27), and 30: Did not exceed any concentration limits.

2. Carpeting

We tested a total of 14 carpet samples:

Standard Products (N=9)

Product 2: Did not exceed any concentration limits.

Product 6: Exceeded Section 01350 for one chemical (naphthalene).

Product (18 and 5): Exceeded Section 01350 for one chemical (naphthalene) and exceeded interim number for caprolactam.

Product (19 and 4): Exceeded Section 01350 for one chemical (naphthalene), exceeded the interim concentration limit for caprolactam, and exceeded odor thresholds for two chemicals (nonanal and 4-PCH).

Product 34: Exceeded Section 01350 for one chemical (naphthalene), exceeded the interim concentration limit for caprolactam, and exceeded odor thresholds for two chemicals (nonanal, and 4-PCH).

Product 35: Exceeded Section 01350 for three chemicals (acetaldehyde, formaldehyde, and naphthalene), exceeded the interim concentration limit for caprolactam, and exceeded odor thresholds for three chemicals (decanal, octanal, and 4-PCH).

Product 40: Exceeded the odor threshold for one chemical (nonanal).

Alternative Products (N=5)

Product 9: Exceeded Section 01350 for one chemical (naphthalene), and exceeded the interim concentration limit for caprolactam.

Product 7: Contains one chemical (1-methyl-2-Pyrrolidinione) listed on Prop. 65 list that does not have a listed CREL.

Product 36: Exceeded Section 01350 for one chemical (acetaldehyde).

Products 37 and 38: Did not exceed any concentration limits.

Of the 14 carpets tested, 6 were made with Nylon 6 fibers (standard products 4, 5, 34, 35, 39, and alternative product 9). In all these samples caprolactam was detected. Two of the standard products (4 and 5) were tested with and without adhesive. All other samples were tested with adhesive. The two samples that were tested without adhesive (standard products 4 and 5) exceeded the interim concentration limit. When the same two samples were tested with adhesive, they did not exceed the limit. Two of the three other standard samples (34 and 35) and the alternative sample (9) also exceeded the interim concentration limit.

3. Fiberboard

We tested five fiberboard samples:

Standard Products (N=2)

Product 51 and 52: Exceeded Section 01350 for one chemical (formaldehyde).

Alternative Products (N=3)

Product 21: Exceeded Section 01350 for one chemical (acetaldehdye).
Products 20 and 24 did not exceed any concentration limits.

4. Gypsum Board

We tested a total of four gypsum board samples:

Standard Products (N=2):

Products 57 and 58: exceeded Section 01350 for one chemical (formaldehyde).

Alternative Products (N=2):

Products 59 and 60: did not exceed any concentration limits.

5. Paints

We tested a total of 10 paints:

Standard Products (N=4)

Product 46: Exceeded Section 01350 concentration limits for one chemical (ethylene glycol)
Product 41: Exceeded the odor threshold for one chemical (nonanal).

Products 42 and 45 did not exceed any concentration limits.

Alternative Products (N=6)

Products 44: Exceeded the odor threshold for one chemical (nonanal).

Product 48: Exceeded the odor threshold for one chemical (decanol)
Products 49 and 50: Exceeded the odor threshold for one chemical (octanal)

Products 43 and 47: did not exceed any concentration limits.

6. Particleboard

We tested two particleboard samples:

Standard Product:

Product 23: Exceeded Section 01350 for one chemical (acetaldehyde).

Alternative Product:

Product 22: Did not exceed any concentration limits.

7. Plastic Laminates

We tested a total of four plastic laminate samples and assemblies with the following general characteristics:

Plastic Laminates Only (N=2)

Products 55 and 56 did not exceed any concentration limits.

Plastic Laminate Assemblies (N=2)

Assemblies 61 and 62 did not exceed any concentration limits.

8. Resilient Flooring (non-rubber-based and rubber-based)

We tested a total of 23 resilient flooring samples:

Standard Non-Rubber Based Products (N=4)

Products 11 and 13 did not exceed any concentration limits.

Product 79: Exceeded Section 01350 concentration limits for two chemicals (formaldehyde and naphthalene).

Product 87: Exceeded Section 01350 concentration limits for one chemical (acetaldehyde). The undated sample (80), which was otherwise identical to sample 87, did not exceed any concentration limits.

Alternative Non-Rubber Based Products (N=5)

Product 12: Exceeded Section 01350 concentration limit for one chemical (acetaldehyde), exceeded ½ CREL for 2-butoxy-ethanol as listed in the TAC list, and exceeded the odor threshold for one chemical (octanal), and contained one Prop. 65/TAC listed chemical (propionaldehyde) without a published CREL.

Product 14: Exceeded Section 01350 concentration limits for one chemical (phenol), and contained one Prop. 65/TAC listed chemical (2-(-2-butoxyethoxy)-ethanol) without a published CREL.

Products 15 and 81 did not exceed any concentration limits.

Product 90: Exceeded Section 01350 concentration limits for one chemical (acetaldehyde), exceeded odor thresholds for two chemicals (octanal and trans-2-decenal), and contained one Prop. 65/TAC listed chemical (propionaldehyde) without a published CREL.

Alternative Rubber-Based (Non-Tire Derived) Products (N=3):

Products 70 and 84: Exceeded Section 01350 concentration limits for one chemical (naphthalene).

Product 75 did not exceed any concentration limits.

Alternative Rubber-Based (Tire-Derived) Products (N=11):

Products 72, 76, and 77: Exceeded Section 01350 concentration limits for one chemical (naphthalene), and emitted one chemical (1-Methyl-2-Pyrrolidinone) on the Prop. 65/Tac lists without a published CREL.

Product 73: Exceeded Section 01350 concentration limits for one chemical (naphthalene).

Product 86 (same as 85 but tested with sealer): Exceeded CREL of one chemical (2-butoxy-ethanol as listed in the TAC).

Products 64, 65, 66, 67, 71, and 74 did not exceed any concentration limits. However, all 11 products emitted a large number of compounds that appeared as small peaks, in some cases numbering more than one hundred.

9. Tackable wall panels

We tested two tackable wall panels:

Products 16 and 17 did not exceed any of the concentration limits.

10. Thermal Insulation

We tested four thermal insulation samples:

Standard Products:

Product 54: Exceeded Section 01350 concentration limits for one chemical (formaldehyde).
Product 68 did not exceed any concentration limits.

Alternative Products:

Product 53: Exceeded Section 01350 for one chemical (formaldehyde).
Product 69 did not exceed any concentration limits.

11. Wall Base

We tested two standard 4-in wall-base, rubber-based samples (no alternatives were tested):

Products 78 and 83 did not exceed any concentration limits.

4.1.2 Classroom Calculations

Based on the room size and ventilation assumptions of this report, the State office configuration was slightly more sensitive to VOC emissions than the classroom configuration. Therefore, some products that exceeded the concentration limits for the State office calculations did not exceed them for the classroom calculations. These products were in six product categories and are listed below:

1. Carpets

Standard Product 18 did not exceed the caprolactam interim concentration limit but was just below this limit. Standard product 34 was just below the Section 01350 concentration limit for one chemical (naphthalene). Standard product 35 was just below the odor threshold for one chemical (4-PCH). Standard product 40 was just below the odor threshold for one chemical (nonanal).

2. Fiberboard

Standard products 51 and 52: Did not exceed the Section 01350 concentration limit but were just below this limit for one chemical (formaldehyde). Alternative product 21 was just below the Section 01350 concentration limit for one chemical (acetaldehyde).

3. Gypsum Board

Standard products 57 and 58: Did not exceed Section 01350 but were just below the limit for one chemical (formaldehyde).

4. Paints

Standard Products:

Product 46: Did not exceed Section 01350 concentration limits but was just below the limit for one chemical (ethylene glycol).

Product 41: Did not exceed the odor threshold but was just below the threshold for one chemical (nonanal).

Alternative Products

Product 44: Did not exceed the odor threshold but was just below the threshold for one chemical (nonanal).
Product 48: Did not exceed the odor threshold but was just below the threshold for one chemical (decanol).

5. Particleboard

Standard Product 23: Did not exceed the Section 01350 concentration limits but was just below the limit for one chemical (acetaldehyde).

6. Thermal Insulation

Standard product 54 and Alternative product 53: Did not exceed the Section 01350 concentration limits but was just below the limit for one chemical (formaldehyde).

4.1.3 State Boardroom and Auditorium Calculations for Tire-Derived Resilient Flooring

Because tire-derived products were high emitting compared to their alternative counterparts, additional calculations were made for this subcategory for building applications larger than a classroom and State office. These applications were a State boardroom and an auditorium.

At the 3.5 ach design ventilation rate for these areas, none of these products exceeded the concentration limit of the one Section 01350 chemical that was detected (naphthalene). When a lower ventilation rate of 0.75 ach was used (ventilation systems of boardrooms and auditoriums typically vary the amount of ventilation based on occupancy), product 72 exceeded the concentration limit for one Section 01350 chemical (naphthalene) for both the State boardroom and auditorium calculations, and products 73, 76, and 77 exceeded the concentration limit for the same chemical only for the State boardroom calculation. Finally, when product 85 was tested with sealer (product 86), it exceeded one chemical (2-Butoxy-Ethanol) on the TAC list with a published CREL for the State boardroom calculation.

4.2 Summary of Results for All Categories

Tables A–D (following Executive Summary) and Tables 27–29 summarize the results of this study. 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, 27 product samples emitted 1 or more chemicals exceeding Section 01350 concentration limits. Of these 27 products, 15 were standard and 12 were alternative. As shown in Tables B–D, of these 27 products, 24 exceeded only 1 chemical, 2 products exceeded the limits of 2 chemicals, and only 1 exceeded the limits for 3 chemicals. Table 27 shows that the most frequently exceeded limits were for naphthalene, formaldehyde, and acetaldehyde.

Similarly, Table A shows that 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 and the interim concentration limit for caprolactam changes these results slightly. For the State office calculation, two additional standard and four alternative products exceeded these criteria (see Tables B–D and Table 29). As shown in Table 28, the most frequently exceeded criteria were the interim concentration limit for caprolactam and odor thresholds for octanal and nonanal.

Tables B–D also show that of the 77 products studied, 55 contained chemicals on both the Prop. 65 *and* TAC lists. The majority of these products had one or two chemicals on the Prop. 65 list

and a few had up to five chemicals from this list. The same products had up to 13 chemicals on the TAC list. In addition, 17 products emitted up to eight chemicals that were only on the TAC list.

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.

4.3 Conclusions

The calculated air concentrations, based on (a) a standard size classroom and State office and (b) the laboratory-derived emission 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 IAQ performance 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. 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.

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

6. Some of the results reported in this study are inconsistent with those reported by industry-supported product certification programs such as CRI Green Label for carpets and low- or no-VOC labels for paints. 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.

7. CRI's Green Label specifications were originally intended primarily for carpets with SBR latex backing. Since many 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.

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

9. 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.

10. 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 (in some cases hundreds of) compounds 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.

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

12. 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 ten 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.

13. 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.

4.4 Uncertainties and Limitations of the Study

There are a number of uncertainties associated with the methodology used in the study. These are listed below:

1. Using chamber-based data from a 6 x 6-in sample and extrapolating the results to an indoor environment may not accurately predict actual building concentrations due to a number of variables.

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 depending on the amount of the material used for each application and the weekly average ventilation rate. Many factors related to the materials and to the building will result in different concentrations in actual buildings. These factors include building ventilation rates, age of material between manufacturing and installation, or storage, delivery, and construction practices.

3. Any sampling and analytical technique has limitations on what VOCs it can detect. The sampling methodology utilized in this study, that is, Tenax® sampling media, can be used to collect VOCs (up to C-15—pentadecane). Other important VOCs outside this range, such as semi-VOCs, are not detectable by this method.

4. The mass spectrometer used in this study scanned from 35 atomic mass units (amu) to 220 amu. Analytes with mass fragments greater than 220 amu may not be properly identified from the spectra alone. Wherever possible, we have provided estimates of the chemical family of the unidentified peaks from the information available.

5. The rubber-based resilient flooring products emitted a large number of small peaks, in some cases numbering more than 100. As most of these peaks constituted less than one percent of the total integrated area under the curve in the chromatogram, all these chemicals were not reported. Further analysis is required to examine any additive health effects associated with these compounds.

6. Variations occurred within and between product categories.

7. There may be changes to and inconsistencies in the manufacturing process as well as variation in feedstock materials.

8. Changes in availability of feedstock materials for certain products.

9. Manufacturers may change product lines and, therefore, what was tested in this study may or may not be available in the future.

10. Time and resource constraints resulted in limitations in the number of samples tested.

11. Although a great amount of effort was made to ensure that the products tested were recently manufactured, a number of manufacturers were unable to provide dated samples.

12. This study was mainly focused on two environmental attributes: recycled content and chemical emissions. Other very important criteria for environmentally preferable products (such as embodied energy) or environmental externalities (such as pollution produced during the manufacturing process) were not considered.

13. Repeated efforts were made to obtain samples with known production dates from all manufacturers. About half of the manufacturers whose products were tested cooperated with us by providing 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.

14. 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. Some chemicals emitted from a flooring product may be reduced when this product is tested with adhesive, whereas, chemicals emitted from the adhesive may be measured especially after sufficient diffusion time is allowed (such as the 14-day period specified by Section 01350).

Therefore, the results of this study should not be used to make generalizations or formulate conclusions regarding emissions from all recycled-content products versus their standard counterparts. Such generalizations should only be made when a larger, probability-based survey is conducted of standard and alternative products. Until such time, testing of individual products is necessary to determine the emissions and calculate potential compliance with the requirements used in this study or other requirements that may be used for screening or other purposes.

Despite the above limitations of this study, Section 01350 does provide a useful screening tool to the practitioner for the selection of low-emitting, high recycled-content building materials based on relatively inexpensive test requirements.

4.5 Comments on Section 01350

There are a number of improvements that can be made to Section 01350. Such improvements include:

1. Re-evaluate 50 percent criterion for CRELs: Section 01350 concentration limits were developed primarily for office buildings where adults spend their time. Although Section 01350 is based on CRELs which are developed taking into consideration sensitive populations such as children, it may be prudent to determine if the 50-percent criterion for CRELs and for the 8-hr formaldehyde level in Section 01350 are protective enough for sensitive populations.

2. Include chemicals on the Prop. 65 and/or TAC lists: Section 01350 requires that such chemicals be reported on the emissions test report. However, most practitioners cannot determine the impact of these chemicals on IAQ without a full risk-assessment analysis. The cost of such analyses should be borne by the material manufacturers.

   In this study we established a list of 121 target chemicals for all the samples analyzed. Seven of these were on both the Prop. 65 and TAC lists and all had a CREL. Four additional chemicals were only on the Prop. 65 list—one of these four did not have a CREL. Twenty-one additional chemicals were only on the TAC list—five of these did not have a CREL.

As was explained above, of the 77 products studied, 55 contained chemicals on the Prop. 65 and TAC lists. The majority of these products had one or two chemicals on the Prop. 65 list and few had up to 5 chemicals from this list. The same products had up to 10 chemicals on the TAC list. An additional 11 products not on the Prop 65 list had up to 6 chemicals on the TAC list. As was previously stated, this information cannot be used to determine whether or not a product is acceptable at this time.

We also note that the mere presence of a Prop. 65 chemical in the emissions test report of a product does not establish the requirement to provide a warning under Prop 65, since the Section 01350 test methodology may not be indicative of actual risk-exposure scenarios. Manufacturers are responsible to determine whether to label their product if they do not have an approved risk assessment demonstrating that the Prop. 65 NSRL is not exceeded. They may choose to have their own emissions testing done to obtain data for use in the risk assessment since Section 01350 testing is not intended to be used for long-term exposure assessment.

3. Explain how TVOC emission factors should be used: Section 01350 requires the reporting of these factors but does not give guidance to the practitioner on how to use these data. We suggest that language be inserted explaining to the user that the reporting of the TVOC emission factors at 24, 48, and 96 hrs is for quality assurance purposes only since the TVOC emission factors for most products should be reasonably stable or decay slowly with time after 10 days of conditioning.

4. Provide guidance on the 10 most abundant compounds. Section 01350 requires reporting of the 10 most abundant compounds not listed on the CREL, Proposition 65, or TAC lists. Although we agree that this is a good requirement to identify chemicals that otherwise would not have been reported, some guidance needs to be given on how these data would be used by a practitioner. We suggest that the 10 most abundant VOCs without Section 01350 concentration limits be reported when chamber concentrations are in excess of 5 $\mu g/m^3$. This will eliminate reporting VOCs having very low emission factors.

5. Provide guidance on products with chromatograms that have TVOC emission factors much higher than the sum of the Section 01350-required individual VOC emission factors. Section 01350 does not address this issue or how the results of these products should be interpreted. We suggest that all individual VOCs be reported (or classes of VOCs in the case of numerous very small peaks) contributing to high sum TVOCs even if these VOCs or classes of VOCs are not included in the concentration limits of Section 01350. Guidance must also be given to the practitioner on how to use this information.

6. Consider candidate chemicals for addition to OEHHA's CREL list: We found modeled concentrations of a few chemicals with known or potential health effects to warrant health hazard assessment and consideration for inclusion in future updates of the CREL lists.

   The most noteworthy of these chemicals is caprolactam. This chemical is found in all the carpets made of Nylon 6. Of the 14 carpets tested, 6 were made with Nylon 6 fibers and in all these samples caprolactam was detected. Since carpeting covers the majority of the floor space in office buildings, it is important that a CREL be established. Meanwhile, OEHHA has established an interim concentration limit for this chemical. Given that Nylon 6 is the only source of this chemical in buildings, the applicability of the 50 percent criterion needs to be evaluated. For the carpets reported in this study, we used 100 percent of the interim concentration limit.

   Another chemical is 2-Butoxy Ethanol (Ethylene glycol monobutyl ether). It was emitted from two resilient flooring products. This chemical has a listed CREL in the TAC list [CREL is 20$\mu g/m^3$ (www.arb.ca.gov/toxics/tac/factshts/glycleth.pdf)]. However, OEHHA does not have this chemical listed in their CREL list.

Other chemicals of concern include 2-ethyl hexanoic acid, propionaldehyde, and 2-(-2-butoxyethoxy)-ethanol.

7. Default ventilation rates: The default ventilation rates in Section 01350 for calculating concentrations are based on weekly averages. This is a conservative assumption that may more accurately predict concentrations during the initial hours of operation after a non-operational period. But these weekly averages may overestimate the concentrations for many chemicals under extended hours of operation.

Therefore, we recommend that State environmental and health agencies review the appropriateness of these criteria for materials and products used in diverse applications such as schools and homes with the purpose of determining if more appropriate criteria are needed for applications other than office buildings.

4.6 Future Steps

As more information is collected on emissions of products with various amounts of recycled content, markets for products with increased recycled content and reduced emissions could be expanded. Furthermore, confidence on these products will increase, allowing building professionals to make well-informed building material selections.

It is this study's intention that emissions test results be utilized to increase the amount of environmentally preferable products specified and installed in classrooms and State office building projects. We anticipate this will occur in several ways:

1. Work with manufacturers whose products exceeded concentration limits of chemicals of concern and encourage them to reduce emissions of these chemicals in their products.

2. Encourage manufacturers to have their products tested according to Section 01350 at independent laboratories and;

    - Forward test results to the Division of the State Architect so that their products can be considered for inclusion in the Environmentally Preferable Products (EPP) Database. Since the Public Resources Code, section 42642 requires the development of an EPP Database (SB 373, Chapter 926, Statutes of 2001), it is anticipated that the Division of the State Architect and the CIWMB, with input from DHS and other environmental agencies, will develop this database incorporating information provided from this study to assist practitioners in the selection of building materials.

    - Forward test results to CHPS so that the information can be available for use to school projects that are trying to meet the Low Emitting Materials Credit within the CHPS Criteria.

Future addenda to this report will include Section 01350-based emissions test data that the manufacturers have released to us for inclusion to this report. Results of additional testing, funded by DHS, will include limited long-term testing of certain building materials that were not the focus of the research reported in this report. We also plan a comparison study of the results presented in this report with other similar studies such as the results reported by Hodgson (1999) and Kelly (1996), as well as other U.S. and European studies.

Our team, consisting of researchers from DHS and PHI—with partial funding from the U.S. EPA—will measure VOCs and aldehydes concentrations at the Capitol Area East End Complex for up to 12 months after occupancy. (See Section 1.5 for more details about this sustainable, five-building complex constructed with low-emitting materials tested according to Section 01350.) The measured concentrations will be compared to those predicted from the emissions data obtained from the manufacturers during the early design phases of this complex. Furthermore, the measured concentrations will also be used to compare the long-term emissions of building construction materials to emissions of office furniture, occupant activities, and cleaning/maintenance products.

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Tables

Table 1. Carpet Manufacturers Specified by 10 Largest School Districts in California			
School District		**Carpet Used**	
Size Rank	Name	Manufacturer	Product Name
1	Los Angeles Unified	Mohawk	Entry SD-26 Endeavor
		Mannington	Aspects II Murano
		J and J	Assertion II
		Shaw	Application
		Cambridge	Oxford II Wynford II
2	San Diego City Unified	Lees	Faculty IV broadloom
		Collins & Aikman	Sonar 6-ft; mark 1 backing
3	Long Beach Unified	Unable to obtain information	
4	Fresno Unified	Lees	Faculty IV Faculty MD
		Collins & Aikman	Arena
5	San Francisco Unified	Unable to obtain information	
6	Santa Ana Unified	Lees	Faculty Classic Faculty IV
7	Oakland Unified	Collins & Aikman	Powerbond Guardian
8	Sacramento City Unified	Mohawk	Industry Performer 28 UPS
9	San Bernardino City Unified	J & J Carpeting	Certificate 3
10	San Juan Unified	Collins & Aikman	Powerbond Infinity

Table 2a. List of Standard Acoustical Ceiling Panels Tested

#	Specimen ID[A]	Product Description	Environmental Considerations	Selection Based On
1	SACP29M5	Tested w/ all sides exposed	Up to 40% total recycled content	Specified for State office buildings
2	SACP31M5	Tested w/ all sides exposed	Up to 45% total recycled content	
3	SACP32M10	Tested w/ all sides exposed	Up to 25% postconsumer recycled content 30% total recycled content from waste paper, synthetic gypsum, and damaged ceiling tiles.	
4	SACP33M5	Tested w/ all sides exposed	Up to 40% total recycled content	

Table 2b. List of Alternative Acoustical Ceiling Panels Tested

#	Specimen ID[A]	Product Description	Environmental Considerations	Selection Based On
1	AACP25M14	Identical samples. AAC P25M14 was tested w/ only one side exposed. AACP28M14 was tested w/ all sides exposed	Up to 10% postconsumer recycled content. Up to 60% total recycled content from waste paper, steel mill slag, and damaged ceiling tiles	Recycled content
	AACP28M14			
2	AACP26M10	Identical samples. AACP26M10 was tested w/ only one side exposed. AACP27M10 was tested w/ all sides exposed	Up to 70% total recycled content from synthetic gypsum and damaged ceiling tiles	
	AACP27M10			
3	AACP30M14	Tested w/ all sides exposed	Up to 20% postconsumer recycled content. Up to 60% total recycled content from waste paper, steel mill slag, and damaged ceiling tiles	

Table 3a. List of Standard Carpets Tested

#	Specimen ID [A]	Product Description	Environmental Considerations	Selection Based On
1	SC2M1	Broadloom Construction: tufted Backing: colloidal emulsion Face Fiber: Nylon 6,6. Tested w/ adhesive	CRI certified (IAQ label)	Specified by one or more of the 10 largest school districts in California
2	SC6M2	Broadloom Construction: tufted Backing: ethylene vinyl acetate (EVA) Face Fiber: Nylon 6,6 Tested w/ adhesive	Face fiber up to 25% recycled content Adhesive listed as "zero VOC" CRI certified (IAQ label)	
3	SCT8M3	Tile Construction: tufted Backing: PVC[B] Face Fiber: Nylon 6,6 Tested w/ adhesive	Adhesive: Less than 5 g/L VOC CRI certified (IAQ label)	
4	SC18M4 (w/adh) SC5M4 (no adh)	Broadloom Construction: tufted Backing: colloidal emulsion Face Fiber: Nylon 6[B] Tested w/ and w/ out adhesive	Face fiber 25% recycled content Adhesive listed as "zero VOC" CRI certified (IAQ label)	
5	SC19M4 (w/adh) SC4M4 (no adh)	Broadloom Construction: tufted Backing: colloidal emulsion Face Fiber: Nylon 6 Tested w/ and w/ out adhesive	Face fiber 25% recycled content 10% total recycled content Adhesive listed as "zero VOC" CRI certified (IAQ label)	
6	SC34M15	Broadloom Construction: tufted Backing: polypropylene, SBR latex Face Fiber: Nylon 6 Tested w/ adhesive	Face fiber: 25% postconsumer recycled content Adhesive listed as "zero VOC" CRI certified (IAQ label)	

Table 3a. List of Standard Carpets Tested

#	Specimen ID [A]	Product Description	Environmental Considerations	Selection Based On
7	SCT35M16	Tile Construction: tufted Backing: urethane Face Fiber: Nylon 6 Tested w/ adhesive	Backing: 20% recycled content CRI certified (IAQ label)	Specified for State office buildings
8	SC39M15	Broadloom Construction: tufted Backing: polypropylene [B] Face Fiber: Nylon 6 Tested w/ adhesive	Face fiber 25% recycled content Adhesive listed as “zero VOC” CRI certified (IAQ label)	
9	SCT40M17	Tile Construction: tufted Backing: polyurethane Face Fiber: Nylon 6,6 Tested w/ adhesive	Adhesive listed as “zero VOC” CRI certified (IAQ label)	

Table 3b. List of Alternative Carpets Tested

#	Specimen ID[A]	Product Description	Environmental Considerations	Selection Based On
1	ACT7M3	Tile Construction: tufted Backing: PVC[B] Face Fiber: Nylon 6,6 Tested w/ adhesive	7% postconsumer recycled content 45% total recycled content Adhesive VOC: Less than 5 g/L CRI certified (IAQ label)	Suggested by carpet manufacturer as an alternative replacement with higher recycled content for classroom applications
2	AC9M1	Broadloom Construction: woven Backing: no secondary backing Face Fiber: Nylon 6. Tested w/ adhesive	Face fiber: 25% postconsumer recycled content, 50% total recycled content Adhesive listed as "zero VOC" [B] CRI certified (IAQ label)	
3	ACT36M16	Tile Construction: tufted Backing: PVC Face Fiber: Nylon 6,6. Tested w/ adhesive	Backing: 50% postconsumer recycled content, 50% postindustrial content CRI certified (IAQ label)	Recycled content
4	ACT37M17	Tile Construction: tufted or bonded Backing: synthetic resin Face Fiber: Nylon 6,6 Tested w/ adhesive Both tested carpets were from the same line but different patterns	100% postconsumer recycled content Adhesive listed as "zero VOC" CRI certified (IAQ label)	
5	ACT38M17			

Table 4a. List of Standard Fiberboard Tested

#	Specimen ID[A]	Product Description	Environmental Considerations	Selection Based On
1	SMDF51M11	¾-in interior grade MDF Fiber source: softwood Tested w/ all sides exposed.	25% total recycled content Urea formaldehyde binder	Standard Product
2	SMDF52M11	¾-in interior grade MDF Fiber source: softwood Tested w/ all sides exposed.	60% total recycled content Urea formaldehyde binder	

Table 4b. List of Alternative Fiberboard Tested

#	Specimen ID[A]	Product Description	Environmental Considerations	Selection Based On
1	AMDF20M11	¾-in interior grade MDF Fiber source: softwood Tested w/ only one side exposed.	25% total recycled content Methylenediphenyl Isocyanate binder	Listed as “no added-formaldehyde”
2	AMDF21M12	½-in interior grade low density fiberboard Fiber source: newsprint Tested w/ only one side exposed.	100% postconsumer recycled newsprint content	Amount of recycled content. Listed as “no added formaldehyde”
3	AMDF24M11	¾-in interior grade MDF Fiber source: softwood Moisture resistant Tested w/ only one side exposed	25% total recycled content Methylenediphenyl Isocyanate binder	Listed as “no added formaldehyde”

Table 5a. List of Standard Gypsum Boards Tested

#	Specimen ID[A]	Product Description	Environmental Considerations[1]	Selection Based On
1	SGB57M31	5/8-in thick Core contains fiberglass	No recycled content in core	Standard product
2	SGB58M10	5/8-in thick Core contains fiberglass	No recycled content in core	
3	SGB91M51[1]	5/8-in thick		Not part of this study; was used only as a substrate for all paint samples in this study

[1] Not part of this study; was used only as a substrate for all paint samples in this study.

Table 5b. List of Alternative Gypsum Boards Tested

#	Specimen ID[A]	Product Description	Environmental Considerations Product Description (All manufacturers list paper facing as 100% recycled content)	Selection Based on
1	AGB59M32	5/8-in thick Core contains fiberglass	Core 5% postindustrial recycled content	Recycled content
2	AGB60M33	5/8-in thick Core contains fiberglass	Core 3% postconsumer recycled content Core 2% postindustrial recycled content	

Table 6a. List of Standard Paints Tested

(All tested on gypsum board sample SGB91M51)

#	Specimen ID[A]	Product Description	Environmental Considerations	Selection Based On
1	SPNT41M18	Interior paint Assembly: two coats of finish (no primer) Finish coat resin type: acrylic copolymer Finish coat sheen: flat	Finish coat VOC: 100 g/L or less	Specified for State office buildings
2	SPNT42M18	Interior paint Assembly: one coat of primer, two coats of finish Finish coat resin type: Interior polymeric Finish coat sheen: eggshell	Primer VOC: 200 g/L or less Finish coat VOC: 150 g/L or less	
3	SPNT45M22	Interior paint Assembly: one coat of primer, two coats of finish Finish coat resin type: acrylic copolymer Finish coat sheen: eggshell	Primer VOC: 250 g/L or less Finish coat VOC: 150 g/L or less	
4	SPNT46M23	Interior paint Assembly: one coat of primer, two coats of finish Finish coat resin type: vinyl acrylic latex Finish coat sheen: eggshell	Primer VOC: 200 g/L or less Finish coat VOC: 250 g/L or less	Specified for State office buildings (primer only)

Table 6b. List of Alternative Paints Tested

#	Specimen ID[A]	Product Description	Environmental Considerations	Selection Based On
1	APNT43M19	Interior paint Assembly: one coat of primer, two coats of finish Finish coat resin type: Acrylic Latex Finish coat sheen: eggshell	Primer: listed as "zero-VOC" Finish coat: listed as "zero-VOC"	Primer and finish coat listed as "zero-VOC"
2	APNT44M20	Interior paint Assembly: one coat of primer, two coats of finish Finish coat resin type: polymer emulsion Finish coat sheen: eggshell	Primer VOC: 200 g/L or less Finish coat: listed as "zero-VOC"	Finish coat listed as "zero-VOC"
3	APNT47M23	Interior paint Assembly: one coat of primer, two coats of finish Finish coat resin type: acrylic latex Finish coat sheen: eggshell	Primer: listed as "zero-VOC" Finish coat: listed as "zero-VOC" Labeled as Green Seal certified	Primer and finish coat listed as "zero-VOC"
4	APNT48M24	Interior/exterior paint Assembly: two coats of finish (no primer needed) Finish coat resin type: Acrylic Latex Finish coat sheen: semi-gloss	Remanufactured finish coat with 50% postconsumer content paint Finish coat VOC: 250 g/L or less	Remanufactured finish coat
5	APNT49M25	Interior/exterior paint Assembly: one coat of primer, two coats of finish Finish coat resin type: acrylic copolymer Finish coat sheen: eggshell	Remanufactured finish coat with 50% postconsumer content paint Primer VOC: 200 g/L or less Finish coat VOC: 250 g/L or less	Remanufactured finish coat
6	APNT50M26	Interior/exterior paint Assembly: one coat of primer, two coats of finish Finish coat resin type: latex Finish coat sheen: eggshell	Remanufactured primer with 50% postconsumer content paint Remanufactured finish coat with 50% postconsumer content paint Primer VOC: 250 g/L or less Finish coat VOC: 250 g/L or less	Remanufactured primer and finish coat

Table 7. List of Particleboard Tested

#	Specimen ID[A]	Product Description	Environmental Considerations	Selection Based On
Standard Particleboard				
1	SPB23M11	¾-in interior grade Fiber source: softwood Tested w/ only one side exposed	25% total recycled content	Specified by one or more of the 10 largest school districts in California
Alternative Particleboard				
2	APB22M13	¾-in interior grade Fiber source: wheat straw Tested w/ only one side exposed	90% total recycled content Methylenediphenyl Isocyanate binder	Recycled content. Listed as “no added formaldehyde”

Table 8. List of Plastic Laminates and Assemblies Tested

#	Specimen ID[A]	Product Description	Environmental Considerations	Selection Based On
Plastic Laminates Only				
1	SPLAM55M29	Composition: Laminate of melamine resin saturated paper over phenolic resin saturated kraft paper Grade: horizontal, general purpose, post-formable		Specified for State office buildings
2	SPLAM56M30	Composition: Laminate of melamine resin saturated paper over phenolic resin saturated kraft paper Grade: horizontal, general purpose, post-formable	Paper: 10% recycled content	
Plastic Laminate Assemblies				
1	SPASM61M30	Laminate: SPLAM56M30 Fiberboard: SMDF52M11 Contact cement: Neoprene rubber Assemblies tested: SPASM61M30: 2 of 4 edges not laminated APASM62M30: all surfaces laminated	Adhesive VOC: 85 g/L or less	Standard Product – Partially Laminated
2	APASM62M30			Alternative Product – Fully Laminated

Table 9a. List of Standard Resilient Flooring Tested (non-rubber based)

#	Specimen ID[A]	Product Description	Environmental Considerations	Selection Based On
1	SRFT11M5	Vinyl composition tile Gauge: 1/8 in (3.2 mm) Tested w/ latex adhesive.	Adhesive VOC: 5 g/L or less	Specified by one or more of the 10 largest school districts in California
2	SRF13M5	Vinyl sheet, felt backed Gauge: 0.085 in (2.16 mm) Tested w/ adhesive	Adhesive VOC: 5 g/L or less	
3	SRFT79M44	Vinyl composition tile Gauge: 1/8 in (3.2 mm) Tested w/ SBR latex emulsion adhesive	Adhesive VOC: 50 g/L or less	Specified in State office buildings
4	SRFT80M46 (old sample) SRFT87M46 (new sample)	Vinyl composition tile Gauge: 1/8 in (3.2 mm) Tested w/ latex adhesive	Vinyl: 10% recycled content Adhesive: listed as “zero-VOC”	

Table 9b. List of Alternative Resilient Flooring Tested (non-rubber-based)

#	Specimen ID[A]	Product Description	Environmental Considerations	Selection Based on
1	ARF12M6	Linoleum sheet Gauge: 0.10 in (2.5 mm) Composition: homogenous blend of oil, resin, and wood flour Backing composition: jute Tested w/ SBR polymer adhesive	Adhesive: listed as "zero-VOC"	No synthetic material content. Listed as containing all natural, renewable, and biodegradable ingredients.
2	ARFT14M7	PVC interlocking tile Gauge: 0.22 in Tested w/ out adhesive (no adhesive required)	100% total recycled content	Recycled content
3	ARFT15M8	Polymeric laminate tile Gauge: 0.10 in (2.5 mm) Wear layer composition: thermoplastic resin Backing composition: mineral filled ethylene copolymer Tested w/ adhesive	PVC- and plasticizer-free floor tile. Alternative to PVC.	Chlorine-free product
4	ARFT81M45	Vinyl composition tile Gauge: 1/8 in (3.2 mm) Tested w/ adhesive	Base layer 35% recycled content Adhesive: listed as "zero-VOC"	Recycled content
5	ARF90M5	Linoleum sheet Gauge: 0.10 in (2.5 mm) Composition: homogenous blend of oil, resin, and wood flour Backing composition: jute Tested w/ latex adhesive	Adhesive VOC: 5g/L or less	No synthetic material content. Listed as containing all natural, renewable, and biodegradable ingredients

Table 9c. List of Alternative Resilient Flooring Tested (rubber-based)

#	Specimen ID[A]	Product Description	Environmental Considerations	Selection Based on
Non-Tire Derived				
1	ARRF70M38	Rubber roll / tile Composition: SBR[1], natural rubber and natural filler Gauge: 0.8 in (2mm) Tested w/ acrylic adhesive No sealer required	10% total recycled content Adhesive: listed as "zero VOC"	Recycled content
2	ARRF75M41	Rubber tile Composition: EPDM[2] rubber Gauge: 0.16 in (4 mm) Tested w/ polyurethane adhesive	90% total recycled content Adhesive VOC: 60 g/L or less	
3	ARRF84M42	Cork and rubber composition tile Gauge: 1/8 in (2.5mm) Tested w/ acrylic latex adhesive	40% total recycled content Adhesive: listed as "zero-VOC"	
Tire-Derived				
1	ARRF64M36	Rubber roll Composition: SBR[1] and EPDM[2] rubber Gauge: ¼ in (6mm) Tested w/ acrylic adhesive No sealer required	85% postconsumer recycled content Adhesive: listed as "zero-VOC"	Recycled content

Table 9c. List of Alternative Resilient Flooring Tested (rubber-based)

#	Specimen ID[A]	Product Description	Environmental Considerations	Selection Based on
2	ARRF65M36	Rubber roll Composition: SBR Gauge: ¼ in 6mm) Tested w/ acrylic adhesive[1] No sealer required	100% postconsumer recycled content Adhesive: listed as "zero-VOC"	
3	ARRF66M36	Rubber tile Composition: SBR[1] and EPDM[2] rubber Gauge: 3/8 in (9mm) Tested w/ acrylic adhesive No sealer required	85% postconsumer recycled content Adhesive: listed as "zero-VOC"	
4	ARRF67M36	Rubber roll Composition: SBR[1] and EPDM[2] rubber Gauge: 3/8" (10mm) Tested w/ acrylic adhesive No sealer required	85% postconsumer recycled content Adhesive: listed as "zero-VOC"	
5	ARRF71M37	Rubber tile Composition: SBR[1] and EPDM[2] rubber Gauge: ¼ in (6mm) Tested w/ polyurethane adhesive No sealer required	90% postconsumer recycled content Adhesive VOC: 60 g/L or less	Recycled content

Table 9c. List of Alternative Resilient Flooring Tested (rubber-based)

#	Specimen ID[A]	Product Description	Environmental Considerations	Selection Based on
6	ARRF72M35	Rubber roll Composition: SBR[1] and EPDM[2] rubber Gauge: 3/8 in (10mm) Tested w/ polyurethane adhesive Sealer recommended for certain applications	80% postconsumer recycled content Adhesive VOC: 60 g/L or less	Recycled content
7	ARRFT73M34	Rubber tile Composition: SBR[1] and EPDM[2] rubber Gauge: ¼ in (6mm) Tested w/ polyurethane adhesive Sealer recommended for high-traffic areas.	85% postconsumer recycled content Adhesive VOC: 60 g/L or less	Recycled content
8	ARRFT74M43	Rubber tile Composition: SBR[1] Gauge: ½ in (12mm) Tested w/out adhesive (due to the weight of the tiles adhesive is not needed) No sealer required	100% postconsumer recycled content	Recycled content
9	ARRF76M41	Rubber roll / tile Composition: SBR[1] and EPDM[2] rubber Gauge: 0.16 in (4 mm) Tested w/ polyurethane adhesive	80% postconsumer recycled content 90% total recycled content Adhesive VOC: 60 g/L or less	Recycled content

Table 9c. List of Alternative Resilient Flooring Tested (rubber-based)

#	Specimen ID[A]	Product Description	Environmental Considerations	Selection Based on
10	ARRF77M49	Rubber roll Composition: SBR[1] and EPDM[2] rubber Gauge: 3/8 in (9 mm) Tested w/ polyurethane adhesive No sealer required	90% postconsumer recycled content 100% total recycled content Adhesive VOC: 60 g/L or less	Recycled content
11	ARRF85M42 (tested w/o sealer) ARRF86M42 (tested w/ low-sealer)	Rubber roll / tile Composition: SBR[1] and EPDM[2] rubber Gauge: ¼ in (6mm) Tested w/ polyurethane adhesive. Low-gloss floor finish Sealer recommended	80% postconsumer recycled content Adhesive VOC: 60 g/L or less	Recycled content

[1] Styrene butadiene rubber.
[2] Ethylene propylene diene monomer.

Table 10. List of Tackable Wall Panels Tested

#	Specimen ID[A]	Product Description	Environmental Considerations	Selection Based on
Standard Wall Panel				
1	SWP16M9	Composition: Composite of vinyl wall covering and wood fiber board		Specified for classrooms
Alternative Wall Panel				
2	AWP17M10	Composition: Composite of fabric, mineral fiber board and gypsum board	No pressed wood	Suggested by advisory group

Table 11a. List of Standard Thermal Insulation Tested

#	Specimen ID[A]	Product Description	Environmental Considerations	Selection Based on
1	SINS54M28	Composition: Fiberglass light density batts Facing type: kraft paper Insulation value: R-19	Urea formaldehyde binder	Standard Product
2	SINS68M47	Composition: Fiberglass light density batts Facing type: kraft paper Insulation value: R-19	Urea formaldehyde binder	

Table 11b. List of Alternative Thermal Insulation Tested

#	Specimen ID[A]	Product Description	Environmental Considerations	Selection Based on
1	AINS53M27	Composition: Fiberglass light density batts Facing type: kraft paper Insulation value: R-19	20% postconsumer recycled content 25% total recycled content Listed as “formaldehyde-free” Acrylic thermosetting binder	Listed as “formaldehyde-free”
2	AINS69M48	Composition: Cellulose, spray wet-applied Insulation value: R-19	80% recycled content cellulose Listed as “formaldehyde-free”	

Table 12. List of Standard Wall Base Tested

#	Specimen ID[A]	Product Description	Environmental Considerations	Selection Based on
1	SWB78M39	4-in wall base Composition: Thermal-set rubber Gauge: 1/8” Tested w/ rubber resin adhesive	Adhesive: listed as “zero-VOC”	Specified for state office buildings
2	SWB83M50	4-in wall base Composition: Thermoplastic rubber Gauge: 1/8” Tested w/ acrylic adhesive	Adhesive: listed as “zero-VOC”	

General notes for tables 2-12:

[A] Code for specimen IDs:
Standard (S) or Alternative (A) Material
Material Category: acoustical ceiling panel (ACP), carpet (C), medium or low density fiberboard (MDF), gypsum board (GB), paint (P), particleboard (PB), plastic laminate (PL), resilient flooring, non-rubber (RF), resilient flooring, rubber (RRF), tackable wall panel (WP), thermal insulation (IN), wall base (WB), tile (T),
Sample ID
Manufacturer’s code

[B] This information may not be accurate - unable to confirm

Table 13a. Summary of Dimensions Used in Calculations of Standard Classroom
Room Dimensions
Room length: 12.19 m (40 ft); Room width: 7.32 m (24 ft); Room height: 2.59 m (8.5 ft)
Window and Door Dimensions
Window: 1.2 m x 2.4 m (4 x 8 ft)
Window: 1.2 m x 1.2 m (4 x 4 ft)
Door: 0.9 m x 2.1 m (3 x 7 ft)
Factors Used to Calculate Air Concentration
Room volume: 231.07 m^3 less 10% for furnishings=208 m^3
Ventilation rate: 0.90 air changes per hour (ach)
Surface Areas
Floor surface area (for all flooring products): 89.23 m^2
Ceiling area for acoustical panels (2 sides of panels exposed): 178.5 m^2
Net wall surface area (for all gypsum boards, paints, and tackable wall panels): 94.6 m^2
Areas subtracted from wall surface area
Window area: 4.46 m^2
Door area: 1.95 m^2
Countertop and Cabinetry (assuming that the 24-ft wall has a 20-ft countertop and 4-ft cabinetry)
Particleboard:
Countertop 20 ft wide x 30 in deep (underside, bare surface): 4.6 m^2
Case 4 ft wide x 8.5 ft high (one bare side): 3.1 m^2
Total for particleboard: 7.81 m^2
Fiberboard: Countertop, 20 ft wide x 30 in deep (underside, bare surface): 4.6 m^2
Plastic Laminate:
Not in Assembly: Surface area based on a 20 ft x30 inch countertop with front edge laminated: 4.76 m^2
Thermal Insulation
All 4 walls and ceiling (only one face of the insulation exposed): 183.9 m^2
Wall Base
4 in high (deduct width of the door): 3.81 m^2

Table 13b. Summary of Dimensions Used in Calculations of State Office
Room Dimensions
Room length: 3.05 m (10 ft); Room width: 3.66 m (12 ft); Room height: 2.74 m (9.0 ft)
Window and Door Dimensions
Window: None
Door: 0.9 m x 2.1 m (3 x 7 ft)
Factors Used to Calculate Air Concentration
Room volume: 30.59 m^3 less 10% for furnishings=27.5 m^3
Ventilation rate: 0.75 air changes per hour (ach)
Surface Areas
Floor surface area (for all flooring products): 11.15 m^2
Ceiling area for acoustical panels (2 sides of panels exposed): 22.3 m^2
Net wall surface area (for all gypsum boards and paints): 46.27 m^2
Areas subtracted from wall surface area
Window area: None
Door area: 1.95 m^2
Particleboard and Fiberboard
Based on State of California Office Systems Furniture Specification (see Figure 1): 3pcs 24 in x48 in. All surfaces have unlaminated sides and undersides. 3.02 m^2
Plastic Laminate
(Not in assembly): Surface area based on State of California Office Systems Furniture Specification (see Figure 1): 3 pcs 24 in x 48 in = 2.97 m^2
Thermal Insulation
Corner office with 2 outside walls and ceiling (only one face of the insulation exposed): 46.41 m^2
Wall Base
4 in high (deduct width of the door): 1.25 m^2
Tackable Wall Panel
Surface Area based on State of California Office Systems Furniture Specification (See Figure 1) 2- pcs 16 in x 48 in (0.41 m x 1.22 m): 1 m^2

Table 13c. Summary of Dimensions and Ventilation Rates Used in Calculations of Boardroom and Auditorium
BOARDROOM
Room Dimensions:
Room length: 22 m (72 ft); Room width: 9.8 m (32 ft); Room height: 2.6 m (8.5 ft)
Factors Used to Calculate Air Concentration
Room volume: 560 m^3 less 10% for furnishings=504 m^3
Ventilation rate: 3.5 air changes per hour (ach)
AUDITORIUM
Room Dimensions:
Room length: 21 m (70 ft); Room width: 21 m (70 ft); Room height (average): 4.6 m (15 ft)
Factors Used to Calculate Air Concentration
Room volume: 2090 m^3 less 10% for furnishings=1880 m^3
Ventilation rate: 3.5 air changes per hour (ach)

Table 14. List of Target Chemicals

	Compound Name	CAS Number	Pure Cal. Stds	OEHHA's Chronic REL µg/m^3	Prop. 65 listed	TAC (ARB) listed	Odor Threshold	
							ppb	µg/m^3
1	Acetic Acid	64-19-7					140	360
2	Acetone (2-Propanone)[1]	67-64-1	x				>1 ppm	
3	Acetophenone	98-86-2				x	360	1800
4	Acetaldehyde[1]	75-07-0	x	9	x	x		
5	Acrolein (2-Propenal)[1]	101-02-8	x	0.06		x	170	410
6	Benzaldehyde[1]	100-52-7	x				42	190
7	Benzene	71-43-2	x	60	x	x	>1 ppm	
8	Butanoic Acid	107-92-6					3.9	14
9	n-Butanol	71-43-2					490	1500
10	2-Butoxy Ethanol[5] (Ethylene glycol monobutyl ether)	111-76-2				x	340	1700
11	2-(-2-butoxyethoxy)-ethanol (diethylene glycol monobutyl ether)	112-34-5				x		
12	Butoxy-2-propanol	5131-66-8						
13	Butylcyclohexane	1678-93-9	x					
14	n-Butyl ethanoate (Butyl Acetate)	123-86-4					190	930
15	n-Butyl ether	142-96-1					47	250
16	n-Butyl propanoate	590-01-2						
17	Butyraldehyde[1]	123-72-8	x					
18	Butyrolactone	96-48-0						
19	Caprolactam[3,6]	105-60-2				x		
20	3-Carene	13466-78-9						
21	Chlorodecane	1002-69-3					52	390
22	Chlorododecane	112-52-7						
23	Chloroform (trichloromethane)	67-66-3	x	300	x	x	>1 ppm	
24	Cumene (Isopropylbenzene)	98-82-8				x	24	120
25	Cyclododecane	294-62-2						
26	Cyclohexanone[1,3]	108-94-1	x				710	2900

Table 14. List of Target Chemicals

	Compound Name	CAS Number	Pure Cal. Stds	OEHHA's Chronic REL µg/m³	Prop. 65 listed	TAC (ARB) listed	Odor Threshold	
							ppb	µg/m³
27	Decanal[1]	112-31-2	x				0.9	5.9
28	Decanol	112-30-1					18	120
29	n-decane (decane)	124-18-5	x				740	4400
30	1-Decene	872-05-9						
31	Dicyclopentadiene	77-73-6						
32	Diethyl Propanedioate (Diethyl Malonate)	105-53-3						
33	1,3-Diisopropyl Benzene	99-62-7						
34	1,4-Diisopropyl Benzene	100-18-5						
35	2,2-Dimethyl-1,3-propanediol	126-30-7						
36	N,N-Dimethylformamide	68-12-2		80		x		
37	1,4-Dioxane	123-91-1		3000		x		
38	Dipropylene Glycol	106-62-7						
39	Dodecanal	112-54-9						
40	Dodecane	112-40-3						
41	2-Ethoxy Ethanol	110-80-5	x	70	x	x	>1 ppm	
42	2-Ethoxy Ethyl Acetate	111-15-9	x	300	x	x	180	1000
43	Ethyl Benzene	100-41-4	x	2000		x	2.9	13
44	2-Ethyl Hexanoic Acid	149-57-5						
45	2-Ethyl-1-hexanol (2-Ethylhexan-1-ol)	104-76-7					250	1300
46	2-Ethylhexyl Acetate	103-09-3					320	2300
47	1-Ethyl-2-Methylbenzene	611-14-3						
48	1-Ethyl-3-Methylbenzene	620-14-4						
49	1-Ethyl-4-Methylbenzene	622-96-8						
50	Ethylene Glycol (1,2-Ethanediol)	107-21-1	x	400		x		
51	Formaldehyde (methanal)[1,4]	50-00-0	x	33[4]	x	x	870	1100
52	2-Furancarboxaldehyde (Furfural)	98-01-1					780	3200

Table 14. List of Target Chemicals

	Compound Name	CAS Number	Pure Cal. Stds	OEHHA's Chronic REL µg/m³	Prop. 65 listed	TAC (ARB) listed	Odor Threshold	
							ppb	µg/m³
53	Heptanal[1]	111-71-7	x				4.8	23
54	n-Heptane	142-82-5	x					
55	Heptanoic Acid	111-14-8					28	150
56	Hexanal[1]	66-25-1	x				14	58
57	n-Hexane	110-54-3	x	7000		x		
58	Hexanoic Acid	142-62-1					13	60
59	2-Hydroxybenzaldehyde (Salicylaldehyde)	90-02-8					7.4	38
60	Indene	95-13-6	x				8.7	43
61	Isopropyl Alcohol (2-Propanol)	67-63-0	x	7000		x	>1 ppm	
62	Isovaleraldehyde (3-methylbutanal) [1]	590-86-3	x				2.2	8.1
63	δ-Limonene (limonene)	138-86-3					440	2500
64	Linalyl Propanoate	144-39-8						
65	Longifolene	475-20-7						
66	2-Methoxy Ethanol	109-86-4	x	60	x	x	1100	3500
67	1-(2-methoxy-1-methylethoxy)-2-propanol (Dipropylene glycol monomethyl ether)	20324-32-7						
68	1-(2-Methoxypropoxy)-2-propanol	13429-07-7						
69	Methyl Cyclohexane	108-87-2	x					
70	Methyl Isobutyl Ketone (MIBK)	108-10-1				x		
71	2-Methyl-2,4-pentanediol	107-41-5						
72	2-Methyl Propanoic Acid (Isobutyric Acid)	79-31-2					19	72
73	2-Methyl-2-propenoic acid, methyl ester (Methyl Methacrylate)[7]	80-62-6				x	350	1500
74	1-Methyl-2-Pyrrolidinone[3](N-Methylpyrrolidinone)	872-50-4	x		x			
75	Methylene Chloride (dichloromethane)	75-09-2	x	400	x	x		

Table 14. List of Target Chemicals

	Compound Name	CAS Number	Pure Cal. Stds	OEHHA's Chronic REL µg/m³	Prop. 65 listed	TAC (ARB) listed	Odor Threshold	
							ppb	µg/m³
76	Naphthalene	91-20-3	x	9		x	15	79
77	Nonanal[1]	124-19-6	x				2.2	13
78	n-Nonane (nonane)	111-84-2	x				>1 ppm	
79	Nonanoic Acid	112-05-0					1.9	13
80	2-Nonenal	18829-56-6						
81	2-Norbornene	498-66-8					74	370
82	Octanal[1]	124-13-0	x				1.3	7.2
83	Octane	111-65-9					>1 ppm	
84	Octanoic Acid	95-47-6					4	24
85	2-Octenal (trans-2-Octenal)	2548-87-0					2	11
86	2,2'-Oxybis-ethanol (Diethylene Glycol)	111-46-6						
87	Pentadecane	629-62-9						
88	Pentanal (valeraldehyde)[1]	110-62-3	x				6	22
89	Pentanoic Acid	109-52-4					4.8	20
90	Phenol	108-95-2	x	200		x	110	430
91	β-Pinene	127-91-3					690	3900
92	4-Phenylcyclohexene (4-PCH)	4994-16-5					0.5[2]	2.5
93	Propionaldehyde[1,3]	123-38-6	x			x		
94	Propylene Glycol	57-55-6						
95	2-pyrrolidinone	616-45-5						
96	Styrene (Vinylbenzene)	100-42-5	x	900		x	140	630
97	α-Terpineol	98-55-5					37	240
98	Tetrachloroethene (tetrachloroethylene, perchloroethylene)	127-18-4	x	35	x	x	> 1 ppm	
99	Tetradecane	629-59-4					> 1 ppm	
100	Toluene	108-88-3	x	300		x	> 1 ppm	
101	trans-2-Decenal	3913-71-1					0.36	2.3
102	trans-Ethyl Cinnamate	103-36-6						

Table 14. List of Target Chemicals

	Compound Name	CAS Number	Pure Cal. Stds	OEHHA's Chronic REL µg/m³	Prop. 65 listed	TAC (ARB) listed	Odor Threshold	
							ppb	µg/m³
103	trans-2-methyl-3-heptene	692-92-6						
104	trans-3-Octene	1449-01-8						
105	1,1,1-Trichloroethane[3] (Methylchloroform)	71-55-6	x	1000		x	> 1 ppm	
106	Trichloroethylene	79-01-6		600	x	x		
107	Tridecane	629-59-4						
108	Triethylene glycol monomethyl ether	112-35-6						
109	Triethylphosphate	78-40-0						
110	1,2,3-Trimethylbenzene	526-73-8						
111	1,2,4-Trimethylbenzene (Psuedocumene)	95-63-6					155	770
112	1,3,5-Trimethyl Benzene	108-67-8	x				230	1100
113	2,2,4-Trimethyl-1,3-pentanediol monoisobutyrate (Texanol monoisobutyrate)	25265-77-4						
114	2,2,4-Trimethyl-1,3-pentanediol	144-19-4						
115	Trimethyl Silanol	1066-40-6						
116	Undecane (n-Undecane)	1120-21-4	x				1200	7800
117	Vinyl acetate	108-05-4		200		x	600	2200
118	5-Vinyl-2-Norbornene	3048-64-4						
119	o-Xylene (1.2-Dimethylbenzene)	95-47-5	x	700		x	850	3800
120	m-Xylene (1,3-Dimethylbenzene)	108-38-3		700		x	320	1400
121	p-Xylene (1,4-Dimethylbenzene)	106-42-3	x	700		x	490	2100

[1] Aldehyde-DNPH analysis.
[2] From Van Ert et al. (1987).
[3] Chemical on Prop. 65 or TAC lists without a CREL.
[4] Based on the current 1-hr Acute Reference Exposure Level (REL) of 76 ppb (94 µg/m³), an exposure level of 27 ppb (33 µg/m³) can be extrapolated based on an 8-hr exposure period (OEHHA, 1999). The current CREL of 3 µg/m³ was not used.
[5] CREL is 20µg/m³ from the TAC list (www.arb.ca.gov/toxics/tac/factshts/glycleth.pdf).
[6] Interim State of California concentration limit is 100 µg/m³ .
[7] CREL is 980µg/m³ from the TAC list (www.arb.ca.gov/toxics/tac/factshts/mthlmeth.pdf)

Table 15a. Summary of Emission Factors in μg/m²hr at 96 Hours for Selected Target Chemicals Emitted by Tested Acoustical Ceiling Panels

(Tested with all sides exposed unless otherwise noted—all samples were conditioned for 10 days)

Compound Name	Standard Ceiling Panels				Alternative Ceiling Panels				
					Same product tested w/ one and all sides exposed		Same product tested w/ one and all sides exposed		
	SACP29M5	SACP31M5	SACP32M10	SACP33M5	AACP25M14 (one side exposed)	AACP28M14	AACP26M10 (one side exposed)	AACP27M10	AACP30M14
Acetone	24			23		18		13	18 33[1]
Decanal	1.8						4.2		 1.5[1]
Ethyl Benzene							5.4		
Formaldehyde	25			11			14		0.55 3.7[1]
Hexanal	3.1			1.6	6.2	1.9	1.8	0.88	3.2 7.7[1]
Nonanal	7.8	2.4	3.3	4.7	11	3.1	5.7	1.7	2.7 5.9[1]
Octanal	2.0				2.7		1.8		 1.5[1]
TVOC[2]	27	12	7.6	13	150	6.9	52	3.2	7.3 27[1]

[1] Duplicate sample.

[2] TVOCs were calculated from the total ion current (TIC) from the GC/MS analysis by adding the areas of the integrated peaks with retention times greater than five minutes, subtracting from the sum the area of the internal standard, chlorobenzene-d5, and then calculating the concentration using the response factor of chlorobenzene-d5.

Table 15b. Typical Classroom: Modeled Air Concentrations in μg/m³ at 96 Hours for Selected Target Chemicals Using Emission Factors of Tested Acoustical Ceiling Panels

(Tested with all sides exposed unless otherwise noted—all samples were conditioned for 10 days)

Compound Name	Section 01350 Concentration Limits	Prop 65 or TAC Listed	Odor Threshold	Standard Ceiling Panels				Alternative Ceiling Panels				
				SACP29M5	SACP31M5	SACP32M10	SACP33M5	Same product tested w/ one and all sides exposed: AACP25M14 (one side exposed)	AACP28M14	Same product tested w/ one and all sides exposed: AACP26M10 (one side exposed)	AACP27M10	AACP30M14
Acetone				23			22		17		12	18 31
Decanal			5.9	1.7						4.0		 1.4
Ethyl Benzene	1000	Yes	13							5.1		
Formaldehyde	16.5	Yes	1100	**24**[1]			10			13	8.0	0.52 3.5
Hexanal			58	3.0			1.6	5.9	1.8	1.7	0.84	3 7.4
Nonanal			13	7.4	2.3	3.1	4.5	10	2.9	5.4	1.6	2.6 5.6
Octanal			7.2	1.9				2.6		1.7		 1.4

[1] Exceeds Section 01350 concentration limit value.

Table 15c. Typical State Office: Modeled Air Concentrations in μg/m³ at 96 Hours for Selected Target Chemicals Using Emission Factors of Tested Acoustical Ceiling Panels

(Tested with all sides exposed unless otherwise noted—all samples were conditioned for 10 days)

Compound Name	Section 01350 Concentration Limits	Prop. 65 or TAC Listed	Odor Threshold	Standard Ceiling Panels				Alternative Ceiling Panels				
				SACP29M5	SACP31M5	SACP32M10	SACP33M5	Same product tested w/ one and all sides exposed: AACP25M14 (one side exposed)	Same product tested w/ one and all sides exposed: AACP28M14	Same product tested w/ one and all sides exposed: AACP26M10 (one side exposed)	Same product tested w/ one and all sides exposed: AACP27M10	AACP30M14
Acetone				26			25		19		14	20 35
Decanal			5.9	1.9						4.5		 1.6
Ethyl Benzene	1000	Yes	13							5.8		
Formaldehyde	16.5	Yes	1100	**27**[1]			11			15	9.1	0.59 3.9
Hexanal			58	3.4			1.8	6.7	2.1	1.9	0.95	3.4 8.3
Nonanal			13	8.4	2.6	3.5	5.1	12	3.3	6.2	1.8	2.9 6.4
Octanal			7.2	2.1				2.9		2		 1.6

[1] Exceeds Section 01350 concentration limit value.

Table 16a. Summary of Emission Factors in μg/m²hr at 96 Hours for Selected Target Chemicals Emitted by Tested Carpet Samples

(All tested w/adhesive unless otherwise noted—all samples were conditioned for 10 days)

Compound Name	Standard Carpets											Alternative Carpets				
	SC2M1	SC6M2	SCT8M3	Same product tested w/ and w/o adhesive		Same product tested w/ and w/o adhesive		SC34M15	SCT35M16	SC39M15	SCT40M17	AC9M1	ACT7M3	ACT36M16	ACT37M17	ACT38M17
				SC18M4	SC5M4 (tested w/o adhesive)	SC19M4	SC4M4 (tested w/o adhesive)									
Acetaldehyde									11					37 31[1]		
Caprolactam				210	420	83	470	840	290	83		260 260[1]				
Decanal															8.5	
2-Ethyl Hexanoic Acid			2500													
Formaldehyde									41					15 17[1]		
Indene	23			59		37		58	19	15		32 79[1]				
1-Methyl-2-Pyrrolidinone													98			
Naphthalene	7.6	22		50		20		9.2	11	7.7		35 59[1]				
Nonanal							42	68	7.2		26			11 11[1]	11	11
Octanal									22							
4-Phenylcyclo-hexene (PCH)						22	85	22	5.0							
TVOC[2]	1000	1000	3200	1900	1400	860	840	9100	1700	2200	2300	1700 2900[1]	340	1600 1500[1]	390	270

[1] Duplicate sample.

[2] TVOCs were calculated from the total ion current (TIC) from the GC/MS analysis by adding the areas of the integrated peaks with retention times greater than five minutes, subtracting from the sum the area of the internal standard, chlorobenzene-d5, and then calculating the concentration using the response factor of chlorobenzene-d5.

Table 16b. Typical Classroom: Modeled Air Concentrations in μg/m³ at 96 Hours for Selected Target Chemicals Using Emission Factors of Tested Carpet Samples

(All tested w/adhesive unless otherwise noted—all samples were conditioned for 10 days)

Compound Name	Section 01350 Concentration Limits	Prop 65 or TAC Listed	Odor Threshold	Standard Carpets										Alternative Carpets				
				SC2M1	SC6M2	SCT8M3	Same product tested w/ and w/o adhesive: SC18M4	Same product tested w/ and w/o adhesive: SC5M4 (tested w/o adhesive)	Same product tested w/ and w/o adhesive: SC19M4	Same product tested w/ and w/o adhesive: SC4M4 (tested w/o adhesive)	SC34M15	SCT35M16	SC39M15	SCT40M17	AC9M1	ACT7M3	ACT36M16	ACT37M17	ACT38M17
Acetaldehyde	4.5	Yes										**5.3**[2]					**18**[2] / **15**[1,2]		
Caprolactam (interim CA concentration limit: 100 μg/m³)		Yes					99[4]	**200**[4,5]	40[4]	**230**[4,5]	**400**[4,5]	**140**[4,5]	39		**120**[4,5] / **130**[1,4,5]				
Decanal			5.9									**27**[3]						4.0	
2-Ethyl Hexanoic Acid						1200													
Formaldehyde	16.5	Yes	1100									**20**[2]					7.0 / 8.0[1]		
Indene			43	11	8.5		28		18		28	9.2	7.0		15 / 38[1]				
1-Methyl-2-Pyrrolidinone		Yes														**47**[4]			
Naphthalene	4.5	Yes	79	3.6	**11**[2]		**24**[2]		**9.7**[2]		4.4	**5.4**[2]	3.7		**17**[2] / **28**[1,2]				
Nonanal			13							**20**[3]	**32**[3]	3.4		**12**[3]			5.2 / 5.3[1]	5.5	5
Octanal			7.2									**10**[3]							
4-Phenylcyclo-hexene (PCH)			2.5						**11**[3]	**40**[3]	**11**[3]	2.4							

[1] Duplicate sample.
[2] Exceeds Section 01350 concentration limit value.
[3] Exceeds odor threshold values.
[4] Prop. 65 chemical and/or ARB TAC.
[5] Exceeds interim State of California concentration limit of 100 μg/m³.

Table 16c. Typical State Office: Modeled Air Concentrations in μg/m³ at 96 Hours for Selected Target Chemicals Using Emission Factors of Tested Carpet Samples

(All tested w/adhesive unless otherwise noted—all samples were conditioned for 10 days)

Compound Name	Section 01350 Concentration Limits	Prop 65 or TAC Listed	Odor Threshold	Standard Carpets										Alternative Carpets				
				SC2M1	SC6M2	SCT8M3	Same product tested w/ and w/o adhesive: SC18M4	Same product tested w/ and w/o adhesive: SC5M4 (tested w/o adhesive)	Same product tested w/ and w/o adhesive: SC19M4	Same product tested w/ and w/o adhesive: SC4M4 (tested w/o adhesive)	SC34M15	SCT35M16	SC39M15	SCT40M17	AC9M1	ACT7M3	ACT36M16	ACT37M17	ACT38M17
Acetaldehyde	4.5	Yes										**6.0**[2]					**20**[2] / **16**[1,2]		
Caprolactam (interim CA concentration limit: 100 μg/m³)		Yes					**110**[4,5]	**230**[4,5]	45[4]	**260**[4,5]	**450**[4,7]	**160**[4,5]	45[4]		**140**[4,5] / **140**[1,4,5]				
Decanal			5.9									**31**[3]						4.6	
2-Ethyl Hexanoic Acid						1100													
Formaldehyde	16.5	Yes	1100									**18**[2]					7.9 / 9.1[1]		
Indene			43	12	9.7		32		20		32	10	7.9		17 / 43[1]				
1-Methyl-2-Pyrrolidinone		Yes														**53**[4]			
Naphthalene	4.5	Yes	79	4.1	**12**[2]		**27**[2]		**11**[2]		**5.0**[2]	**6.1**[2]	4.2		**19**[2] / **32**[1,2]				
Nonanal			13							**23**[3]	**36**[3]	3.9		**14**[3]			5.9 / 6[1]	6.2	5.7
Octanal			7.2									**9.6**[3]							
4-Phenylcyclo-hexene (PCH)			2.5						**12**[3]	**46**[3]	**12**[3]	**2.7**[3]							

[1] Duplicate sample.
[2] Exceeds Section 01350 concentration limit value.
[3] Exceeds odor threshold values.
[4] Prop. 65 chemical and/or ARB TAC.
[5] Exceeds interim State of California concentration limit of 100 μg/m³

Table 17a. Summary of Emission Factors in μg/m²hr at 96 Hours for Selected Target Chemicals Emitted by Tested Fiberboard

(All samples were conditioned for 10 days)

Compound Name	Standard Fiberboard (Tested with all sides exposed)		Alternative Fiberboard (Tested with one side exposed)		
	SMDF51M11	SMDF52M11	AMDF20M11	AMDF21M12	AMDF24M11
Acetaldehyde			13	32	
Acetic Acid	26	16			
Acetone	67	66	13	29	
4,7-Dimethyl-1-Methylethyl Naphthalene					270
Ethylene Glycol			200	200	290
Formaldehyde	570	500	14		
n-Heptane			50	53	
Naphthalene			6.9	8.2	
Toluene			42	46	7.7
TVOC[1]	52	55	640	850	410

[1] TVOCs were calculated from the total ion current (TIC) from the GC/MS analysis by adding the areas of the integrated peaks with retention times greater than five minutes, subtracting from the sum the area of the internal standard, chlorobenzene-d5, and then calculating the concentration using the response factor of chlorobenzene-d5.

Table 17b. Typical Classroom: Modeled Air Concentrations in μg/m^3 at 96 Hours for Selected Target Chemicals Using Emission Factors of Tested Fiberboard

(All samples were conditioned for 10 days)

Compound Name	Section 01350 Concentration Limits	Prop 65 or TAC Listed	Odor Threshold	Standard Fiberboard (Tested with all sides exposed)		Alternative Fiberboard (Tested with one side exposed)		
				SMDF51M11	SMDF52M11	AMDF20M11	AMDF21M12	AMDF24M11
Acetaldehyde	4.5	Yes				0.33	0.79	
Acetic Acid			360	0.64	0.39			
Acetone				1.7	1.6	0.33	0.71	
4,7-Dimethyl-1-Methylethyl Naphthalene								6.6
Ethylene Glycol	200	Yes				5.0	4.9	7.1
Formaldehyde	16.5	Yes	1,100	14	12	0.35		
n-Heptane						1.2	1.3	
Naphthalene	4.5	Yes	79			0.17	0.20	
Toluene	150	Yes				1.0	1.1	0.19

Table 17c. Typical State Office: Modeled Air Concentrations in μg/m^3 at 96 Hours for Selected Target Chemicals Using Emission Factors of Tested Fiberboard

(All samples were conditioned for 10 days)

Compound Name	Section 01350 Concentration Limits	Prop. 65 or TAC Listed	Odor Threshold	Standard Fiberboard (Tested with all sides exposed)		Alternative Fiberboard (Tested with one side exposed)		
				SMDF51M11	SMDF52M11	AMDF20M11	AMDF21M12	AMDF24M11
Acetaldehyde	4.5	Yes				1.9	**4.6**[1]	
Acetic Acid			360	3.8	2.3			
Acetone				9.8	9.7	1.9	4.2	
4,7-Dimethyl-1-Methylethyl Naphthalene								39
Ethylene Glycol	200	Yes				30	29	42
Formaldehyde	16.5	Yes	1,100	**84**[1]	**73**[1]	2.1		
n-Heptane						7.3	7.8	
Naphthalene	4.5	Yes	79			1.0	1.2	
Toluene	150	Yes				6.1	6.7	1.1

[1] Exceeds Section 01350 concentration limit value.

Table 18a. Summary of Emission Factors in μg/m²hr at 96 Hours for Selected Target Chemicals Emitted by Tested Gypsum Board

(All samples were conditioned for 10 days)

Compound Name	Standard Gypsum Board (Tested with all sides exposed)			Alternative Gypsum Board (Tested with one side exposed)	
	SGB57M31	SGB58M10	SGB91M51[1]	AGB59M32	AGB60M33
Acetone	39	35	110		
Nonanal	2.1		28	16	2.7
Formaldehyde	15	19			
TVOC[2]	4.4		61	3.2	6.7

[1] Not part of this study; was used only as a substrate for all paint samples in this study.

[2] TVOCs were calculated from the total ion current (TIC) from the GC/MS analysis by adding the areas of the integrated peaks with retention times greater than five minutes, subtracting from the sum the area of the internal standard, chlorobenzene-d5, and then calculating the concentration using the response factor of chlorobenzene-d5.

Table 18b. Typical Classroom and State Office: Modeled Air Concentrations in μg/m^3 at 96 Hours for Selected Target Chemicals Using Emission Factors of Tested Gypsum Board

(All samples were conditioned for 10 days)

Compound Name	Section 01350 Concentration Limits	Prop. 65 or TAC Listed	Odor Threshold	Standard Gypsum Board (tested with all sides exposed) classroom (state office)			Alternative Gypsum Board (tested with one side exposed) classroom (state office)	
				SGB57M31	SGB58M10	SGB91M51[2]	AGB59M32	AGB60M33
Acetone				20 (86)	18 (79)	54 (240)		
Nonanal			13	1.1 (4.8)		14 (62)	0.83 (3.7)	1.3 (6.0)
Formaldehyde	16.5	Yes	1,100	7.8 **(35)**[1]	9.4 **(42)**[1]			

[1] Exceeds Section 01350 concentration limit value.
[2] Not part of this study; was used only as a substrate for all paint samples in this study.

Table 19a. Summary of Emission Factors in μg/m2hr at 96 Hours for Selected Target Chemicals Emitted by Tested Paint Samples

[All tested: (a) on gypsum board sample SGB91M51; and (b) w/ primer unless otherwise noted]
(All samples were conditioned for 10 days)

Compound Name	Standard Paints				Alternative Paints					
	SPNT41M18 (no primer)	SPNT42M18	SPNT45M22	SPNT46M23	APNT43M19	APNT44M20	APNT47M23	APNT48M24 (no primer)	APNT49M25	APNT50M26
Acetone			88	85	71 120	79				
2-(2-butoxyethoxy) ethanol			400	250			42	2,200 1,500[1]	350	480
Decanol				28				150 95[1]		
Ethylene glycol				190						
Hexanal	16									
Isobutyl butyrate	250	980	400	690	11 12	170	30	780 470[1]	560	1,800
Nonanal	13					24				
Octanal									17	63
Octanoic acid						10				
2,2'-oxybis-ethanol			610							
2,2,4-trimethyl-1,3-pentanediol monoisobutyrate	760	2,100	820	1,600	38 41	400	180	1,700 1,100[1]	1,200	3,500
TVOC[2]	1,400	3,100	3,000	3,100	170 170[1]	930	300	5,100 3,300[1]	2,200	6,200

[1] Duplicate sample.
[2] TVOCs were calculated from the total ion current (TIC) from the GC/MS analysis by adding the areas of the integrated peaks with retention times greater than five minutes, subtracting from the sum the area of the internal standard, chlorobenzene-d5, and then calculating the concentration using the response factor of chlorobenzene-d5.

Table 19b. Typical Classroom and State Office: Modeled Air Concentrations in μg/m³ at 96 Hours for Selected Target Chemicals Using Emission Factors of Tested Paint Samples

[All tested: (a) on gypsum board sample SGB91M51; and (b) w/primer unless otherwise noted]
(All samples were conditioned for 10 days)

Compound Name	Section 01350 Concentration Limits	Prop 65 or TAC Listed	Odor Threshold	Standard Paints Classroom (state office)				Alternative Paints Classroom (state office)					
				SPNT41M18 (no primer)	SPNT42M18	SPNT45M22	SPNT46M23	APNT43M19	APNT44M20	APNT47M23	APNT48M24 (no primer)	APNT49M25	APNT50M26
Acetone						45 (200)	43 (190)	36 (160) 63[1] (280)[1]	40 (180)				
2-(2-butoxyethoxy) ethanol		Yes				200 (890)	130 (560)			21 (93)	1100 (4,900) 740[1] (3,300)[1]	180 (640)	240 (1,100)
Decanol			120				14 (62)				74 (**330**)[3] 48[1] (**210**)[1,3]		
Ethylene glycol	200	Yes					98 (**430**)[2]						
Hexanal			58	8.1(36)									
Isobutyl butyrate				120 (550)	500 (2,200)	200 (900)	350 (1,600)	5.5 (25) 6.1[1] (27)[1]	88 (390)	15 (55)	400 (1,800) 240[1] (1,000)[1]	280 (1,300)	910 (4,000)
Nonanal			13	6.5(**29**)[3]					12 (**53**)[3]				
Octanal			7.2									**8.8** (**39**)[3]	**32** (**140**)[3]
Octanoic acid			24						5.1 (23)				
2,2'-oxybis-ethanol						310 (1,400)							
2,2,4-trimethyl-1,3-pentanediol monoisobutyrate				390 (1,700)	1000 (4600)	420 (1800)	790 (3500)	19 (86) 21[1] (92)[1]	200 (890)	93 (410)	880 (3,900) 580[1] (2,500)[1]	590 (2,600)	1,800 (7,800)

[1] Duplicate sample.
[2] Exceeds Section 01350 concentration limit value.
[3] Exceeds odor threshold values.

Table 20a. Summary of Emission Factors in $\mu g/m^2hr$ at 96 Hours for Selected Target Chemicals Emitted by Tested Particleboards

(Tested with one side exposed)
(All samples were conditioned for 10 days)

Compound Name	Standard Particleboard	Alternative Particleboard
	SPB23M11	APB22M13
Acetaldehyde	55	
Ethylene Glycol	140	200
		170[1]
Formaldehyde	97	
Hexanal		120
		93[1]
TVOC[2]	510	420
		240[1]

[1] Duplicate sample.
[2] TVOCs were calculated from the total ion current (TIC) from the GC/MS analysis by adding the areas of the integrated peaks with retention times greater than five minutes, subtracting from the sum the area of the internal standard, chlorobenzene-d5, and then calculating the concentration using the response factor of chlorobenzene-d5.

Table 20b. Typical Classroom and State Office: Modeled Air Concentrations in μg/m^3 at 96 Hours for Selected Target Chemicals Using Emission Factors of Tested Particleboard

(Tested with one side exposed—all samples were conditioned for 10 days)

Compound Name	Section 01350 Concentration Limits	Prop. 65 or TAC Listed	Odor Threshold	Standard Particleboard classroom (state office)	Alternative Particleboard classroom (state office)
				SPB23M11	**APB22M13**
Acetaldehyde	4.5	Yes		2.3 (**8.1**[2])	
Ethylene Glycol	200	Yes		6.0 (21)	8.1 (29) 6.9 (24)[1]
Formaldehyde	16.5	Yes	1,100	4.0 (14)	
Hexanal			58	2.8 (9.8)	9.8 (35) 6.1 (22)[1]

[1] Duplicate sample.
[2] Exceeds Section 01350 concentration limit value.

Table 21a. Summary of Emission Factors in μg/m²hr at 96 Hours for Selected Target Chemicals Emitted by Tested Plastic Laminates and Assemblies

(All samples were conditioned for 10 days)

Compound Name	Standard Laminate (laminate only)		Standard Laminate Assembly (Laminate: SPLAM56M30, Substrate: SMDF52M11)	
	SPLAM55M29	SPLAM56M30	SPASM61M30 (2 of 4 edges not laminated)	APASM62M30 (all surfaces laminated)
Acetone	120	150	4.8	32
				20[1]
Formaldehyde	19	12		14
				29[1]
Phenol	7.7	6.3	19	4.4
				4.5[1]
TVOC[2]	7.7	6.3	300	310
				310[1]

[1] Duplicate sample.

[2] TVOCs were calculated from the total ion current (TIC) from the GC/MS analysis by adding the areas of the integrated peaks with retention times greater than five minutes, subtracting from the sum the area of the internal standard, chlorobenzene-d5, and then calculating the concentration using the response factor of chlorobenzene-d5.

Table 21b. Typical Classroom and State Office: Modeled Air Concentrations in μg/m^3 at 96 Hours for Selected Target Chemicals Using Emission Factors of Tested Plastic Laminates and Assemblies

(All samples were conditioned for 10 days)

Compound Name	Section 01350 Concentration Limits	Prop. 65 or TAC Listed	Odor Threshold	Standard Laminate classroom (state office)		Standard Laminate Assembly (Laminate: SPLAM56M30, Substrate: SMDF52M11) classroom (state office)	
				SPLAM55M29	SPLAM56M30	SPASM61M30 (2 of 4 edges not laminated)	APASM62M30 (all surfaces laminated)
Acetone				3.0 (17)	3.8 (17)	0.25 (1.3)	1.6 (8.7) 1.0[2] (5.6)[1]
Formaldehyde	16.5	Yes	1,100	0.48 (2.7)	0.29 (1.7)		0.72 (3.9) 1.5[2] (8.0)[1]
Phenol	100	Yes		0.20 (1.1)	0.16 (0.91)	0.97 (5.1)	0.23 (1.2) 0.23 [2] (1.2)[1]

[1] Duplicate sample.

Table 22a. Summary of Emission Factors in μg/m²hr at 96 Hours for Selected Target Chemicals Emitted by Tested Resilient Flooring Samples (non-rubber-based)

(All tested w/adhesive unless otherwise noted—all samples were conditioned for 10 days)

Compound Name	Standard Resilient Flooring					Alternative Resilient Flooring				
	SRFT11M5	SRF13M5	SRFT79M44	Same product		ARF12M6	ARFT14M7 (no adhesive)	ARFT15M8	ARFT81M45	ARF90M5
				SRFT80M46 (old sample)	SRFT87M46 (new sample)					
Acetaldehyde				2.9	15	49				41
Acetone			830 / 270[3]	72		47			240	280
Benzyl Alcohol				82	13					
2-Butoxy-ethanol (ethylene glycol monobutyl ether)						24				
2-(-2-butoxyethoxy)-Ethanol							81			
Butanoic Acid										5.1
Decanal					11				6.9	7.6
2-dimethylamino-ethanol									250	
Ethylene Glycol						210	130			
Formaldehyde			79 / 47[3]	1.1					1.6	1.9
Hexanal						53				16
Naphthalene			13 / 14[3]			6.7	6.9	6.7		
Nonanal				11	10	19			7.1	9.6
Nonanoic Acid						14				2.5
Octanal					5.5	28				24
Octanoic Acid						32				14
Pentanal						23				8.6
Pentanoic Acid						18				6.6
Phenol		10	22 / 28[3]				310	6.5		

Table 22a. Summary of Emission Factors in μg/m²hr at 96 Hours for Selected Target Chemicals Emitted by Tested Resilient Flooring Samples (non-rubber-based)

(All tested w/adhesive unless otherwise noted—all samples were conditioned for 10 days)

Compound Name	Standard Resilient Flooring					Alternative Resilient Flooring				
	SRFT11M5	SRF13M5	SRFT79M44	Same product		ARF12M6	ARFT14M7 (no adhesive)	ARFT15M8	ARFT81M45	ARF90M5
				SRFT80M46 (old sample)	SRFT87M46 (new sample)					
Propionaldehyde						91				64
Toluene		8.8			5.8	7.7	8.1	8.1	12	
Trans-2-Decenal										9.1
Trimethyl Silanol					6.0				66	2.0
Valeraldehyde										
Unidentified	130 330[3]									
TVOC[4]	270 330[3]	2100[1]	400 400[3]	270	100	840	1800[2]	110	570	290

[1] SRF13M5 emitted many long-chain saturated and unsaturated alcohols, glycols, and hydrocarbons. Identified compounds included 1-(2-methoxypropoxy)-2-propanol, 3,3'-oxybis-2-butanol, 4-methyl-2-dodecene, and 1-tetradecene. Tentative identification of a few other compounds included diisopropyl glycol, 2,(2-hydroxypropoxy)-1-propanol, and 4-octene. Long-chain alcohols are odorous.

[2] ARFT14M7 emitted many long-chain saturated and unsaturated hydrocarbons most of which were below the five percent of area cutoff. Exceptions were tetradecane and pentadecane, with each representing about 8% of the total area of the total ion chromatogram.

[3] Indicates duplicate sample.

[4] TVOCs were calculated from the total ion current (TIC) from the GC/MS analysis by adding the areas of the integrated peaks with retention times greater than five minutes, subtracting from the sum the area of the internal standard, chlorobenzene-d5, and then calculating the concentration using the response factor of chlorobenzene-d5.

Table 22b. Typical Classroom: Modeled Air Concentrations in μg/m³ at 96 Hours for Selected Target Chemicals Using Emission Factors of Tested Resilient Flooring Samples (non-rubber-based)

(All tested w/adhesive unless otherwise noted—all samples were conditioned for 10 days)

Compound Name	Section 01350 Concentration Limits	Prop. 65 or TAC Listed	Odor Threshold	Standard Resilient Flooring					Alternative Resilient Flooring				
				SRFT11M5	SRF13M5	SRFT79M44	Same product: SRFT80M46 (old sample)	Same product: SRFT87M46 (new sample)	ARF12M6	ARFT14M7 (no adhesive)	ARFT15M8	ARFT81M45	ARF90M5
Acetaldehyde	4.5	Yes					1.4	**7.3**[1]	**23**[1]				**20**[1]
Acetone						390 130[6]	34		22			110	130
Benzyl Alcohol							39	6.1					
2-Butoxy-ethanol (Concentration limit: 10μg/m³)[4]		Yes							**12**[7]				
2-(-2-butoxyethoxy)-ethanol		Yes								**38**[5]			
Butanoic Acid			14										2.4
Decanal			5.9					5.1				3.3	3.6
2-dimethylamino-ethanol												120	
Ethylene Glycol	200	Yes							100	61			
Formaldehyde	16.5	Yes	1100			**38**[1] **22**[1,6]	0.52					0.75	0.92
Hexanal			58						56				7.6
Naphthalene	4.5	Yes	79			**6.1**[1] **6.5**[1,6]			3.2	3.3	3.2		
Nonanal			13				5.5	4.9	9.2			3.4	4.6
Nonanoic Acid			13						6.7				1.2
Octanal			7.2					2.6	**13**[2]				**12**[2]
Octanoic Acid			24						15				
Pentanal			22						11				4.1
Pentanoic Acid			20						8.6				3.1

Table 22b. Typical Classroom: Modeled Air Concentrations in μg/m³ at 96 Hours for Selected Target Chemicals Using Emission Factors of Tested Resilient Flooring Samples (non-rubber-based)

(All tested w/adhesive unless otherwise noted—all samples were conditioned for 10 days)

Compound Name	Section 01350 Concentration Limits	Prop. 65 or TAC Listed	Odor Threshold	Standard Resilient Flooring					Alternative Resilient Flooring				
				SRFT11M5	SRF13M5	SRFT79M44	Same product: SRFT80M46 (old sample)	Same product: SRFT87M46 (new sample)	ARF12M6	ARFT14M7 (no adhesive)	ARFT15M8	ARFT81M45	ARF90M5
Phenol	100	Yes	430		4.8	11 13[6]				**150**[1]	3.1		
Propionaldehyde		Yes							**43**[3]				31[3]
Toluene	150	Yes						2.7	3.7	3.8	3.9	5.7	
Trimethyl Silanol								2.9				32	0.95
Trans-2-Decenal			2.3										**4.3**[2]
Valeraldehyde			22										
Unidentified				60 160[7]									

[1] Exceeds Section 01350 concentration limit value.
[2] Exceeds odor threshold values.
[3] Prop. 65 chemical and/or ARB TAC.
[4] ½ of CREL from the TAC list (http://www.arb.ca.gov/toxics/tac/factshts/glycleth.pdf). This chemical is not listed in OEHHA's CREL list.
[5] TAC listed chemical.
[6] Indicates duplicate sample.
[7] Exceeds ½ of CREL as listed in TAC list.

Table 22c. Typical State Office: Modeled Air Concentrations in μg/m³ at 96 Hours for Selected Target Chemicals Using Emission Factors of Tested Resilient Flooring Samples (non-rubber-based)

(All tested w/adhesive unless otherwise noted—all samples were conditioned for 10 days)

Compound Name	Section 01350 Concentration Limits	Prop. 65 or TAC Listed	Odor Threshold	Standard Resilient Flooring					Alternative Resilient Flooring				
				SRFT11M5	SRF13M5	SRFT79M44	Same product SRFT80M46 (old sample)	Same product SRFT87M46 (new sample)	ARF12M6	ARFT14M7 (no adhesive)	ARFT15M8	ARFT81M45	ARF90M5
Acetaldehyde	4.5	Yes					1.6	**8.3**[1]	**26**[1]				**22**[1]
Acetone						450 150[6]	39		25			130	150
Benzyl Alcohol							44	6.9					
2-Butoxy-ethanol (ethylene glycol monobutyl ether) (Concentration limit: 10μg/m³)[4]		Yes							**13**[7]				
2-(-2-butoxyethoxy)-ethanol		Yes								**44**[5]			
Butanoic Acid			14										2.7
Decanal			5.9					5.8				3.7	4.1
2-dimethylamino-ethanol												140	
Ethylene Glycol	200	Yes							110	69			
Formaldehyde	16.5	Yes	1100			**43**[1] **25**[1,6]	0.59					0.85	1.0
Hexanal			58						64				8.7
Naphthalene	4.5	Yes	79			**6.9**[1] **7.4**[1,6]			3.6	3.7	3.6		
Nonanal			13				6.2	5.6	10			3.8	5.2
Nonanoic Acid			13						7.6				1.4
Octanal			7.2					3.0	**15**[2]				**13**[2]

Table 22c. Typical State Office: Modeled Air Concentrations in μg/m³ at 96 Hours for Selected Target Chemicals Using Emission Factors of Tested Resilient Flooring Samples (non-rubber-based)

(All tested w/adhesive unless otherwise noted—all samples were conditioned for 10 days)

Compound Name	Section 01350 Concentration Limits	Prop. 65 or TAC Listed	Odor Threshold	Standard Resilient Flooring					Alternative Resilient Flooring				
				SRFT11M5	SRF13M5	SRFT79M44	Same product SRFT80M46 (old sample)	Same product SRFT87M46 (new sample)	ARF12M6	ARFT14M7 (no adhesive)	ARFT15M8	ARFT81M45	ARF90M5
Octanoic Acid			24						17				
Pentanal			22						12				4.7
Pentanoic Acid			20						9.8				3.6
Phenol	100	Yes	430		5.4	12 15[6]				**170**[1]	3.5		
Propionaldehyde		Yes							49[3]				35[3]
Toluene	150	Yes			4.8			3.1	4.2	4.4	4.4	6.5	
Trans-2-Decenal			2.3										**4.9**[2]
Trimethyl Silanol								3.3				36	1.1
Valeraldehyde			22										
Unidentified				68 180									

[1] Exceeds Section 01350 concentration limit value.
[2] Exceeds odor threshold values.
[3] Prop. 65 chemical.
[4] ½ of CREL from the TAC list (www.arb.ca.gov/toxics/tac/factshts/glycleth.pdf). This chemical is not listed in OEHHA's CREL list
[5] TAC listed chemical.
[6] Indicates duplicate sample.
[7] Exceeds ½ of CREL as listed in TAC list.

Table 23a. Summary of Emission Factors in μg/m²hr at 96 Hours for Selected Target Chemicals Emitted by Tested Resilient Flooring Samples (rubber-based)

(All tested w/adhesive unless otherwise noted—all samples were conditioned for 10 days)

Compound Name	Alternative Resilient Flooring (rubber-based, tire-derived unless otherwise noted)														
	Non-tire derived			ARRF64M36	ARRF65M36	ARRF66M36	ARRF67M36	ARRF71M37	ARRF72M35	ARRF73M34	ARRF74M43 (no adhesive)	ARRF76M41	ARRF77M49	Same product	
	ARRF70M38	ARRF75M41	ARRF84M42											ARRF85M42 (w/o sealer)	ARRF86M42 (w/sealer)
Acetophenone			18						2,300					460	680
Benzothiazole	590 520[1]			200	63	400	280	540	390	220	210		380	200	160
2-Butoxy-ethanol															24
Cumene									79				55	30	39
Decanal				7.2	6.2										
Diethyl Propanedioate		910						450	250	120		1,200	760	440	530
α,α-dimethylbenzenemethanol									6,100					1,300	1,700
Dodecane										20					
Ethyl Benzene									7.2					7.3	6.6
2-Ethyl Hexanoic Acid									56						
2-Ethylhexyl Acetate	4 160[1]			230	220	17	160								
1-Ethyl-2-Methylbenzene		62						110	180	42		170	190		
1-Ethyl-3-Methylbenzene		130						380	610	150		370	530	270	320
1-Ethyl-4-Methylbenzene		55						210	320	81		150	250	130	170
Indene	9.0 9.7[1]		11												
1-Methyl-2-Pyrrolidinone									26			5.4	1.5		
α-Methyl-styrene									120					320	540
Naphthalene	22 28[1]		13						14	11		12	12		
Nonanal				11	10										

Table 23a. Summary of Emission Factors in μg/m²hr at 96 Hours for Selected Target Chemicals Emitted by Tested Resilient Flooring Samples (rubber-based)

(All tested w/adhesive unless otherwise noted—all samples were conditioned for 10 days)

Compound Name	Alternative Resilient Flooring (rubber-based, tire-derived unless otherwise noted)														
	Non-tire derived			ARRF64M36	ARRF65M36	ARRF66M36	ARRF67M36	ARRF71M37	ARRF72M35	ARRFT73M34	ARRFT74M43 (no adhesive)	ARRF76M41	ARRF77M49	Same product	
	ARRF70M38	ARRF75M41	ARRF84M42											ARRF85M42 (w/o sealer)	ARRF86M42 (w/sealer)
Propylene Glycol	180 580[1]			680	230	290	320								
Triethylphosphate											260				
1,2,3-Trimethylbenzene		97						88	120	32		260	180	74	110
1,2,4-Trimethylbenzene		200						370	530	130		590	570	290	410
3,3,5-Trimethylcyclohexanone		290													
Unidentified				15,000[11]	12,000[1] 1	3,000[11]	15,000[1] 1				8,500[11]				4,800[12]
TVOC[14]	2,000[2] 2,500[1,2]	5,900[6]	1,500[13]	17,000	13,000	4,300	17,000	8,100[3]	100,000[4]	2,500[5]	9,700	7,600[7]	7,500[8]	5,300[9]	18,000[10]

[1] Indicates duplicate sample.

[2] ARRF70M38: In addition to the chemicals listed above, small amounts of many hydrocarbons were emitted, including but not limited to, Benzocylcobutane, Benzoic acid and N-ethyl aniline.

[3] ARRF71M37: Many other chemicals were emitted; these included the following tentatively identified compounds: 3-Methyl nonane, 2,6-dimethyl nonane, 2-methyl Decane, 3-methyl Decane 1,4-diethyl benzene, 2-methyl naphthalene and several dimethyl naphthalene isomers.

[4] ARRF72M35: Additionally, many other chemicals were emitted. These included 2-methyl octane, 2-Heptenal, 3-methyl nonane and 2,5-dimethyl octane.

[5] ARRFT73M34: Many other chemicals were emitted; these include the methyl Decane isomers, the methylnaphthalene isomers and the dimethyl naphthalene isomers.

[6] ARRF75M41: Many other chemicals were emitted; some that have been tentatively identified as 2,6-dimethyl octane, 3-methyl Decane, 4-methyl Decane, 1-methyl-3-propyl-benzene, 2,6- and 3-6-dimethyl Decane.

[7] ARRF76M41: In addition to the chemicals listed above, other tentatively identified chemicals were emitted. These chemicals were mostly 7 to 15 carbon molecules. These included the methyl Decane isomers, 3-methyl nonane and several alkyl benzenes.

[8] ARRF77M49: Other chemicals emitted included the following tentatively identified compounds: diethyl benzene isomers, ethyl phenyl ketone, several methyl Decane isomers and 3,3,5-trimethyl cyclohexanone.

[9] ARRF85M42: Other chemicals emitted include several branched alkane isomers, such as 3-methyl nonane, and 2,6-dimethyl octane; several alkyl benzenes, 4-ethyl-1,2-dimethyl benzene and 1,2,3,4-tetramethyl benzene among many others.

[10] ARRF86M42: Emitted large amounts of 2-(2-ethoxyethoxy)-ethanol, in addition to many smaller peaks.

[11] Unidentified peak is probably a long chain ester.

[12] Unidentified peak is probably a long-chain ester or glycol ether.

[13] ARRF84M42 emitted many branched and cylcic hydrocarbons. These peaks included the following tentatively identified compounds: 2-Methyl Heptane, 3-Methyl Heptane, 4-Methyl Heptane, 2,6-Dimethyl Heptane, Ethylcyclohexane, 1,3-dimethylcyclohexane, 1,4-dimethylcyclohexane, 2-methyl octane, 1,2,4-trimethyl cyclohexane, and 1-ethyl-3-methyl cyclohexane.[14] TVOCs were calculated from the total ion current (TIC) from the GC/MS analysis by adding the areas of the integrated peaks with retention times greater than five minutes, subtracting from the sum the area of the internal standard, chlorobenzene-d5, and then calculating the concentration using the response factor of chlorobenzene-d5.

Table 23b. Typical Classroom: Modeled Air Concentrations in μg/m^3 at 96 Hours for Selected Target Chemicals Using Emission Factors of Tested Resilient Flooring Samples (rubber-based)

(All tested w/adhesive unless otherwise noted—all samples were conditioned for 10 days)

Compound Name	Section 01350 Concentration Limits	Prop. 65 or TAC Listed	Odor Threshold	Alternative Resilient Flooring (rubber-based, tire-derived unless otherwise noted)													
				Non-tire-derived			ARRF64M36	ARRF65M36	ARRF66M36	ARRF67M36	ARRF71M37	ARRF72M35	ARRF73M34	ARRF74M43	ARRF76M41	ARRF77M49	Same product	
				ARRF70M38	ARRF75M41	ARRF84M42											ARRF85M42 (w/o sealer)	ARRF86M42 (w/sealer)
Acetophenone		Yes	1,800			8.5						1,100					220	320
Benzothiazole				280 250[1]			94	30	190	130	260	190	100	98		180	94	77
2-Butoxy-ethanol (Concentration limit: 10μg/m^3)[4]		Yes																**11**[5]
Cumene		Yes	120									38				26	14	18
Decanal			5.9				3.4	3.0										
Diethyl Propanedioate					430						220	120	56		550	360	210	250
α,α-dimethylbenzenemethanol												**2,900**					600	790
Dodecane													9.3					
Ethyl Benzene	1,000	Yes	13									3.4					3.5	3.2
2-Ethyl Hexanoic Acid												27						
2-Ethylhexyl Acetate			2,300	35 75[1]			110	110	8.3	78								
1-Ethyl-2-Methylbenzene					29						54	84	20		82	89		
1-Ethyl-3-Methylbenzene					63						180	290	70		170	250	130	150
1-Ethyl-4-Methylbenzene					26						100	150	38		72	120	63	80
Indene			43	4.3		5.2												

Table 23b. Typical Classroom: Modeled Air Concentrations in μg/m³ at 96 Hours for Selected Target Chemicals Using Emission Factors of Tested Resilient Flooring Samples (rubber-based)

(All tested w/adhesive unless otherwise noted—all samples were conditioned for 10 days)

Compound Name	Section 01350 Concentration Limits	Prop. 65 or TAC Listed	Odor Threshold	Alternative Resilient Flooring (rubber-based, tire-derived unless otherwise noted)													
				Non-tire-derived			ARRF64M36	ARRF65M36	ARRF66M36	ARRF67M36	ARRF71M37	ARRF72M35	ARRF73M34	ARRF74M43	ARRF76M41	ARRF77M49	Same product	
				ARRF70M38	ARRF75M41	ARRF84M42											ARRF85M42 (w/o sealer)	ARRF86M42 (w/sealer)
				4.6[1]														
1-Methyl-2-Pyrrolidinone		Yes										**12**[3]			**2.6**[3]	**0.73**[3]		
α-Methyl-styrene			790									59					150	260
Naphthalene	4.5	Yes	79	**11**[2] **13**[1,2]		**6.2**[2]						**6.8**[2]	**5.4**[2]		**5.6**[2]	**5.9**[2]		
Nonanal			13				5.1	4.8										
Propylene Glycol				87 280[1]			330	110	140	150								
Triethylphosphate														120				
1,2,3-Trimethylbenzene					46						42	56	15		120	86	35	51
1,2,4-Trimethylbenzene		Yes	770		97						180	250	64		280	270	140	200
3,3,5-Trimethylcyclohexanone					140													
Unidentified							7,100	5,700	1,500	7,400				4,100				2,300

[1] Indicates duplicate sample.
[2] Exceeds Section 01350 concentration limit value.
[3] Prop. 65 chemical.
[4] ½ of CREL from the TAC list (http://www.arb.ca.gov/toxics/tac/factshts/glycleth.pdf). This chemical is not listed in OEHHA's CREL list.
[5] Exceeds CREL of 10 μg/m³.

Table 23c. Typical State Office: Modeled Air Concentrations in μg/m³ at 96 Hours for Selected Target Chemicals Using Emission Factors of Tested Resilient Flooring Samples (rubber-based)

(All tested w/adhesive unless otherwise noted—all samples were conditioned for 10 days)

Compound Name	Section 01350 Concentration Limits	Prop. 65 or TAC Listed	Odor Threshold	Alternative Resilient Flooring (rubber-based, tire-derived unless otherwise noted)													
				Non-tire-derived			ARRF64M36	ARRF65M36	ARRF66M36	ARRF67M36	ARRF71M37	ARRF72M35	ARRFT73M34	ARRFT74M43	ARRF76M41	ARRF77M49	Same product	
				ARRF70M38	ARRF75M41	ARRF84M42											ARRF85M42 (w/o sealer)	ARRF86M42 (w/sealer)
Acetophenone		Yes	1,800			9.6						1200					250	370
Benzothiazole				320 280[1]			110	34	210	150	290	210	120	110		210	110	87
2-Butoxy-ethanol (Concentration limit: 10μg/m³)[4]		Yes																**13**[5]
Cumene		Yes	120									43				30	16	21
Decanal			5.9				3.9	3.4										
Diethyl Propanedioate					490						240	130	63		630	410	240	290
α,α-dimethylbenzenemethanol												**3,300**					680	900
Dodecane													11					
Ethyl Benzene	1,000	Yes	13									3.9					4.0	3.6
2-Ethyl Hexanoic Acid												30						
2-Ethylhexyl Acetate			2,300	40 85[1]			120	120	9.4	88								
1-Ethyl-2-Methylbenzene					33						61	95	23		93	100		
1-Ethyl-3-Methylbenzene					72						210	330	79		200	290	150	170
1-Ethyl-4-Methylbenzene					30						120	170	44		82	130	71	91
Indene			43	4.9 5.2[1]		5.9												

Table 23c. Typical State Office: Modeled Air Concentrations in μg/m³ at 96 Hours for Selected Target Chemicals Using Emission Factors of Tested Resilient Flooring Samples (rubber-based)

(All tested w/adhesive unless otherwise noted—all samples were conditioned for 10 days)

Compound Name	Section 01350 Concentration Limits	Prop. 65 or TAC Listed	Odor Threshold	Alternative Resilient Flooring (rubber-based, tire-derived unless otherwise noted)												
				Non-tire-derived											Same product	
				ARRF70M38	ARRF75M41	ARRF84M42	ARRF64M36	ARRF65M36	ARRF66M36	ARRF67M36	ARRF71M37	ARRF72M35	ARRFT73M34	ARRFT74M43	ARRF76M41	ARRF77M49	ARRF85M42 (w/o sealer)	ARRF86M42 (w/sealer)
1-Methyl-2-Pyrrolidinone		Yes										**14**[3]			**2.9**[3]	**0.82**[3]		
α-Methyl-styrene			790									67					170	290
Naphthalene	4.5	Yes	79	**12**[2] **15**[1,2]		**7.0**[2]						**7.7**[2]	**6.2**[2]		**6.4**[2]	**6.6**[2]		
Nonanal			13				5.8	5.4										
Propylene Glycol				98 310[1]			370	120	150	170								
Triethylphosphate														140				
1,2,3-Trimethylbenzene					52						48	64	17		140	98	40	57
1,2,4-Trimethylbenzene		Yes	770		110						200	280	73		320	310	160	220
3,3,5-Trimethylcyclohexanone					160													
Unidentified							8,000	6,500	1,600	8,400				4,600				2,600

[1] Indicates duplicate sample.
[2] Exceeds Section 01350 concentration limit value.
[3] Prop. 65 chemical.
[4] ½ of CREL from the TAC list (www.arb.ca.gov/toxics/tac/factshts/glycleth.pdf). This chemical is not listed in OEHHA's CREL list.
[5] Exceeds CREL of 10 μg/m³.

Table 23d. Typical State Boardroom: Modeled Air Concentrations in μg/m^3 at 96 Hours for Selected Target Chemicals Using Emission Factors of Tested Resilient Flooring Samples (rubber-based, tire-derived)

(All tested w/adhesive unless otherwise noted—all samples were conditioned for 10 days)

Compound Name	Section 01350 Concentration Limits	Prop. 65 or TAC Listed	Odor Threshold	Based on 3.5 ach (based on 0.75 ach)											
				ARRF64M36	ARRF65M36	ARRF66M36	ARRF67M36	ARRF71M37	ARRF72M35	ARRF73M34	ARRF74M43	ARRF76M41	ARRF77M49	Same product	
														ARRF85M42 (w/o sealer)	ARRF86M42 (w/sealer)
Acetophenone		Yes	1,800						260 (1,200)					53 (250)	77 (360)
Benzothiazole				23 (110)	7.3 (34)	45 (210)	32 (150)	61 (290)	45 (210)	25 (120)	24 (110)		44 (200)	22 (100)	18 (86)
2-Butoxy-ethanol (Concentration limit: 10μg/m^3)[4]		Yes													2.7 (**13**)[5]
Cumene		Yes	120						9.0 (42)				6.3 (29)	3.4 (16)	4.4 (21)
Decanal			5.9	0.82 (3.8)	0.71 (3.3)										
Diethyl Propanedioate								52 (240)	28 (130)	13 (62)		130 (620)	87 (400)	51 (240)	61 (280)
α,α-dimethylbenzenemethanol									700 **(3,300)**					140 (670)	190 (890)
Dodecane										2.2 (10)					
Ethyl Benzene	1,000	Yes	13						0.82 (3.8)					0.84 (3.9)	0.76 (3.5)
2-Ethyl Hexanoic Acid									6.4 (30)						
2-Ethylhexyl Acetate			2,300	26 (120)	26 (120)	2.0 (9.3)	19 (87)								
1-Ethyl-2-Methylbenzene								13 (60)	20 (94)	4.8 (22)		20 (92)	21 (99)		
1-Ethyl-3-Methylbenzene								44 (200)	70 (330)	17 (78)		42 (200)	61 (280)	31 (140)	37 (170)
1-Ethyl-4-Methylbenzene								24 (110)	37 (170)	9.2 (43)		17 (81)	29 (130)	15 (70)	19 (90)
Indene			43												

Table 23d. Typical State Boardroom: Modeled Air Concentrations in μg/m^3 at 96 Hours for Selected Target Chemicals Using Emission Factors of Tested Resilient Flooring Samples (rubber-based, tire-derived)

(All tested w/adhesive unless otherwise noted—all samples were conditioned for 10 days)

Compound Name	Section 01350 Concentration Limits	Prop. 65 or TAC Listed	Odor Threshold	Based on 3.5 ach (based on 0.75 ach)											
				ARRF64M36	ARRF65M36	ARRF66M36	ARRF67M36	ARRF71M37	ARRF72M35	ARRF73M34	ARRF74M43	ARRF76M41	ARRF77M49	Same product	
														ARRF85M42 (w/o sealer)	ARRF86M42 (w/sealer)
1-Methyl-2-Pyrrolidinone		Yes							2.9 (14)[3]			0.61 (2.9)[3]	0.17 (0.82)[3]		
α-Methyl-styrene									14 (66)					36 (170)	62 (290)
Naphthalene	4.5	Yes	790						1.6 (**7.6**)[2]	1.3 (**6.13**)[2]		1.4 (**6.3**)[2]	1.4 (**6.6**)[2]		
Nonanal			13	1.2 (5.7)	1.1 (5.4)										
Propylene Glycol				78 (360)	26 (120)	33 (150)	37 (170)								
Triethylphosphate											29 (140)				
1,2,3-Trimethylbenzene								10 (47)	13 (63)	3.7 (17)		30 (140)	21 (97)	8.5 (40)	12 (57)
1,2,4-Trimethylbenzene		Yes	770					42 (200)	60 (280)	15 (72)		68 (320)	66 (310)	33 (150)	47 (220)
3,3,5-Trimethylcyclohexanone															
Unidentified				1,700 (7,900)	1,400 (6,400)	350 (1,600)	1,800 (8,300)				970 (4,500)				550 (2,600)

[1] Indicates duplicate sample.
[2] Exceeds Section 01350 concentration limit value.
[3] Prop. 65 chemical.
[4] ½ of CREL from the TAC list (www.arb.ca.gov/toxics/tac/factshts/glycleth.pdf). This chemical is not listed in OEHHA's CREL list.
[5] Exceeds CREL of 10 μg/m^3.

Table 23e. Typical State Auditorium: Modeled Air Concentrations in μg/m³ at 96 Hours for Selected Target Chemicals Using Emission Factors of Tested Resilient Flooring Samples (rubber-based, tire-derived)

(All tested w/adhesive unless otherwise noted—all samples were conditioned for 10 days)

Compound Name	Section 01350 Concentration Limits	Prop. 65 or TAC Listed	Odor Threshold	Based on 3.5 ach (based on 0.75 ach)											
				ARRF64M36	ARRF65M36	ARRF66M36	ARRF67M36	ARRF71M37	ARRF72M35	ARRFT73M34	ARRFT74M43	ARRF76M41	ARRF77M49	Same product	
														ARRF85M42 (w/o sealer)	ARRF86M42 (w/sealer)
Acetophenone		Yes	1,800						160 (730)					32 (150)	47 (220)
Benzothiazole				14 (64)	4.4 (21)	27 (130)	19 (89)	37 (170)	27 (130)	15 (70)	14 (67)		26 (120)	14 (64)	11 (52)
2-Butoxy-ethanol (Concentration limit: 10μg/m³)[4]		Yes													1.7. (7.7)
Cumene		Yes	120						5.5 (26)				3.8 (18)	2.1 (9.7)	2.7 (13)
Decanal			5.9	0.50 (2.3)	0.43 (2.0)										
Diethyl Propanedioate								31 (150)	17 (79)	8.1 (38)		80 (380)	53 (250)	31 (140)	37 (170)
α,α-dimethylbenzenemethanol									420 **(2,000)**					88 (410)	120 (540)
Dodecane										1.4 (6.4)					
Ethyl Benzene	1,000	Yes	13						0.50 (2.3)					0.51 (2.4)	0.46 (2.2)
2-Ethyl Hexanoic Acid									3.9 (18)						
2-Ethylhexyl Acetate			2,300	16 (73)	16 (73)	1.2 (5.7)	11 (53)								
1-Ethyl-2-Methylbenzene								7.9 (37)	12 (57)	2.9 (14)		12 (56)	13 (60)		
1-Ethyl-3-Methylbenzene								26 (120)	43 (200)	10 (47)		25 (120)	37 (170)	19 (88)	22 (100)
1-Ethyl-4-Methylbenzene								15 (69)	22 (100)	5.6 (26)		11 (49)	17 (81)	9.1 (42)	12 (54)
Indene			43												
1-Methyl-2-Pyrrolidinone		Yes							1.8 (8.3)[3]			0.37 (1.7)[3]	0.11 (0.49)[3]		

Table 23e. Typical State Auditorium: Modeled Air Concentrations in μg/m³ at 96 Hours for Selected Target Chemicals Using Emission Factors of Tested Resilient Flooring Samples (rubber-based, tire-derived)

(All tested w/adhesive unless otherwise noted—all samples were conditioned for 10 days)

Compound Name	Section 01350 Concentration Limits	Prop. 65 or TAC Listed	Odor Threshold	Based on 3.5 ach (based on 0.75 ach)											
				ARRF64M36	ARRF65M36	ARRF66M36	ARRF67M36	ARRF71M37	ARRF72M35	ARRFT73M34	ARRFT74M43	ARRF76M41	ARRF77M49	Same product	
														ARRF85M42 (w/o sealer)	ARRF86M42 (w/sealer)
α-Methyl-styrene									8.6 (40)					22 (100)	38 (180)
Naphthalene	4.5	Yes	790						0.99 (**4.6**)[2]	0.79 (3.7)		0.82 (3.8)	0.85 (4.0)		
Nonanal			13	0.74 (3.5)	0.70 (3.3)										
Propylene Glycol				47 (220)	16 (74)	20 (93)	22 (100)								
Triethylphosphate											18 (83)				
1,2,3-Trimethylbenzene								6.1 (29)	8.2 (38)	2.2 (10)		18 (85)	13 (59)	5.1 (24)	7.4 (34)
1,2,4-Trimethylbenzene		Yes	770					26 (120)	37 (170)	9.4 (44)		41 (190)	40 (190)	20 (94)	29 (130)
3,3,5-Trimethylcyclohexanone															
Unidentified				1,000 (4,800)	830 (3,900)	210 (990)	1,100 (5,000)				590 (2,800)				340 (1,600)

[1] Indicates duplicate sample.
[2] Exceeds Section 01350 concentration limit value.
[3] Prop. 65 chemical.
[4] ½ of CREL from the TAC list (www.arb.ca.gov/toxics/tac/factshts/glycleth.pdf). This chemical is not listed in OEHHA's CREL list.

Table 24a. Summary of Emission Factors in μg/m²hr at 96 Hours for Selected Target Chemicals Emitted by Tested Tackable Wall Panels

(All samples were conditioned for 10 days)

Compound Name	Standard Tackable Wall Panel	Alternative Tackable Wall Panel
	SWP16M9	AWP17M10
Naphthalene	6.6	6.6
2-Ethyl Hexanoic Acid	180	
TVOC[1]	430	100

[1] TVOCs were calculated from the total ion current (TIC) from the GC/MS analysis by adding the areas of the integrated peaks with retention times greater than five minutes, subtracting from the sum the area of the internal standard, chlorobenzene-d5, and then calculating the concentration using the response factor of chlorobenzene-d5.

Table 24b. Typical Classroom: Modeled Air Concentrations in μg/m^3 at 96 Hours for Selected Target Chemicals Using Emission Factors of Tested Tackable Wall Panels (All samples were conditioned for 10 days)					
Compound Name	**Section 01350 Concentration Limits**	**Prop. 65 or TAC Listed**	**Odor Threshold**	**Standard Tackable Wall Panel**	**Alternative Tackable Wall Panel**
				SWP16M9	AWP17M10
Naphthalene				3.3	3.3
2-Ethyl Hexanoic Acid				93	

Table 25a. Summary of Emission Factors in μg/m²hr at 96 Hours for Selected Target Chemicals Emitted by Tested Thermal Insulation

(All samples were conditioned for 10 days)

Compound Name	Standard Thermal Insulation		Alternative Thermal Insulation	
	SINS54M28	SINS68M47	AINS53M27	AINS69M48
Acetone	21	1.8	15	8.2
Decanal			0.87	
Formaldehyde	14	0.35	7.7	1.7
Hexanal				5.3
Nonanal	1.2	0.57	1.4	4.0
TVOC[1]	1.2	0.57	2.2	26

[1] TVOCs were calculated from the total ion current (TIC) from the GC/MS analysis by adding the areas of the integrated peaks with retention times greater than five minutes, subtracting from the sum the area of the internal standard, chlorobenzene-d5, and then calculating the concentration using the response factor of chlorobenzene-d5.

Table 25b. Typical Classroom and State Office: Modeled Air Concentrations in μg/m^3 at 96 Hours for Selected Target Chemicals Using Emission Factors of Tested Thermal Insulation

(All samples were conditioned for 10 days)

Compound Name	Section 01350 Concentration Limits	Prop. 65 or TAC Listed	Odor Threshold	Standard Thermal Insulation Classroom (Office)		Alternative Thermal Insulation Classroom (Office)	
				SINS54M28	SINS68M47	AINS53M27	AINS69M48
Acetone				20 (46)	1.8 (4.1)	15 (34)	8.0 (18)
Decanal			5.9			0.86 (2.0)	
Formaldehyde	16.5	Yes		13 (**31**)[1]	0.34 (0.78)	7.5 (**17**)[1]	1.7 (3.9)
Hexanal			58				4.2 (9.6)
Nonanal			13	1.2 (2.6)	0.56 (1.3)	1.3 (3.0)	3.9 (9.0)

[1] Exceeds Section 01350 concentration limit value.

Table 26a. Summary of Emission Factors in μg/m²hr at 96 Hours for Selected Target Chemicals Emitted by Tested Wall Base

(All tested w/adhesive—all samples were conditioned for 10 days)

Compound Name	Standard Wall Base		Alternative Wall Base
	SWB78M39	SWB83M50	None Tested
Acetone	400	30	
2-Ethyl Hexanoic Acid		240	
Formaldehyde	61	3.6	
n-Butanol		200	
Octane	300		
Phenol		680	
Propylene Glycol		250	
Undecane	13	270	
Unidentified			
TVOC[1]	1,200	13,000	

[1] In addition to the compounds listed above, many branched and cyclic hydrocarbons were emitted, mostly in the 9-carbon to 14-carbon range. Several of these compounds have been tentatively identified, including 2,6-dimethyl nonane, 2-methyl decane, 3-methyl decane, 4-methyl decane, 5-methyl decane, pentyl-cyclohexane, and 2,6-dimethyl undecane.

Table 26b. Modeled Air Concentrations in μg/m^3 at 96 Hours for Selected Target Chemicals Using Emission Factors of Tested Wall Base for Typical Classroom and State Office Calculations

(All tested w/adhesive—all samples were conditioned for 10 days)

Compound Name	Section 01350 Concentration Limits	Prop. 65 or TAC Listed	Odor Threshold	Standard Wall Base				Alternative Wall Base
				SWB78M39		SWB83M50		
				Classroom	Office	Classroom	Office	
Acetone				8.1	24	.61	1.8	None Tested
Acetaldehyde	4.5	Yes		0.19	0.57	0.40	1.2	
2-Ethyl Hexanoic Acid						4.4	15	
Formaldehyde	16.5	Yes		1.2	3.7	0.07	0.22	
n-Butanol						4.2	12	
Octane				6.0	18			
Phenol	100	Yes	430			14	41	
Propylene Glycol						5.1	15	
Undecane			7800	0.27	0.82	5.4	16	

Table 27. Number of Products Exceeding Section 01350 Concentration Limits for the State Office Application

Compound Name	Acoustical ceiling tiles	Carpeting	Fiberboard	Gypsum Board	Paints	Particleboard	Plastic Laminates	Resilient Flooring	Tackable Wall Panels	Thermal Insulation	Wall Baseboard	TOTAL
Acetaldehyde		1std 1 alt	1alt			1 std		1 std 2 alt[1]				7
Ethylene Glycol					1 std							1
Formaldehyde	1 std	1std	2 std	2std				1 std		1 std 1alt		9
Naphthalene		5 std 1 alt						1 std 2 altN[2] 4 altT[3]				13
Phenol								1 alt[1]				1

[1] Alternative, non-rubber-based.
[2] Alternative, rubber-based, non-tire-derived.
[3] Alternative, rubber-based, tire-derived.

Table 28. Number of Products Exceeding IAQ Performance Criteria Other Than Section 01350 Concentration Limits for the State Office Calculation

Compound Name	Acoustical ceiling tiles	Carpeting	Fiberboard	Gypsum Board	Paints	Particleboard	Plastic Laminates	Resilient Flooring	Tackable Wall Panels	Thermal Insulation	Wall Baseboard	TOTAL
2-butoxy ethanol[7]								1 alt[4] 1 altT[5]				2
Caprolactam[1]		4 std 1 alt										5
Decanal[2]		1 std										1
Decanol[2]					1 alt							1
Nonanal[2]		3 std			1 std 1 alt							5
Octanal[2]		1 std			2 alt			2 alt[4]				5
4-PCH[3]		3 std										3
Trans-2-Decenal[2]								1 alt[4]				1

[1] Exceeds interim State of California concentration limit.
[2] Exceeds odor thresholds as listed in Devos, et al. (1990).
[3] Exceeds odor threshold as listed in Van, et al. (1987).
[4] Alternative, non-rubber-based.
[5] Alternative, rubber-based, non-tire-derived.
[6] Alternative, rubber-based, tire-derived.
[7] Exceeds ½ of CREL of 20 µg/m^3 from the TAC list (www.arb.ca.gov/toxics/tac/factshts/glycleth.pdf). This chemical is not listed in OEHHA's CREL list.

Table 29. Summary of Number of Samples That Did and Did Not Exceed Section 01350 Concentration Limits and Other IAQ Performance Indicators for a Typical State Office

Material Category		Number of Samples That Did Not Emit Chemicals of Concern		Number of Samples That Did Emit Chemicals of Concern[1]		Total Samples
		Standard	Alternative	Standard	Alternative	
Acoustical Ceiling Panels		3	3	1	0	7
Carpets		1	2	8	3	14
Fiberboard		0	2	2	1	5
Gypsum Board		0	2	2	0	4
Paints		0	2	4	4	10
Particleboard		0	1	1	0	2
Plastic Laminates		3	1	0	0	4
Resilient Flooring	Non-rubber-based	1	2	3	3	9
	Rubber-based, non-tire-derived	None tested	0	None tested	3	3
	Rubber-based, tire-derived		0		11	11
Tackable Wall Panels		1	1	0	0	2
Thermal Insulation		1	1	1	1	4
Wall Base		2	None tested	0	None tested	2
Totals		12	17	22	26	77
		29		48		

[1] Includes samples that exceeded Sect ion 01350 concentration limits, odor threshold values, TVOC criterion, interim concentration for caprolactam, and CREL for 2-butoxy ethanol (TAC list). There may be chemicals of concern not found or identified using the measurement techniques utilized in this study.

Appendix A
Section 01350—Special Environmental Requirements

SECTION 01350

SPECIAL ENVIRONMENTAL REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes Special Environmental Requirements: Work includes special environmental, sustainable, and “green” building practices related to energy conservation and efficiency, indoor air quality, and resource efficiency, including the following:
   1. Special Requirements:
      a. Require practices to ensure healthy indoor air quality in final Project.
      b. Maximize use of durable products.
      c. Maximize use of products easy to maintain, repair, and that can be cleaned using non-toxic substances.
      d. Maximize recycled content in materials, products, and systems.
      e. Require use of wood from certified sustainably harvested sources.
      f. Maximize use of reusable and recyclable packaging.
      g. Maximize use of products with low embodied energy (production, manufacturing, and transportation).
   2. Construction team is required to comply with sustainable building practices during construction and when considering materials for substitutions. Refer to Article 1.2 - Design Requirements.

B. Related Requirements:
   Refer to Specification sections for special environmental requirements for specific products.
   1. Section 01565: Site Waste Management Program.
   2. Section 01600: Product Requirements.
   3. Section 01810: Building Commissioning.
   4. Section 01820: System Demonstration.

1.2 DESIGN REQUIREMENTS

A. General: Owner has established with design team general environmental goals for design and for construction of Project; Contractor, subcontractors, suppliers, and manufacturers (construction team) are encouraged to participate where possible to realize Owner’s environmental goals.
   1. Intent is for environmental goals to be achieved in manner that ultimately provides safe and healthy environment for building occupants with minimal impact on local, regional, and global environment.
   2. Contract Documents are not intended to limit alternative means of achieving environmental goals.
      a. Suggestions from construction team for implementing goals are encouraged.
      b. Team approach is encouraged.

B. Environmental Goals:
   1. Refer to specific Specifications sections for more detailed construction requirements related to specific materials and systems.
      a. Energy Efficiency (Operations Throughout Project Life): Materials and systems are intended to maximize energy efficiency for operation of Project throughout service life (substantial completion to ultimate disposition – reuse, recycling, or demolition).
      b. Indoor Environmental and Air Quality: Materials are selected and processes specified, such as preconditioning and temporary ventilation, to maximize healthy indoor air quality. Cleaning, surface coating, and renewal or replacement of interior materials should be feasible with lowest practical use of toxic, irritating, or odorous compounds. Ventilation system design, construction, and commissioning ensure adequate outside air supply under all anticipated conditions of use. Documentation of system design assumptions is included in Project Manuals to enable building operators and management to use and modify the system as required to provide continued assurance of indoor air quality. Additionally, materials are selected to provide appropriate indoor environmental qualities such as good acoustics and lighting.
      c. Resource Efficiency (Project Construction): Materials and systems are to maximize environmentally-benign construction techniques, including construction waste recycling, reusable delivery packaging, and reusability of selected materials.

C. Energy Conservation: Maximize energy conservation strategies in order to reduce life-cycle energy requirements.
   1. Reduce undesirable heat gain and heat loss through exterior envelope.
   2. Use daylight as the primary lighting source in classrooms and supplement with integrated and energy-efficient electrical lighting systems.
   3. Choose equipment with high-end energy performance characteristics, including lighting, HVAC systems, appliances, and office equipment.
   4. Where appropriate, use thermal storage strategies such as thermal mass of building or ground to minimize total energy consumption.
   5. Design mechanical systems for efficient operation throughout the typical operating range, from minimum to peak load.

D. Sustainable Site Planning and Landscape:
   1. Maximize erosion and sedimentation control.
   2. Minimize site disturbance.
   3. Maximize planted areas.
   4. Reduce heat islands.
   5. Where possible, reduce or eliminate light pollution from site lighting. (Note 3)
   6. Reduce or eliminate use of pesticides.
   7. Rely on indigenous, dry or xeriscape planting. Maintain existing planting on site to reduce costs.
   8. Implement seasonal plant and soil maintenance schedule to maintain healthy soil and landscaping.
   9. Maximize storm water runoff.
   10. Reduce water use with water efficient irrigation systems and local vegetation.

E. Durable Materials:
   1. Select materials with longest useful service life.
   2. Select materials that deteriorate minimally under installed conditions, exposures, and uses.
   3. Select materials with surfaces that require minimal or no refinishing or resurfacing.
   4. Select materials with protective coating requirements that do not involve frequent application of toxic or odorous components for materials that require surface renewal or protection.
   5. Select materials that can be reused after their service life in this building.
   6. Select materials that can be recycled at the end of their useful lives for materials that cannot be re-used.

F. Resource-Efficient Materials: Use resource-efficient materials; consider energy use over life cycle of material including harvesting, mining, manufacturing, transport, installation, use, operations, recycling, and disposal.
   1. Where possible and allowable by the Agency and Code with jurisdiction over the project, reuse existing building materials to the extent feasible within design concept expressed in Contract Documents.
   2. Select materials that efficiently use resources such as energy, water, and component materials.
   3. Use construction practices such as material reduction and dimensional planning that maximize efficient use of resources and materials.
   4. Provide materials that utilize recycled content to maximum degree possible without being detrimental to product performance or indoor air quality.
   5. Where possible and feasible, provide for non-destructive removal and reuse of materials after their service life in this building.
   6. Select materials that use less embodied energy to manufacture.
      a. Exceptions might include materials that result in net energy conservation during their useful life in building and building's life cycle.
   7. Select materials that conserve energy during building operations.
   8. Where possible, select materials harvested and manufactured regionally, within a 500-mile radius of the project site.

G. Scarce, Irreplaceable, and Endangered Resources:
   1. Select materials from abundant resources.
      a. For natural resources, determine abundance based on ratio of removal rate from existing stocks to natural replacement/renewal rate, where this information is available.
      b. For mineral resources, determine abundance based on ratio of removal rate from terrestrial storage minus amount re-entering commerce through recycling or resource recovery compared to total in terrestrial storage, where this information is available.
   2. Select renewable materials, and materials which can be replenished.
   3. Select materials that create minimal or no damage to natural habitats and natural environment.
   4. Select materials that can be easily refinished, repaired, or refurbished to extend their useful life.

H. Pollution: Select materials that generate least amount of pollution during mining, manufacturing, transport, installation, use, and disposal.

   1. Avoid materials that emit greenhouse gases
   2. Avoid materials that require energy intensive extraction, manufacturing, processing, transport, installation, maintenance, or removal.
   3. Avoid materials that contain ozone-depleting chemicals (e.g., CFCs or HCFCs).
   4. Avoid materials that emit potentially harmful volatile organic chemicals (VOCs), as described in Article 2.2.
   5. Employ construction practices that minimize dust production and combustion by-products.
   6. Avoid materials that can leach harmful chemicals into ground water; do not allow potentially harmful chemicals to enter sewers or storm drains.
   7. Protect soil against erosion and topsoil depletion.
   8. Minimize noise generation during construction; screen mechanical equipment to block noise.
   9. Select materials that can be reused or recycled and materials with significant percentage of recycled content; conform with or exceed specified Project recycled content percentages for individual materials; avoid materials difficult to recycle.
   10. Protect natural habitats; restore natural habitats where feasible within scope of Project.

I. Wood Products:
   1. Use woods from Forest Stewardship Council (FSC) accredited certified sustainably harvested sources.
   2. Composite wood products with high recycled content, which meet the indoor air quality data requirements, are acceptable. *(Note 4)*

J. Water Efficiency:
   1. Reduce the use of municipally supplied potable water.
   2. Reduce dependence on municipal storm water system for plumbing fixtures and irrigation. Eliminate irrigation or use micro-irrigation. Use no moisture sensors or clock timers on irrigation systems.
   3. Maintain natural aquifer conditions.
   4. Consider roofwater or groundwater collection system.
   5. Consider graywater collection system for irrigation systems.
   6. Commission irrigation, graywater, roofwater collection systems. Provide measurement and verification for these systems. Train maintenance staff on performance of all water collection and distribution systems.

1.3 SUBMITTALS

A. Resource Efficient Product Data:
   1. Environmental Issues Data: Submit following information, including manufacturer's certifications, verifying information, and test data, where Specifications sections require data relating to environmental issues including but not limited to:
      a. Project Recyclability: Submit information to assist Owner and Contractor in recycling materials involved in shipping, handling, and delivery, and for temporary materials necessary for installation of products.
      b. Recycled Content: Submit information regarding product postindustrial recycled and postconsumer recycled content.
      c. Use the "Recycled Content Certification Form," attached as Appendix A to this Section, signed by a corporate office holder (i.e., Chairman of the Board, President, Vice President, Secretary, or similar position of authority). (Note 5)
      d. Product Recyclability: Submit information regarding product and product's component's recyclability including potential sources accepting recyclable materials.
      e. Provide certification for all wood products provided by a Forest Stewardship Council (FSC) accredited certifier.
      f. Provide final certification of well-managed* forest of origin to provide final documentation of certified sustainably harvested status: Acceptable wood "certified sustainably harvested" certifications shall include:
         1) Wood suppliers' certificate issued by one of the Forest Stewardship Council-accredited certifying agencies, such as Smart wood (800-434-5491) or Forest Conservation Program (510-832-1415);
         2) Suppliers' invoice detailing the quantities of certified wood products for project;
         3) Letter from one of a certifying agency corroborating that the products on the wood supplier's invoice originate from certified well-managed forests (Note 6).

B. Indoor Air Quality (IAQ) Data:
   1. Environmental Issues: Submit emission test data produced by acceptable testing laboratory listed in Quality Assurance Article for materials as required in each specific Specification section.
      a. Laboratory reports shall contain emissions test data on VOCs including total VOCs (SumVOC), specific individual VOCs, formaldehyde and other aldehydes as described in this Specification Section.
      b. In special cases it may be necessary to identify other specific chemicals for listing based on known quantity present or on known odor, irritation or toxicity.
      c. Identify all VOCs emitted by each material as required in these Specifications.
      d. Specific test conditions and requirements are set forth in this Section. For required tests, submit documentation of sample acquisition, handling, and test specimen preparation, as well as test conditions, methods, and procedures. The tests consist of a ten-day conditioning period followed by a 96-h test period.
         1) Samples collected during the test period at 24, 48, and 96 hours shall be analyzed for TVOC and formaldehyde. *(Note 8)*

2) VOC samples collected at 96 hours shall be identified and quantified for all compounds that are Chemicals of Concern on lists in Article 2.

2. Cleaning and Maintenance Products: Provide data on manufacturers' recommended maintenance, cleaning, refinishing and disposal procedures for materials and products. These procedures are for final Contractor cleaning of the project prior to substantial completion and for provided materials and products as required by the specific specification sections.
   a. Where chemical products are recommended for these procedures, provide documentation to indicate that no component present in the cleaning product at more than 1% of the total mass of the cleaning product is a carcinogen or reproductive toxicant as defined in the lists in this specification section.
   b. For purposes of reporting, identification of product VOC contents shall not be limited to those regulated under Clean Air Act (CAA) but shall also include compounds exempted from the CAA definition and listing of VOCs.
   c. California EPA and local air district definitions of VOCs based on CAA are not sufficient as they exempt compounds based on non-reactivity for outdoor air pollution control but still important for indoor air quality.
   d. No alpha-pinene, d-limonene or other unsaturated carbon double bond alkalines are permitted in cleaning agents.

C. Certificates:
   1. Environmental Issues Certifications:
      a. Submit documentation certifying accuracy of postindustrial and postconsumer recycled content, and recyclability.
      b. Prior to Final Completion, submit certificate signed by corporate office holder (i.e., Chairman of the Board, President, Vice President, Secretary, or similar position of authority) of contractor, subcontractor, supplier, vendor, installer or manufacturer, provided they are primarily responsible for manufacture of product, indicating:
         1) Postindustrial and postconsumer recycled content of materials installed are same as those required by Project requirements.
         2) Product recyclability of materials installed are same as those required by Project requirements.
         3) Indoor air quality requirements. Certification shall state products and materials provided are essentially same, and contain essentially same components as products and materials tested.
      c. Comply with requirements specified in Section 01770 – Closeout Procedures.

D. Closeout Submittals: Submit data relating to environmental issues.
   1. Submit environmental product certifications, in two forms:
      a. Two CD-ROMs organized by CSI 16 Division Format.
      b. Four three-ring binders organized by CSI 16 Division Format with Table of Contents and with dividers for each division.

1.4 QUALITY ASSURANCE

A. Environmental Project Management and Coordination: Contractor to identify one person on Contractor's staff to be responsible for environmental issues compliance and coordination.
   1. Experience: Environmental project manager to have experience relating to sustainable building construction.
   2. Responsibilities: Carefully review Contract Documents for environmental issues, coordinate work of trades, subcontractors, and suppliers; instruct workers relating to environmental issues; and oversee Project Environmental Goals.
   3. Meetings: Discuss Environmental Goals at following meetings.
      a. Pre-construction meeting.

b. Pre-installation meetings.
c. Regularly scheduled job-site meetings.
d. Special sustainability issues meetings.

B. Environmental Issues Criteria: Comply with requirements listed in various Specification sections.

C. Acceptable Indoor Air Emissions Testing Laboratories: (Note 10)
1. Berkeley Analytical Associates; 815 Harbour Way South, Suite 6, Richmond, California 94804; telephone 510.236.2325; fax 510.236.2335; e-mail berkeleyanalytical@ att.net .
2. Air Quality Sciences, Inc.; 1337 Capital Circle, Atlanta, Georgia 30067; telephone 770.933.0638; fax 770.933.0641; e-mail aqs@mindspring.com.
3. Other Laboratories:
a. Selection of testing laboratories shall include assessment of prior experience in conducting indoor source emissions tests.
b. Many laboratories participate in and are certified by American Industrial Hygiene Association laboratory accreditation program. http://www.aiha.org/lists.html.
1) These laboratories are accredited to do analysis for hazards at levels of concern for industrial workplaces and not necessarily accredited, organized, or able to perform analysis for chemicals and particulate matter at concentrations of concern for indoor air.
c. The proposed laboratory shall be an independent company or organization not related to manufacturer of product to be tested.
d. Submit documentation on proposed laboratory for review and approval by Owner.

D. Indoor Air Emissions Tests:
1. Provide environmental chamber test data from tests based on ASTM Standard D5116-97, Guide for Small Scale Environmental Chamber Determination of Organic Emissions from Indoor Materials/Products. (Refer to ASTM, Annual Book of Standards, Volume 11.03. West Conshohocken, PA: American Society for Testing and Materials. http://www.astm.org.)
2. Tests shall be conducted according to guidance contained in ASTM Standard D5116-97 on material test specimens pre-conditioned in clean air prior to testing.
a. Review test specimen collection, documentation, collection, preparation and shipping procedures with testing laboratory prior to preparing and shipping sample.
b. Test specimens shall be packaged in the normal manner at the factory and shipped directly to testing laboratory by the manufacturer. For materials that are not packaged in convenient consumer units, alternate procedures to preserve the chemical integrity of the specimen are required. Obtain test laboratory procedure sheet covering the handling and shipping of materials. If such information is not provided by the laboratory, then wrap the specimen in a manner that will eliminate direct contact with air or packaging materials other than an inert air barrier such as foil or laboratory grade plastic sheet wrapping material.
c. Conditioning: Condition all test specimens for ten days in clean air. Clean air should be free from the Chemicals of Concern listed in Article 2. Hold in clean vessels approximately the size of the test chambers and ventilated at the same air flow rate to be used in the test period. Suspend or place specimens on wire racks so that air freely circulates around all sides during the conditioning period. The air temperature and relative humidity during the conditioning period shall be 23±2ºC and 50±10% RH. Otherwise, the material must be held in an environmental chamber for the entire period.
d. For wet-applied products and material assemblies, a realistic test specimen shall be prepared using the substrate material on which it will be applied in the building. Alternately, it may be necessary to use a substrate material that closely simulates the actual building substrate.
e. For material assemblies (e.g., floor and wall systems where the finish material is placed over a substrate, either with or without the use of adhesives), individual components of the assembly system shall be tested separately. If all components meet the emissions criteria established herein, no further testing shall be required. For assemblies where one

component, such as a floor or wall covering adhesive, does not meet the criteria, the assembled system may be tested with specimen preparation following the manufacturer's recommended procedures for application of wet components and assembly of the system. If there is a difference between the manufacturers' recommended procedures and procedures required by the project specifications, the project specifications shall be followed.

f. Wall and other types of paints shall be tested according to the specifications for the particular material. For example, if two coats are to be applied over a primer coat, then the test specimen shall be prepared accordingly, dried between coats per manufacturer's label instructions, and tested as a complete assembly after required conditioning. The total quantity of paint applied shall be reported based on the weight of the assembly immediately before and after the application of each coat.

3. The maximum concentration for any chemical emitted at 96 hours in emissions tests shall not result in a modeled indoor air concentration greater than ½ the chronic inhalation REL concentration of California Office of Environmental Health Hazard Assessment (OEHHA) Chronic Reference Exposure Limit (REL), with the exception of formaldehyde, which is discussed separately below.
4. Formaldehyde: No single product shall contribute more than one half (½) the OEHHA staff recommended indoor air limit of 33 µg/m3 (27 ppb) for formaldehyde. The calculated concentration of formaldehyde shall not exceed 16.5 µg/m3. Same modeling procedure as described above shall be used for formaldehyde. This concentration limit shall apply to all building and occupancy types. (Note 12)
5. Construction adhesives used in Work shall comply with following requirement: no component present in adhesive at more than 1% of total mass of adhesive shall be a carcinogen or reproductive toxicant as defined in the lists in this specification section.
6. Provide calculations of modeled concentrations based on emissions test results.
   a. Calculations shall be submitted with all other documentation. This requires the calculation of emission factors based on emissions tests, then application of the emission factors, product loading factors in the building, and building parameters in a steady state mass-balance model. The model assumes zero outdoor concentrations, perfect mixing, and no sink effects. Alternatively, follow procedures in ASTM D5116-97 and submit assumptions and calculations.
   b. The concentration of a compound in the building shall be calculated using the following equation:

$$\text{Concentration} = \frac{(\text{Emission factor}) * (\text{Loading factor})}{(\text{Air change rate})}$$

For this equation, the units are: $\mu g/m^3 = \frac{(\mu g/m^2\ hr) * (m^2/m^3)}{(h^{-1})}$

This can be simplified as follows:

$$\text{Concentration} = \frac{\text{Emission rate}}{\text{Air change rate}}$$

Note that the weekly average air change rate must be used in the calculations of concentrations of contaminants.

   c. Calculation of emission rate: Determine the emission rate by multiplying the emission factor by the amount of the material to be used in the building or air handler zone being evaluated. Multiply the emission factor by the area of the material in the building zone being assessed. Note that in some cases a length or mass may be the appropriate unit for emission factor that must then be multiplied by the length or mass of the emission source.
   d. Provide to the laboratory the total area of the zone being assessed by consulting the Contract Documents or the design engineer, to identify the total area served by the air

handler that serves the area(s) within it where the material will be applied. If the material is used in multiple zones, then calculations shall be made to determine the concentration in the zone with the highest loading ratio of material to volume or material to weekly average minimum air change rate, whichever is greater.

e. Provide to the laboratory the volume of the space served by the air handler by multiplying the floor area by the floor-to-floor clear height (top of finish floor to bottom of structure of floor above) and multiply by 0.9 (to take account of the portion of the volume that is occupied by solid objects). This value represents the ventilated volume for purposes of the calculations required here.

f. Determine the air change rate by dividing the volume of outside air introduced into the space per hour by the ventilated volume of the space.

g. Determine the weekly average air change rate by adding the minimum design air change rate during ventilation system operating hours times the number of hours the system is operated to an assumed air change rate from infiltration during ventilation system non-operational hours times the number of hours the system is off; then divide the total by the number of hours in a week, (168). Where no values are available from the design documents, use default values as follows:

   1) Offices:
      a) Where design data are not available to calculate the weekly average air change rate, the modeling shall assume a weekly average air change rate for office buildings of 0.75 air changes per hour (ach). This “default” office air exchange rate is based on a typical weekly State office building 55-hour operating schedule and an assumed off-hours air change rate of 0.3 ach (assumed air change rate during normal operating hours is in excess of 1.0 per hour).
      b) Where specific information is available, the project specific data should be used to calculate the weekly average air change rate. A default building air change rate of 0.2 per hour during non-HVAC operations should be used.
   2) Schools:
      a) Modeling shall assume weekly average air change rate for school buildings of 0.9 per hour. This air change rate is based on an assumed 40 hours per week of ventilation system operation at 3.0 ach and 128 hours per week of 0.2 ach through infiltration.
      b) Where specific information is available, the project-specific data should be used to calculate the weekly average air change rate. A default building air exchange rate of 0.2 per hour during non-HVAC operations should be used.
   3) Other building types or occupancy types: Use ASHRAE Standard 62.1999 default occupant densities and ventilation rates for hours of operation and 0.2 ach for nonoperating hours unless actual rates are known, in which case the actual rates and hours of operation are to be used.

7. Environmental Chamber Testing: Indoor Air Emissions Testing Laboratories may use a range of acceptable loading ratios in order to make use of various size chambers, since these are not standardized across laboratories. Loading ratios ranging from 0.25 m2/m3 to 0.45 m2/m3 will be acceptable.
   a. For dry products, loading ratios within reasonable limits are not critical for determining emission factors; conditioning of test specimens prior to testing will reduce or eliminate differences that may occur in unconditioned samples due to evaporation-limited emissions and sink effects from adsorption of VOCs during final stages of manufacturing or while in packaging during transport to and storage at the laboratory.
   b. Higher loading ratios lower expected emission factor; however, the relationship is not linear, especially at higher concentrations. Therefore, where strong formaldehyde (or other chemical) sources are known or expected to be present, loading ratios should be selected to represent a median value for the plausible range of actual building loading ratios.
   c. Loading ratios used shall be included in test report.
   d. Contractors shall provide to product manufacturers information on actual quantity of material to be used in Project. The product manufacturers will then forward this information

to Indoor Air Emissions Testing Laboratory so loading ratios can be adjusted toward actual loading ratio of Project. However, for most low-emitting materials used in construction, actual loading ratio will not significantly affect emission rates except for strong formaldehyde sources, primarily products using urea-formaldehyde resins.

8. Sample Preparation Requirements:
    a. Substrates for environmental chamber emissions tests of individual products or materials (materials tested separately):
        1) Dry solid sheet type products:
            a) Sheet stainless steel or aluminum tray to provide tight fit at edges and reduce emissions from edge of material specimen. If material does not fit very snugly, then use aluminized, low-emitting, clean room tape to seal edges. Dry fabric type products.
            b) No substrate necessary.
        2) Wet products such as adhesives and sealers:
            a) Sheet stainless steel, aluminum, or glass unless product is to be applied to gypsum board or other highly absorbent material. If substrate is a highly absorbent material, use a sample of the substrate preconditioned for 24 hours to the temperature and humidity of the test chamber.
        3) Substrates for specific products:
            a) Composite wood products (Section 06400): sample to be suspended or supported in chamber with all edges exposed and no edge masking.
            b) Gypsum Board (Section 09260): no substrate (testing required ONLY if recycled content gypsum board or if water resistant types are used).
            c) Acoustical Ceiling Panels (Section 09510): no substrate, sample to be suspended or supported in chamber with no edge masking.
            d) Resilient flooring (Section 09650): stainless steel tray, fitted tightly so that only the upper surface is exposed. Alternately, cover back of flooring with sheet stainless steel and seal edges with low-VOC emitting aluminized clean room tape so only wear surface of flooring is exposed.
            e) Carpet Tile and Broadloom Carpet (Section 09680): stainless steel tray, fitted tightly so that only the upper surface is exposed.
            f) Flat and eggshell Paints (Section 09900): 5/8" gypsum board.
            g) Semi-gloss paints (Section 09900): Where applied to metal, use sheet stainless steel. Where applied to gypsum board, use gypsum board conditioned as described in subsection c below.
            h) Joint Sealers (Section 07900): Steel channel 0.64 cm by 0.64 cm by 25.4 cm Channel shall be filled with sealant.
    b. Substrates for environmental chamber emissions tests of assemblies of products or materials (materials tested in an assembly):
        1) Laminates or wood veneers applied with adhesives (Section 06400): Medium density fiberboard (MDF).
        2) Resilient flooring applied with adhesives (Section 09650): Sheet stainless steel or glass plate.
        3) Carpet Tile/Broadloom Carpet applied with adhesives and adhesives (Section 09685/Section 09680): Sheet stainless steel or glass plate.
        4) Wall Coverings applied with adhesives (Section 09700 Series): 5/8” gypsum board. Prior to preparation of the test specimen, Gypsum board substrate shall be pre-conditioned for at least 24 hours at 23 $\pm$ 2oC and 50 $\pm$ 10% RH while ventilated with clean air. [Ventilation rate is not important.]
    c. Protocol for Paint Testing: Preparation and handling of paint test specimen.
        1) Flat and Eggshell Paints:
            a) Apply paints to 5/8" thick gypsum board. Hold Gypsum board substrate for at least 24 hours at 23 $\pm$ 2^{o}C and 50 $\pm$ 10% RH while ventilated with clean air. Accurately weigh substrate just prior to painting, mask borders to avoid paint dripping on

edges and leave center area for paint. Alternative approaches to protecting the edges are acceptable and shall be reported if used.

b) Apply paint using standardized roller procedure that simulates application of paint in building. For most wall paint applications use a 4” wide 3/8” nap roller intended for smooth surfaces.
c) Stir paint in container and transfer 100 mL of paint to heavy-duty aluminum foil disposable tray.
d) Saturate roller cover with paint by running back and forth in tray.
e) Apply paint to substrate using four strokes, two in vertical direction, and two in horizontal direction, so entire area is uniformly covered.
f) Remove tape from substrate and re-weigh substrate.
g) Difference in weight determines amount of applied paint and coverage in grams of wet paint per square meter of substrate surface.
h) Place substrate on 6” by 6" piece of sheet stainless steel to cover entirely the back surface. Attach substrate to stainless steel with strips of low VOC aluminized clean room tape so only painted surface is exposed. For a blank specimen, similarly prepare an unpainted piece of gypsum. Alternate procedures to cover unpainted surfaces of gypsum board may be used and must be adequately described in the laboratory report if used.
i) Place sample in conditioning environment immediately and hold for ten days.
j) Where multiple coats, which may include primer, are being tested, apply paints and follow manufacturers’ instructions for drying time between coats. Report weight of test specimen prior to and after each coat of paint is applied. Hold specimen in conditioning environment between coats. The ten-day conditioning period begins after application of final coat. Apply semi-gloss paint to clean steel sheet following same procedure as above for “flat and eggshell paints.” No tape should be used. Sheet should be weighed immediately before and after painting.

9. Chemical Analyses:
    a. VOC Analysis: Make multi-point calibrations using pure compounds whenever such compounds are available from commercial suppliers (such as Aldrich Chemical Company, Sigma Aldrich). Quantitative analyses performed using surrogate compounds shall be indicated in reported test results. Identify EPA and ASTM standard methods and practices, and testing laboratory calibration procedures, which should include a calibration at least once every three (3) months.
    b. Formaldehyde and Acetaldehyde Analysis: Formaldehyde and Acetaldehyde analysis shall be performed following ASTM Standard D 5197 "Standard Test Method for Formaldehyde and other Carbonyl Compounds in Air (Active Sampler Methodology)."

10. Reporting Requirements: In addition to reporting requirements stated elsewhere in Specifications, reports shall include all compounds emitted from samples that are on the list in Table 1 of this Section, and all compounds on Proposition 65 and the California Toxic Air Contaminant list. For these compounds, report following:
    a. Measured chamber concentrations.
    b. Calculated emission factors.
    c. Calculated building concentrations and assumptions used to make calculation.

E. State Agency Buy Recycled Campaign (SABRC) Recycled Content: Implement the SABRC recycled-content goals for specific building products, including but not limited to:
    1. Paper products;
    2. Glass products (windows, glazing, fiberglass, tile, construction blocks, loose-grain abrasives);
    3. Plastic products (carpet, plastic lumber, furniture made from plastic, fencing, parking bumpers, toilet partitions, entry mats, signage, sheet plastic and other plastic-containing building products);

4. Solvents;
5. Tire-derived products (entry-mats, resilient flooring, wheelchair and other ramps, playground surfacing, parking bumpers, speed bumps, tree ties, road surfacing);
6. Steel products (structural steel, steel framing, architectural metal, reinforcing bars, sheet metal, metal siding, metal roofing, lockers, toilet partitions, office furniture for filing and storage);
7. Paint (allowed only in exterior installations);
8. Compost

1.5 DELIVERY, STORAGE, AND HANDLING

A. Packaging: Deliver materials in recyclable or in reusable packaging such as cardboard, wood, paper, or reusable blankets, which will be reclaimed by supplier or manufacturer for recycling.
1. General: Minimize packaging materials to maximum extent possible while still ensuring protection of materials during delivery, storage, and handling.
   a. polystyrene, polyethylene, and similar plastic materials such as “foam” plastics and “shrink-fit” plastics.
2. Reusable Blankets: Deliver and store materials in reusable blankets and mats reclaimed by manufacturers or suppliers for reuse where program exists or where program can be developed for such reuse.
3. Pallets: Where pallets are used, suppliers shall be responsible to ensure pallets are removed from site for reuse or for recycling.
4. Corrugated Cardboard and Paper: Where paper products are used, recycle as part of construction waste management recycling program, or return to material’s manufacturer for use by manufacturer or supplier.
5. Sealants, Paint, Primers, Adhesives, and Coating Containers: Return to supplier or manufacturer for reuse where such program is available.

1.6 PROJECT CONDITIONS

A. No smoking will be permitted in indoor Project site locations, as per California Labor Code (Section 400-6413.5).

B. Certifications:
1. Environmental Product Certification:
   a. Include manufacturer certification indicating product contains maximum recycled content possible without being detrimental to product performance
   b. Include certification indicating cleaning materials comply with requirements of these Specifications.

C. Construction Ventilation and Preconditioning:
1. Temporary Construction Ventilation: Maintain sufficient temporary ventilation of areas where materials are being used that emit VOCs. Maintain ventilation continuously during installation, and until emissions dissipate after installation. If continuous ventilation is not possible via building’s HVAC system(s) then ventilation shall be supplied via open windows and temporary fans, sufficient to provide no less than three air changes per hour.
   a. Period after installation shall be sufficient to dissipate odors and elevated concentrations of VOCs. Where no specific period is stated in these Specifications, a time period of 72 hours shall be used.
   b. Ventilate areas directly to outside; ventilation to other enclosed areas is not acceptable.
2. During dust-producing activities (e.g., drywall installation and finishing) turn ventilation system off, and openings in supply and return HVAC system shall be protected from dust infiltration. Provide temporary ventilation as required.

3. Preconditioning: Prior to installation, allow products which have odors and significant VOC emissions to off-gas in dry, well-ventilated space for 14 calendar days to allow for reasonable dissipation of odors and emissions prior to delivery to Project site.
    a. Condition products without containers and packaging to maximize off-gassing of VOCs
    b. Condition products in ventilated warehouse or other building. Comply with substitution requirements for consideration of other locations.

D. Protection:
    1. Moisture Stains: Materials with evidence of moisture damage, including stains, are not acceptable, including both stored and installed materials; immediately remove from site and properly dispose. Take special care to prevent accumulation of moisture on installed materials and within packaging during delivery, storage, and handling to prevent development of molds and mildew on packaging and on products.
        a. Immediately remove from site and properly dispose of materials showing signs of mold and signs of mildew, including materials with moisture stains.
        b. Replace moldy materials with new, undamaged materials.
    2. Ducts: Seal ducts during transportation, delivery, and construction to prevent accumulation of construction dust and construction debris inside ducts.

1.7 SEQUENCING

A. Environmental Issues:
    1. On-Site Application: Where odorous and/or high VOC-emitting products are applied on-site, apply prior to installation of porous and fibrous materials. Where this is not possible, protect porous materials with polyethylene vapor retarders.
    2. Complete interior finish material installation no less than fourteen (14) days prior to Substantial Completion to allow for building flush out.

PART 2 - PRODUCTS

2.1 CHEMICALS OF CONCERN

A. Chemicals of Concern are those chemicals listed below as toxic air contaminants, carcinogens, teratogens, reproductive toxins, and chemicals with established Chronic Reference Exposure Levels (REL):

B. Carcinogens: Chemicals listed as probable or known human carcinogens in the latest published edition of the following two lists:
1. California Environmental Protection Agency, Air Resources Board (ARB), list of Toxic Air Contaminants (California Air Toxics). http://www.arb.ca.gov/toxics/summary/summary.htm.
2. California Environmental Protection Agency, Office of Environmental Health Hazard Assessment (OEHHA), Safe Drinking Water and Toxic Enforcement Act of 1986 (Proposition 65). http://www.oehha.ca.gov/prop65/prop65_list/Newlist.html.

C. Reproductive Toxicants: Chemicals known to cause reproductive toxicity including birth defects or other reproductive harm in the latest published edition of the following list: California Environmental Protection Agency, Office of Environmental Health Hazard Assessment (OEHHA), Safe Drinking Water and Toxic Enforcement Act of 1986 (Proposition 65). http://www.oehha.ca.gov/prop65/prop65_list/Newlist.htm.

D. Chemicals with established Chronic Reference Exposure Levels (REL): Chronic RELs have been developed for 65 hazardous airborne substances as of January 2001. A chronic REL is an airborne concentration level that would pose no significant health risk to individuals indefinitely exposed to that level. RELs are based solely on health considerations, and are developed from the best available data in the scientific literature. The California Environmental Protection Agency, Office of Environmental Health Hazard Assessment (OEHHA) establishes and publishes RELs. *(Note 16)*

Table 1. Chronic Reference Exposure Levels for organic chemicals with possible indoor sources. Based on California OEHHA list as of January 2001:

Substance	(CAS #)	Chronic Inhalation REL ($\mu g/m^3$)	Hazard Index Target(s)
Acetaldehyde*	75-07-0	9	Respiratory system
Acrolein	107-02-8	0.06	Respiratory system; eyes
Ammonia	7664-41-7	200	Respiratory system
Arsenic & arsenic compounds	7440-38-2	0.03	Development; Cardiovascular system; Nervous system
Benzene	71-43-2	60	Hematopoietic system; development; nervous system
Butadiene	106-99-0	20	Reproductive system
Cadmium & cadmium compounds	7440-43-9	0.02	Kidney; respiratory system

Substance	(CAS #)	Chronic Inhalation REL (µg/m^3)	Hazard Index Target(s)
Carbon tetrachloride	56-23-5	40	Alimentary system; development; nervous system
Chlorinated dioxins & dibenzofurans	1746-01-6 5120-73-19	0.00004	Alimentary system (liver); reproductive system; development; endocrine system; respiratory system; hematopoietic system
Chlorine	7782-50-5	0.2	Respiratory system
Chlorine dioxide	10049-04-4	0.6	Respiratory system
Chlorobenzene	108-90-7	1000	Alimentary system; kidney; reproductive system
Chloroform	67-66-3	300	Alimentary system; kidney; development
Chromium hexavalent: soluble except chromic trioxide		0.2	Respiratory system
Chromic trioxide (as chromic acid mist)		0.002	Respiratory system
Cresol mixtures	1319-77-3	600	Nervous system
Dichlorobenzene (1,4-)	106-46-7	800	Nervous system; respiratory system; alimentary system; kidney
Dichloroethylene (1,1)	75-35-4	70	Alimentary system
Diesel Exhaust*		5	Respiratory system
Dimethylformamide (N,N-)	68-12-2	80	Alimentary system; respiratory system
Dioxane (1,4-)	123-91-1	3,000	Alimentary system; kidney; cardiovascular system
Epichlorohydrin	106-89-8	3	Respiratory system; eyes
Epoxybutane (1,2-)	106-88-7	20	Respiratory system; cardiovascular system

Substance	(CAS #)	Chronic Inhalation REL (µg/m^3)	Hazard Index Target(s)
Ethylbenzene	100-41-4	2,000	Development; alimentary system (liver); kidney; endocrine system
Ethyl chloride	75-00-3	30,000	Development; alimentary system
Ethylene dichloride	107-06-2	400	Alimentary system (liver)
Ethylene glycol	107-21-1	400	Respiratory system; kidney; development
Ethylene glycol monoethyl ether	110-80-5	70	Reproductive system; hematopoietic system
Ethylene glycol monoethyl ether acetate	111-15-9	300	Development
Ethylene glycol monomethyl ether	109-86-4	60	Reproductive system
Ethylene glycol monomethyl ether acetate	110-49-6	90	Reproductive system
Ethylene oxide	75-21-8	30	Nervous system
Formaldehyde	50-00-0	3	Respiratory system; eyes
Glutaraldehyde	111-30-8	0.08	Respiratory system
Hexane (n-)	110-54-3	7000	Nervous system
Hydrazine	302-01-2	0.2	Alimentary system; endocrine system
Hydrogen chloride	7647-01-0	9	Respiratory system
Hydrogen cyanide	74-90-8	9	Nervous system; endocrine system; cardiovascular system
Hydrogen sulfide	7783-06-4	10	Respiratory system
Isopropanol	67-63-0	7,000	Kidney; development
Manganese & manganese compounds		0.2	Nervous system
Mercury & mercury compounds (inorganic)		0.09	Nervous system

Substance	(CAS #)	Chronic Inhalation REL (µg/m^3)	Hazard Index Target(s)
Methanol	67-56-1	4,000	Development
Methyl bromide	74-83-9	5	Respiratory system; nervous system; development
Methyl chloroform	71-55-6	1,000	Nervous system
Methyl t-butyl ether	1634-04-4	8,000	Kidney; eyes; alimentary system (liver)
Methylene chloride	75-09-2	400	Cardiovascular system; nervous system
Methylene Diphenyl Isocyanate	101-68-8	0.7	Respiratory system
Naphthalene	91-20-3	9	Respiratory system
Nickel & compounds (except nickel oxide		0.05	Respiratory system; hematopoietic system
Nickel oxide	1313-99-1	0.1	Respiratory system; hematopoietic system
Phenol	108-95-2	200	Alimentary system; cardiovascular system; kidney; nervous system
Phosphoric acid	7664-38-2	7	Respiratory system
Phthalic anhydride	85-44-9	20	Respiratory system
Propylene	115-07-1	3,000	Respiratory system
Propylene glycol monomethyl ether	107-98-2	7,000	Alimentary system (liver)
Propylene oxide	75-56-9	30	Respiratory system
Styrene	100-42-5	900	Nervous system
Tetrachloroethylene* (perchloroethylene)	127-18-4	35	Kidney; alimentary system (liver)
Toluene	108-88-3	300	Nervous system; respiratory system; development
Toluene diisocyanates (2,4-&2,6-)		0.07	Respiratory system

Substance	(CAS #)	Chronic Inhalation REL (µg/m^3)	Hazard Index Target(s)
Trichloroethylene	79-01-6	600	Nervous system; eyes
Xylenes (m-, o-, p-)		700	Nervous system; respiratory system

2.2 SUBSTITUTIONS

A. Substitutions Environmental Issues: Requests for substitutions shall comply with requirements specified in Section 01630 – Product Substitution Procedures, with following additional information required where environmental issues are specified.
   1. Indicate each proposed substitution complies with requirements for VOCs.
   2. Owner, in consultation with Architect, reserves the right to reject proposed substitutions where data for VOCs is not provided or where emissions of individual VOCs are higher than for specified materials.
   3. Comply with specified recycled content and other environmental requirements.

PART 3 - EXECUTION

3.1 FIELD QUALITY CONTROL

A. Building Flush Out: Just prior to Substantial Completion, flush out building continuously (i.e., 24 hours per day, seven (7) days a week) using maximum tempered outside air (or maximum amount of outside air while achieving reasonable indoor temperature) for at least fourteen (14) calendar days. If interruptions of more than a few hours are required for testing and balancing purposes, extend flush-out period accordingly.
   1. When Contractor is required to perform touch-up work, provide temporary construction ventilation during installation and extend building flush-out by a minimum of four (4) days after touch-up installation with maximum tempered outside air for 24 hours per day.
   2. If construction schedule permits, extend flush-out period beyond 15 days.
   3. Return ventilation system to normal operation following flush-out period to minimize energy consumption.

3.2 CLEANING

A. Final Cleaning Environmental Issues:
   1. Clean interior and exterior surfaces exposed to view; remove temporary labels, stains, and foreign substances; polish transparent and glossy surfaces using cleaning and maintenance products as described in Part 1 of this Section.
   2. Clean equipment and fixtures to sanitary condition using cleaning and maintenance products as described in Part 1 of this Section.
   3. Vacuum carpeted and soft surfaces with high efficiency particulate arrestor (HEPA) vacuum.
   4. If ducts were not sealed during construction and contain dust or dirt, clean ducts using HEPA vacuum immediately prior to Substantial Completion and prior to using ducts to circulate air. Oil film on sheet metal shall be removed before shipment to site. However, ducts shall be inspected to confirm that no oil film is present. Remove oil.
   5. Replace all air filters (i.e., pre and final filters) just prior to Substantial Completion.
   6. Remove and properly dispose of recyclable materials using construction waste management program described in Section 01565 – Site Waste Management Program.

3.3 PROTECTION

A. Environmental Issues:
   1. Protect interior materials from water intrusion or penetration; where interior products not intended for wet applications are exposed to moisture, immediately remove from site, and dispose of properly.
   2. Protect installed products using methods that do not support growth of molds and mildews.
      a. Immediately remove from site materials with mold and materials with mildew.

END OF SECTION

Project Name: _____

RECYCLED CONTENT CERTIFICATION FORM

This form is to be completed by a Corporate Officer of the Product Manufacturer for the General Contractor. The General Contractor must return the certification, completed for each product with recycled content as required by specific Specification Sections. Attach additional sheets if necessary.

GENERAL CONTRACTOR	**SUBCONTRACTOR/INSTALLER**	**PRODUCT MANUFACTURER**
Name:	Name:	Name:
Address:	Address:	Address:
Telephone, fax, e-mail:	Telephone, fax, e-mail:	Telephone, fax, e-mail:

Item #	*Product Category*[1&2] *(Include if applicable)*	*Product Description CSI section number*[3] (Needed for all products)	Quantity Bid	*Unit of measure*	Cost of material, (Excluding installation labor)	Weight in pounds	% Virgin Content[5]	% Postconsumer[6]	% Postindustrial[7]	Total %[8]
							As a percent of total weight			
		CSI section:								100
		CSI section:								100
		CSI section:								100
		CSI section:								100
		CSI section:								100
		CSI section:								100

Printed Name: (a corporate officer) *Title* *Date* *Signature*

GENERAL NOTES:

The Public Contract Code Sections, listed below, apply to California public (DGS) projects only. The required document has been adapted for use on other types of projects, including public schools.

A. Public Contract Code Sections 10233, 10308.5, and 10354 require all vendors and contractors to certify in writing, under penalty of perjury, to the state agency awarding a contract, the minimum, if not the exact percentage, of postconsumer and postindustrial material in the materials, goods, or supplies offered or used.

B. Public Contract Code Section 12205(a) requires all state agencies to require all contractors to certify in writing, under penalty of perjury, the minimum, if not the exact percentage, of postconsumer and postindustrial material in the materials, goods, or services provided or used.

NOTES:

(1) Product Category: (Fill in above, if applicable. This information is used to determine compliance with the State Agency Buy Recycled Campaign.)

1. Compost/Co-compost
2. Glass Products
3. Lubricating Oils
4. Paint
5. Plastic Products
6. Paper Products
7. Printing and Writing Papers
8. Solvents
9. Steel Products
10. Tires
11. Tire-derived Products

(2) Product category is used for State agency reporting for State projects, excluding public schools. Products that are made from multiple material types should be reported in the product category of the material type representing most of the product. The amount of material used in the product can be measured by weight or volume. If, for instance, a chair is made from steel, aluminum, and plastic and most of the material, either by weight or volume, is plastic, report it as a plastic product. If, however, most of the product, either by weight or volume, is steel, report the purchase as a steel product.

(3) Identify the Construction Specifications Institute (CSI) Specification Section number for the product, as indicated in the Project Specifications.

(4) Below are products preliminarily identified in the Project Specifications as having minimum recycled content requirements. Refer to the Project Specifications for individual sections in the specifications for recycled-content level that must be achieved. Recycled content guidelines shall include, but not be limited to, the products below (to be revised for each project):

1. Parking Bumpers (Section 2760)
2. Fluid-Applied Waterproofing (Section 07140)
3. Concrete reinforcement (Section 03200)
4. Bentonite Waterproofing (Section 07170)
5. Structural steel (Section 05120)
6. Metal Decking (Section 05300)
7. Building Insulation (Section 07210)
8. Steel doors and frames (Section 08110)
9. Glazing (Section 08800)
10. Paints and Coatings (Section 09900)
11. Cold-Formed Metal Framing (Section 05400)
12. Gypsum board (Sections 09255, 09260, 09265)
13. Ceramic tile (Section 09300)
14. Acoustical ceilings (Section 09510)
15. Resilient flooring (Section 09650)
16. Carpeting (Sections 09682, 09686)
17. Metal Toilet Compartments (Section 10160)
18. Identifying Devices (Section 10400)
19. Architectural Woodwork (Section 06400)

(5) Virgin material content is that portion of the product made from non-recycled material, that is, the material is neither postindustrial nor postconsumer material.

(6) Postconsumer material is defined as "a finished material which would have been disposed of as a solid waste, having completed its life cycle as a consumer item, and does not include manufacturing wastes." This is material such as a newspaper that is read, recycled and then made into recycled content newsprint or some other recycled product. Postconsumer material is generally any product that is bought by the consumer, used, and then recycled into another product.

(7) Postindustrial (also referred to as pre-consumer or secondary material) is defined as "fragments of finished products or finished products of a manufacturing process, which has converted a resource into a commodity of real economic value, but does not include excess virgin resources of the manufacturing process." This is material such as newsprint that is trimmed from a roll in the paper plant that is returned to the beginning of the process to make recycled content newsprint. The material (product) did not get to the consumer before being recycled. Postindustrial material DOES NOT include postconsumer material. FOR EXAMPLE: If a Printing and Writing Paper contained 20% postconsumer material, you would indicate 20 in the postconsumer column and 80 in the virgin column. If the product had 40% secondary material and 20% postconsumer material, you would indicate 40 in the postindustrial column, 20 in the postconsumer column, and 40 in the virgin column.

(8) The sum of the percentages for virgin, postconsumer, and postindustrial content must equal 100 percent.

Appendix B

Analytical Results Summary For Acoustical Ceiling Panels

Analytical Results Summary

Sample Information

Sample ID: 25

Material Type:	Acoustical Ceiling Panels	Date Manufactured:	03/01/2002
Manufacturer:	M14	Date Arrived:	03/13/2002
Product Name:	AACP25M14	Date Conditioning Started:	03/15/2002
Adhesive Used:	No	Date Test Started:	03/25/2002

Sample Analyzed in Duplicate? No

Chamber: 1

Compound Name (CAS Number)	Prop. 65 Chemical	ARB TAC	1/2 CREL (ug/m^3)	Olfactory Threshold (ug/m^3)	Emission Factors ($ug/(m^2*hr)$) 24-Hr	48-Hr	96-Hr	96-Hr. Air Conc. (ug/m^3) Class-room	Office
Analysis Name: VOCs-Thermal Desorption - GC/MS									
1,2-Bis(trimethylsiloxy)ethane (7381-30-8) *					10	6.3	4.0	3.8	4.3
Hexanal (66-25-1) *				58	15	9.7	6.2	5.9	6.7
Nonanal (124-19-6) *				13	16	13	11	10	12
Octanal (124-13-0) *				7.2	4.1	3.4	2.7	2.6	2.9
Pentadecane (629-62-9) *					5.0	4.2	3.6	3.5	3.9
Tetradecane (629-59-4) *					7.8	7.8	6.4	6.1	7.0
Toluene (108-88-3)		Yes	150			7.7	7.6	7.3	8.2

* Results for chemicals marked with an asterisk were calculated based on internal standard (chlorobenzene-d5).

Analysis Name: Aldehyde-DNPH									
Formaldehyde (50-00-0) **	Yes	Yes	16.5	1,100	9.7	6.3			

**CREL Note: Based on 1/2 of a total maximum of 27 ppb from all sources. The 27 ppb guideline is based on OEHHA's current acute 1-hour Reference Exposure Level (REL) of 76 ppb (94 µg/m3), extrapolated to an 8-hour exposure period.

Analysis Name: TVOC									
TVOC					210	150	150	140	160

Analytical Results Summary

Sample Information

Sample ID: 26

Material Type:	Acoustical Ceiling Panels	Date Manufactured:	03/12/2002
Manufacturer:	M10	Date Arrived:	03/13/2002
Product Name:	AACP26M10	Date Conditioning Started:	03/15/2002
Adhesive Used:	No	Date Test Started:	03/25/2002

Sample Analyzed in Duplicate? No

Chamber: 2

Compound Name (CAS Number)	Prop. 65 Chemical	ARB TAC	1/2 CREL (ug/m^3)	Olfactory Threshold (ug/m^3)	Emission Factors ($ug/(m^2*hr)$) 24-Hr	48-Hr	96-Hr	96-Hr. Air Conc. (ug/m^3) Class-room	Office
Analysis Name: VOCs-Thermal Desorption - GC/MS									
Butyrolactone (96-48-0) *						4.5			
Decanal (112-31-2) *				5.9	5.3	27	4.2	4.0	4.5
Ethyl Benzene (100-41-4)		Yes	1000	13	5.4	5.6	5.4	5.1	5.8
Heptanal (111-71-7) *				23		6.8			
Hexanal (66-25-1) *				58	3.8	14	1.8	1.7	1.9
m/p-Xylene (108-38-3/106-42-3)		Yes	350	2,100	3.5	4.2	3.6	3.4	3.9
Nonanal (124-19-6) *				13	8.8	39	5.7	5.4	6.2
Octanal (124-13-0) *				7.2	2.4	11	1.8	1.7	2.0
o-Xylene (95-47-6)		Yes	350	3,800	5.2	5.5	5.2	5.0	5.6
Pentadecane (629-62-9) *					3.8	16	2.9	2.7	3.1
Tetradecane (629-59-4) *					3.7	13	1.8	1.8	2.0
Toluene (108-88-3)		Yes	150		7.6	9.5	7.6	7.3	8.2

* Results for chemicals marked with an asterisk were calculated based on internal standard (chlorobenzene-d5).

Analysis Name: Aldehyde-DNPH									
Formaldehyde (50-00-0) **	Yes	Yes	16.5	1,100	170	27	14	13	15

**CREL Note: Based on 1/2 of a total maximum of 27 ppb from all sources. The 27 ppb guideline is based on OEHHA's current acute 1-hour Reference Exposure Level (REL) of 76 ppb (94 µg/m3), extrapolated to an 8-hour exposure period.

Analysis Name: TVOC									
TVOC					99	390	52	49	56

Analytical Results Summary

Sample Information

Sample ID: 27

Material Type:	Acoustical Ceiling Panels	Date Manufactured:	03/12/2002
Manufacturer:	M10	Date Arrived:	03/13/2002
Product Name:	AACP27M10	Date Conditioning Started:	04/05/2002
Adhesive Used:	No	Date Test Started:	04/15/2002

Sample Analyzed in Duplicate? No

Chamber: 1

Compound Name (CAS Number)	Prop. 65 Chemical	ARB TAC	1/2 CREL (ug/m^3)	Olfactory Threshold (ug/m^3)	Emission Factors (ug/(m^2*hr)) 24-Hr	48-Hr	96-Hr	96-Hr. Air Conc. (ug/m^3) Class-room	Office
Analysis Name: VOCs-Thermal Desorption - GC/MS									
Decanal (112-31-2) *				5.9	1.7	1.1			
Heptanal (111-71-7) *				23	1.4				
Hexanal (66-25-1) *				58	5.1	1.2	0.88	0.84	0.95
Nonanal (124-19-6) *				13	6.3	2.1	1.7	1.6	1.8
Analysis Name: Aldehyde-DNPH									
Acetone (67-64-1)					10	20	13	12	14
Formaldehyde (50-00-0) **	Yes	Yes	16.5	1,100	6.6	7.1	8.4	8.0	9.1
Analysis Name: TVOC									
TVOC					18	6.0	3.2	3.1	3.5

* Results for chemicals marked with an asterisk were calculated based on internal standard (chlorobenzene-d5).

**CREL Note: Based on 1/2 of a total maximum of 27 ppb from all sources. The 27 ppb guideline is based on OEHHA's current acute 1-hour Reference Exposure Level (REL) of 76 ppb (94 µg/m3), extrapolated to an 8-hour exposure period.

Analytical Results Summary

Sample Information

Sample ID: 28

Material Type:	Acoustical Ceiling Panels	Date Manufactured:	03/01/2002
Manufacturer:	M14	Date Arrived:	03/13/2002
Product Name:	AACP28M14	Date Conditioning Started:	04/05/2002
Adhesive Used:	No	Date Test Started:	04/15/2002

Sample Analyzed in Duplicate? No

Chamber: 2

Compound Name (CAS Number)	Prop. 65 Chemical	ARB TAC	1/2 CREL (ug/m^3)	Olfactory Threshold (ug/m^3)	Emission Factors ($ug/(m^2*hr)$) 24-Hr	48-Hr	96-Hr	96-Hr. Air Conc. (ug/m^3) Class-room	Office
Analysis Name: VOCs-Thermal Desorption - GC/MS									
Decanal (112-31-2) *				5.9	1.6				
Hexanal (66-25-1) *				58	1.3	2.4	1.9	1.8	2.1
Nonanal (124-19-6) *				13	3.0	3.7	3.1	2.9	3.3
Toluene (108-88-3)		Yes	150		2.6	2.7			

* Results for chemicals marked with an asterisk were calculated based on internal standard (chlorobenzene-d5).

Analysis Name: Aldehyde-DNPH									
Acetone (67-64-1)					24	15	18	17	19
Formaldehyde (50-00-0) **	Yes	Yes	16.5	1,100	0.73				

**CREL Note: Based on 1/2 of a total maximum of 27 ppb from all sources. The 27 ppb guideline is based on OEHHA's current acute 1-hour Reference Exposure Level (REL) of 76 ppb (94 µg/m3), extrapolated to an 8-hour exposure period.

Analysis Name: TVOC									
TVOC					6.2	9.6	6.9	6.6	7.5

Analytical Results Summary

Sample Information

Sample ID: 29

Material Type:	Acoustical Ceiling Panels	Date Manufactured:	Not Known
Manufacturer:	M5	Date Arrived:	03/12/2002
Product Name:	SACP29M5	Date Conditioning Started:	04/12/2002
Adhesive Used:	No	Date Test Started:	04/22/2002

Sample Analyzed in Duplicate? No

Chamber: 1

Compound Name (CAS Number)	Prop. 65 Chemical	ARB TAC	1/2 CREL (ug/m^3)	Olfactory Threshold (ug/m^3)	Emission Factors ($ug/(m^2*hr)$) 24-Hr	48-Hr	96-Hr	96-Hr. Air Conc. (ug/m^3) Class-room	Office
Analysis Name: VOCs-Thermal Desorption - GC/MS									
2-Furancarboxaldehyde (98-01-1) *				3,200	1.7	3.7	2.1	2.0	2.3
Benzaldehyde (100-52-7) *				190		1.2			
Butyrolactone (96-48-0) *					1.8	2.6	2.0	1.9	2.2
Decanal (112-31-2) *				5.9	1.7	1.4	1.8	1.7	1.9
Heptanal (111-71-7) *				23	0.96	1.4	1.1	1.1	1.2
Hexanal (66-25-1) *				58	2.3	5.1	3.1	3.0	3.4
m/p-Xylene (108-38-3/106-42-3)		Yes	350	2,100	1.3	1.2	1.3	1.2	1.4
Nonanal (124-19-6) *				13	7.8	8.4	7.7	7.4	8.4
Octanal (124-13-0) *				7.2	1.7	2.3	2.0	1.9	2.1
Phenol (108-95-2)		Yes	100	430		1.9			
Toluene (108-88-3)		Yes	150		2.6	2.6	2.6	2.5	2.8

* Results for chemicals marked with an asterisk were calculated based on internal standard (chlorobenzene-d5).

Analysis Name: Aldehyde-DNPH									
Acetone (67-64-1)					170	25	24	23	26
Formaldehyde (50-00-0) **	Yes	Yes	16.5	1,100	19	26	25	24	27

**CREL Note: Based on 1/2 of a total maximum of 27 ppb from all sources. The 27 ppb guideline is based on OEHHA's current acute 1-hour Reference Exposure Level (REL) of 76 ppb (94 µg/m3), extrapolated to an 8-hour exposure period.

Analysis Name: TVOC									
TVOC					22	37	27	26	29

Analytical Results Summary

Sample Information

Sample ID: 30

Material Type:	Acoustical Ceiling Panels	Date Manufactured:	03/06/2002
Manufacturer:	M14	Date Arrived:	03/13/2002
Product Name:	AACP30M14	Date Conditioning Started:	04/12/2002
Adhesive Used:	No	Date Test Started:	04/22/2002

Sample Analyzed in Duplicate? Yes

Chamber: 1

Compound Name (CAS Number)	Prop. 65 Chemical	ARB TAC	1/2 CREL (ug/m^3)	Olfactory Threshold (ug/m^3)	Emission Factors ($ug/(m^2*hr)$) 24-Hr	48-Hr	96-Hr	96-Hr. Air Conc. (ug/m^3) Class-room	Office
Analysis Name: VOCs-Thermal Desorption - GC/MS									
2-(2-Butoxyethoxy) Ethanol (112-34-5) *		Yes			2.4	1.8			
Decanal (112-31-2) *				5.9	2.1	1.8			
Heptanal (111-71-7) *				23	0.96	1.1			
Hexanal (66-25-1) *				58	8.6	6.9	3.2	3.0	3.4
Hexanoic Acid (142-62-1) *				60	2.0	1.7			
m/p-Xylene (108-38-3/106-42-3)		Yes	350	2,100	1.2				
Nonanal (124-19-6) *				13	6.4	5.4	2.7	2.6	2.9
Octanal (124-13-0) *				7.2	1.4	1.3			
o-Xylene (95-47-6)		Yes	350	3,800	1.8				
Pentanal (110-62-3) *				22	1.1	1.2			
Phenol (108-95-2)		Yes	100	430	2.1	2.1			
Toluene (108-88-3)		Yes	150		2.6	2.6	2.5	2.4	2.7

* Results for chemicals marked with an asterisk were calculated based on internal standard (chlorobenzene-d5).

Compound Name (CAS Number)	Prop. 65 Chemical	ARB TAC	1/2 CREL (ug/m^3)	Olfactory Threshold (ug/m^3)	Emission Factors ($ug/(m^2*hr)$) 24-Hr	48-Hr	96-Hr	96-Hr. Air Conc. (ug/m^3) Class-room	Office
Analysis Name: Aldehyde-DNPH									
Acetone (67-64-1)					17	30	18	18	20
Formaldehyde (50-00-0) **	Yes	Yes	16.5	1,100	1.8		0.55	0.52	0.59

**CREL Note: Based on 1/2 of a total maximum of 27 ppb from all sources. The 27 ppb guideline is based on OEHHA's current acute 1-hour Reference Exposure Level (REL) of 76 ppb (94 µg/m^3), extrapolated to an 8-hour exposure period.

Compound Name (CAS Number)	Prop. 65 Chemical	ARB TAC	1/2 CREL (ug/m^3)	Olfactory Threshold (ug/m^3)	Emission Factors ($ug/(m^2*hr)$) 24-Hr	48-Hr	96-Hr	96-Hr. Air Conc. (ug/m^3) Class-room	Office
Analysis Name: TVOC									
TVOC					33	32	7.3	6.9	7.8

Analytical Results Summary

Sample Information

Sample ID: 30

Material Type:	Acoustical Ceiling Panels	Date Manufactured:	03/06/2002
Manufacturer:	M14	Date Arrived:	03/13/2002
Product Name:	AACP30M14	Date Conditioning Started:	04/12/2002
Adhesive Used:	No	Date Test Started:	04/22/2002

Sample Analyzed in Duplicate? Yes

Chamber: 2

Compound Name (CAS Number)	Prop. 65 Chemical	ARB TAC	1/2 CREL (ug/m^3)	Olfactory Threshold (ug/m^3)	Emission Factors (ug/(m^2*hr)) 24-Hr	48-Hr	96-Hr	96-Hr. Air Conc. (ug/m^3) Class-room	Office
Analysis Name: VOCs-Thermal Desorption - GC/MS									
2-(2-Butoxyethoxy) Ethanol (112-34-5) *		Yes			1.6	2.5			
2-Furancarboxaldehyde (98-01-1) *				3,200		1.2			
Decanal (112-31-2) *				5.9	1.2	1.7	1.5	1.4	1.6
Decanol (112-30-1) *				120		0.63			
Heptanal (111-71-7) *				23		1.5	0.95	0.91	1.0
Hexanal (66-25-1) *				58	8.5	18	7.7	7.4	8.3
Hexanoic Acid (142-62-1) *				60	1.3	2.0			
m/p-Xylene (108-38-3/106-42-3)		Yes	350	2,100	1.2	1.2	1.2	1.2	1.3
Nonanal (124-19-6) *				13	4.5	8.5	5.9	5.6	6.4
Octanal (124-13-0) *				7.2	1.1	2.6	1.5	1.4	1.6
Pentanal (110-62-3) *				22	1.0	2.9	1.1	1.1	1.2
Phenol (108-95-2)		Yes	100	430	1.9	2.0	1.9	1.8	2.1
Toluene (108-88-3)		Yes	150		2.6	2.6	2.6	2.5	2.8

* Results for chemicals marked with an asterisk were calculated based on internal standard (chlorobenzene-d5).

Compound Name (CAS Number)	Prop. 65 Chemical	ARB TAC	1/2 CREL (ug/m^3)	Olfactory Threshold (ug/m^3)	Emission Factors (ug/(m^2*hr)) 24-Hr	48-Hr	96-Hr	96-Hr. Air Conc. (ug/m^3) Class-room	Office
Analysis Name: Aldehyde-DNPH									
Acetone (67-64-1)					38	30	33	31	35
Formaldehyde (50-00-0) **	Yes	Yes	16.5	1,100	1.8	2.2	3.7	3.5	3.9

**CREL Note: Based on 1/2 of a total maximum of 27 ppb from all sources. The 27 ppb guideline is based on OEHHA's current acute 1-hour Reference Exposure Level (REL) of 76 ppb (94 µg/m^3), extrapolated to an 8-hour exposure period.

Compound Name (CAS Number)	Prop. 65 Chemical	ARB TAC	1/2 CREL (ug/m^3)	Olfactory Threshold (ug/m^3)	Emission Factors (ug/(m^2*hr)) 24-Hr	48-Hr	96-Hr	96-Hr. Air Conc. (ug/m^3) Class-room	Office
Analysis Name: TVOC									
TVOC					28	60	27	25	29

Analytical Results Summary

Sample Information

Material Type:	Acoustical Ceiling Panels	Sample ID:	31
Manufacturer:	M5	Date Manufactured:	Not Known
Product Name:	SACP31M5	Date Arrived:	04/11/2002
Adhesive Used:	No	Date Conditioning Started:	04/19/2002
Sample Analyzed in Duplicate?	No	Date Test Started:	04/29/2002

Chamber: 2

Compound Name (CAS Number)	Prop. 65 Chemical	ARB TAC	1/2 CREL (ug/m^3)	Olfactory Threshold (ug/m^3)	Emission Factors ($ug/(m^2*hr)$) 24-Hr	48-Hr	96-Hr	96-Hr. Air Conc. (ug/m^3) Class-room	Office
Analysis Name: VOCs-Thermal Desorption - GC/MS									
Hexanal (66-25-1) *				58	0.65				
Nonanal (124-19-6) *				13	3.2	2.5	2.4	2.3	2.6
Toluene (108-88-3)		Yes	150				2.5	2.4	2.7
Analysis Name: TVOC									
TVOC					19	26	12	11	13

* Results for chemicals marked with an asterisk were calculated based on internal standard (chlorobenzene-d5).

Analytical Results Summary

Sample Information

Sample ID: 32

Material Type:	Acoustical Ceiling Panels	Date Manufactured:	Not Known
Manufacturer:	M10	Date Arrived:	04/26/2002
Product Name:	SACP32M10	Date Conditioning Started:	04/26/2002
Adhesive Used:	No	Date Test Started:	05/06/2002

Sample Analyzed in Duplicate? No

Chamber: 1

Compound Name (CAS Number)	Prop. 65 Chemical	ARB TAC	1/2 CREL (ug/m^3)	Olfactory Threshold (ug/m^3)	Emission Factors ($ug/(m^2*hr)$) 24-Hr	48-Hr	96-Hr	96-Hr. Air Conc. (ug/m^3) Class-room	Office
Analysis Name: VOCs-Thermal Desorption - GC/MS									
Decanal (112-31-2) *				5.9	1.9	2.8			
Hexanal (66-25-1) *				58	1.4	1.9			
m/p-Xylene (108-38-3/106-42-3)		Yes	350	2,100	1.3	1.3			
Nonanal (124-19-6) *				13	6.1	6.9	3.3	3.1	3.5
Pentadecane (629-62-9) *					1.0	1.1	2.8	2.7	3.0
Phenol (108-95-2)		Yes	100	430	2.6	3.0	2.3	2.2	2.5
Toluene (108-88-3)		Yes	150		2.7	2.8	2.6	2.5	2.9

* Results for chemicals marked with an asterisk were calculated based on internal standard (chlorobenzene-d5).

Analysis Name: TVOC									
TVOC					6.1	3.7	7.6	7.3	8.2

Analytical Results Summary

Sample Information

Sample ID: 33

Material Type:	Acoustical Ceiling Panels	Date Manufactured:	Not Known
Manufacturer:	M5	Date Arrived:	04/25/2002
Product Name:	SACP33M5	Date Conditioning Started:	04/26/2002
Adhesive Used:	No	Date Test Started:	05/06/2002

Sample Analyzed in Duplicate? No

Chamber: 2

Compound Name (CAS Number)	Prop. 65 Chemical	ARB TAC	1/2 CREL (ug/m^3)	Olfactory Threshold (ug/m^3)	Emission Factors ($ug/(m^2*hr)$) 24-Hr	48-Hr	96-Hr	96-Hr. Air Conc. (ug/m^3) Class-room	Office
Analysis Name: VOCs-Thermal Desorption - GC/MS									
Decanal (112-31-2) *				5.9	0.99				
Hexanal (66-25-1) *				58	3.1	3.6	1.6	1.6	1.8
m/p-Xylene (108-38-3/106-42-3)		Yes	350	2,100		1.3			
Nonanal (124-19-6) *				13	6.1	8.0	4.7	4.5	5.1
Octanal (124-13-0) *				7.2	1.2	1.7			
o-Xylene (95-47-6)		Yes	350	3,800		1.9			
Phenol (108-95-2)		Yes	100	430	1.9	2.0			
Toluene (108-88-3)		Yes	150		2.7	2.7			

* Results for chemicals marked with an asterisk were calculated based on internal standard (chlorobenzene-d5).

Analysis Name: Aldehyde-DNPH									
Acetone (67-64-1)					25	27	23	22	25
Formaldehyde (50-00-0) **	Yes	Yes	16.5	1,100	9.9	13	11	10	11

**CREL Note: Based on 1/2 of a total maximum of 27 ppb from all sources. The 27 ppb guideline is based on OEHHA's current acute 1-hour Reference Exposure Level (REL) of 76 ppb (94 µg/m3), extrapolated to an 8-hour exposure period.

Analysis Name: TVOC									
TVOC					13	22	13	12	14

Appendix C
Analytical Results Summary for Carpet

Analytical Results Summary

Sample Information

Sample ID: 2

Material Type:	Carpet	Date Manufactured:	Not Known
Manufacturer:	M1	Date Arrived:	10/19/2001
Product Name:	SC2M1	Date Conditioning Started:	10/26/2001
Adhesive Used:	Yes	Date Test Started:	11/05/2001

Sample Analyzed in Duplicate? No

Chamber: 2

Compound Name (CAS Number)	Prop. 65 Chemical	ARB TAC	1/2 CREL (ug/m3)	Olfactory Threshold (ug/m3)	Emission Factors (ug/(m2*hr)) 24-Hr	48-Hr	96-Hr	96-Hr. Air Conc. (ug/m3) Class-room	Office
Analysis Name: VOCs-Thermal Desorption - GC/MS									
1,3-Diisopropyl Benzene (99-62-7) *					50	33	50	24	27
1,4-Diisopropyl Benzene (100-18-5) *					45	32	57	27	31
2-Ethyl-1-hexanol (104-76-7) *				1,300	31	17	27	13	14
2-Norbornene (498-66-8) *				370	24	14	21	10	12
Ethyl Benzene (100-41-4)		Yes	1000	13	6.6	5.9	6.1	2.9	3.3
Ethylene Glycol (107-21-1)		Yes	200			140			
Indene (95-13-6) *				43	23	16	23	11	12
Isopropyl Alcohol (67-63-0)		Yes	3500		8.1		7.7	3.7	4.2
m/p-Xylene (108-38-3/106-42-3)		Yes	350	2,100	5.7	4.4			
Naphthalene (91-20-3)		Yes	4.5	79	7.5	7.2	7.6	3.6	4.1
Phenol (108-95-2)		Yes	100	430	6.0	5.8	6.4	3.1	3.5
Styrene (100-42-5)		Yes	450	630	14	11	12	5.7	6.5
Toluene (108-88-3)		Yes	150		9.6	7.9			
Trimethyl Silanol (1066-40-6) *					35	27	46	22	25

* Results for chemicals marked with an asterisk were calculated based on internal standard (chlorobenzene-d5).

Analysis Name: TVOC									
TVOC					850	650	1,000	500	560

Analytical Results Summary

Sample Information

Sample ID: 4

Material Type:	Carpet	Date Manufactured:	Not Known
Manufacturer:	M4	Date Arrived:	11/01/2001
Product Name:	SC4M4	Date Conditioning Started:	11/02/2001
Adhesive Used:	No	Date Test Started:	11/12/2001

Sample Analyzed in Duplicate? No

Chamber: 2

Compound Name (CAS Number)	Prop. 65 Chemical	ARB TAC	1/2 CREL (ug/m^3)	Olfactory Threshold (ug/m^3)	Emission Factors ($ug/(m^2*hr)$) 24-Hr	48-Hr	96-Hr	96-Hr. Air Conc. (ug/m^3) Class-room	Office
Analysis Name: VOCs-Thermal Desorption - GC/MS									
4-Phenylcyclohexene (4994-16-5) *				2.5	48	65	85	40	46
Caprolactam (105-60-2) *		Yes			340	390	470	230	260
Ethyl Benzene (100-41-4)		Yes	1000	13	6.2	6.4	6.8	3.2	3.7
m/p-Xylene (108-38-3/106-42-3)		Yes	350	2,100	4.4				
Nonanal (124-19-6) *				13	32	42	42	20	23
Phenol (108-95-2)		Yes	100	430	5.9	5.6	6.4	3.1	3.5
Toluene (108-88-3)		Yes	150		8.0		8.9	4.2	4.8
Undecane (1120-21-4)				7,800	8.5	9.3	9.2	4.4	4.9

* Results for chemicals marked with an asterisk were calculated based on internal standard (chlorobenzene-d5).

Analysis Name: TVOC									
TVOC					570	740	840	400	450

Analytical Results Summary

Sample Information

Sample ID: 5

Material Type:	Carpet	Date Manufactured:	Not Known
Manufacturer:	M4	Date Arrived:	11/01/2001
Product Name:	SC5M4	Date Conditioning Started:	11/02/2001
Adhesive Used:	No	Date Test Started:	11/12/2001

Sample Analyzed in Duplicate? No

Chamber: 1

Compound Name (CAS Number)	Prop. 65 Chemical	ARB TAC	1/2 CREL (ug/m^3)	Olfactory Threshold (ug/m^3)	Emission Factors ($ug/(m^2*hr)$) 24-Hr	48-Hr	96-Hr	96-Hr. Air Conc. (ug/m^3) Class-room	Office
Analysis Name: VOCs-Thermal Desorption - GC/MS									
Caprolactam (105-60-2) *		Yes			360	420	420	200	230
Cyclododecane (294-62-2) *					520	590	590	280	320
Ethyl Benzene (100-41-4)		Yes	1000	13			6.2	2.9	3.3
Phenol (108-95-2)		Yes	100	430	6.1	6.2	6.9	3.3	3.7
Toluene (108-88-3)		Yes	150				8.5	4.0	4.6
Undecane (1120-21-4)				7,800	6.8				

* Results for chemicals marked with an asterisk were calculated based on internal standard (chlorobenzene-d5).

Analysis Name: TVOC									
TVOC					1,100	1,400	1,400	670	760

Analytical Results Summary

Sample Information

Sample ID: 6

Material Type:	Carpet	Date Manufactured:	10/18/2001
Manufacturer:	M2	Date Arrived:	11/21/2001
Product Name:	SC6M2	Date Conditioning Started:	11/21/2001
Adhesive Used:	Yes	Date Test Started:	12/03/2001

Sample Analyzed in Duplicate? Yes

Chamber: 1

Compound Name (CAS Number)	Prop. 65 Chemical	ARB TAC	1/2 CREL (ug/m^3)	Olfactory Threshold (ug/m^3)	Emission Factors ($ug/(m^2*hr)$) 24-Hr	48-Hr	96-Hr	96-Hr. Air Conc. (ug/m^3) Class-room	Office
Analysis Name: VOCs-Thermal Desorption - GC/MS									
1,3,5-Trimethyl Benzene (108-67-8)				1,200	2.7	5.4	5.8	2.8	3.1
2-Amino-2-methyl Propanol (124-68-5) *					210	120	420	200	220
2-Ethoxy Ethyl Acetate (111-15-9)	Yes		150	1,000	3.7	7.7			
2-Ethyl-1-hexanol (104-76-7) *				1,300	29	6.9			
2-Methoxy Ethanol (109-86-4)	Yes		30	3,600	8.3	9.0			
Butyl Cyclohexane (1678-93-9)					3.9	4.7	5.7	2.7	3.1
Cyclohexanone (108-94-1)				2,900	2.6				
Decane (124-18-5)				4,400	12	9.8	16	7.4	8.4
Ethyl Benzene (100-41-4)		Yes	1000	13	2.0	5.5	5.7	2.7	3.1
Ethylene Glycol (107-21-1)		Yes	200		94				
Indene (95-13-6) *				43	37	9.0	18	8.5	9.7
Isopropyl Alcohol (67-63-0)		Yes	3500		5.1	7.2	7.4	3.5	4.0
m/p-Xylene (108-38-3/106-42-3)		Yes	350	2,100	2.0	3.6	3.8	1.8	2.1
Methylene Chloride (75-09-2)	Yes	Yes	200				5.9	2.8	3.2
Naphthalene (91-20-3)		Yes	4.5	79	18	14	22	11	12
Nonane (111-84-2)					8.5	5.2	7.2	3.4	3.9
o-Xylene (95-47-6)		Yes	350	3,800	2.1	5.4	5.6	2.7	3.0
Phenol (108-95-2)		Yes	100	430	8.2	5.2	6.0	2.9	3.3
Pinane (473-55-2) *					170	47	100	49	56
Styrene (100-42-5)		Yes	450	630	8.9	8.7	13	6.2	7.1
Toluene (108-88-3)		Yes	150		0.92	7.6	7.9	3.7	4.2
Undecane (1120-21-4)				7,800	7.4	7.0	10	4.8	5.5

* Results for chemicals marked with an asterisk were calculated based on internal standard (chlorobenzene-d5).

Analysis Name: TVOC									
TVOC					1,500	430	1,000	490	560

Analytical Results Summary

Sample Information

Sample ID: 6

Material Type:	Carpet	Date Manufactured:	10/18/2001
Manufacturer:	M2	Date Arrived:	11/21/2001
Product Name:	SC6M2	Date Conditioning Started:	11/21/2001
Adhesive Used:	Yes	Date Test Started:	12/03/2001

Sample Analyzed in Duplicate? Yes

Chamber: 2

Compound Name (CAS Number)	Prop. 65 Chemical	ARB TAC	1/2 CREL (ug/m^3)	Olfactory Threshold (ug/m^3)	Emission Factors ($ug/(m^2*hr)$) 24-Hr	48-Hr	96-Hr	96-Hr. Air Conc. (ug/m^3) Class-room	Office
Analysis Name: VOCs-Thermal Desorption - GC/MS									
1,3,5-Trimethyl Benzene (108-67-8)				1,200	2.9	3.9			
2-Amino-2-methyl Propanol (124-68-5) *					1,000	470			
2-Ethoxy Ethanol (110-80-5)	Yes		35			7.6			
2-Ethoxy Ethyl Acetate (111-15-9)	Yes		150	1,000	4.2	5.8			
2-Ethyl-1-hexanol (104-76-7) *				1,300	36	20			
Butyl Cyclohexane (1678-93-9)					6.6	5.1			
Cyclohexanone (108-94-1)				2,900	3.0	2.4			
Decane (124-18-5)				4,400	40	20			
Ethyl Benzene (100-41-4)		Yes	1000	13	2.4	3.8			
Ethylene Glycol (107-21-1)		Yes	200		92	120			
Indene (95-13-6) *				43	31	21			
Isopropyl Alcohol (67-63-0)		Yes	3500		5.2	5.4			
m/p-Xylene (108-38-3/106-42-3)		Yes	350	2,100	2.4	2.8			
Naphthalene (91-20-3)		Yes	4.5	79	33	19			
Nonane (111-84-2)					16	7.7			
o-Xylene (95-47-6)		Yes	350	3,800	2.4	3.8			
Phenol (108-95-2)		Yes	100	430	6.1	5.3			
Pinane (473-55-2) *					280	130			
Styrene (100-42-5)		Yes	450	630	28	15			
Toluene (108-88-3)		Yes	150		2.0	4.4			
Undecane (1120-21-4)				7,800	23	13			
Analysis Name: TVOC									
TVOC					3,100	1,500			

* Results for chemicals marked with an asterisk were calculated based on internal standard (chlorobenzene-d5).

Note: A power outage occurred during the analysis of the 96-hour samples; samle tubes for chamber 2 were not analyzed.

Analytical Results Summary

Sample Information

Sample ID: 7

Material Type:	Carpet	Date Manufactured:	11/13/2001
Manufacturer:	M3	Date Arrived:	11/21/2001
Product Name:	ACT7M3	Date Conditioning Started:	11/30/2001
Adhesive Used:	Yes	Date Test Started:	12/11/2001

Sample Analyzed in Duplicate? No

Chamber: 1

Compound Name (CAS Number)	Prop. 65 Chemical	ARB TAC	1/2 CREL (ug/m^3)	Olfactory Threshold (ug/m^3)	Emission Factors (ug/(m^2*hr)) 24-Hr	48-Hr	96-Hr	96-Hr. Air Conc. (ug/m^3) Class-room	Office
Analysis Name: VOCs-Thermal Desorption - GC/MS									
1,3,5-Trimethyl Benzene (108-67-8)				1,200	6.1	7.1	5.3	2.5	2.9
1-Methyl-2-Pyrrolidinone (872-50-4)	Yes				240	510	98	47	53
2-Ethyl-1-hexanol (104-76-7) *				1,300	120	230	38	18	21
Benzene (71-43-2)	Yes	Yes	30		6.6	6.7	6.0	2.9	3.3
Butyl Cyclohexane (1678-93-9)					4.4				
Cyclohexanone (108-94-1)				2,900	4.0				
Ethyl Benzene (100-41-4)		Yes	1000	13	5.8	6.3	5.5	2.6	3.0
Isopropyl Alcohol (67-63-0)		Yes	3500		7.5	7.7			
Naphthalene (91-20-3)		Yes	4.5	79	6.7	6.9			
n-Heptane (142-82-5)					15				
Nonane (111-84-2)					3.7	4.9	2.8	1.3	1.5
Phenol (108-95-2)		Yes	100	430	12	18	7.3	3.5	4.0
Propylene Glycol (57-55-6) *					420	690	89	42	48
Toluene (108-88-3)		Yes	150		8.8	10	7.6	3.6	4.1
Undecane (1120-21-4)				7,800	7.0	11	4.7	2.2	2.5
Analysis Name: Aldehyde-DNPH									
Acetone (67-64-1)					49	47	41	19	22
Analysis Name: TVOC									
TVOC					1,200	2,100	340	160	180

* Results for chemicals marked with an asterisk were calculated based on internal standard (chlorobenzene-d5).

Analytical Results Summary

Sample Information

Sample ID: 8

Material Type:	Carpet	Date Manufactured:	11/13/2001
Manufacturer:	M3	Date Arrived:	11/21/2001
Product Name:	SCT8M3	Date Conditioning Started:	11/30/2001
Adhesive Used:	Yes	Date Test Started:	12/11/2001

Sample Analyzed in Duplicate? No

Chamber: 2

Compound Name (CAS Number)	Prop. 65 Chemical	ARB TAC	1/2 CREL (ug/m^3)	Olfactory Threshold (ug/m^3)	Emission Factors ($ug/(m^2*hr)$) 24-Hr	48-Hr	96-Hr	96-Hr. Air Conc. (ug/m^3) Class-room	Office
Analysis Name: VOCs-Thermal Desorption - GC/MS									
2-Ethoxy Ethyl Acetate (111-15-9)	Yes		150	1,000	17	13	20	9.7	11
2-Ethyl Hexanoic Acid (149-57-5) *					1,300	750	2,500	1,200	1,300
2-Ethyl-1-hexanol (104-76-7) *				1,300	74	42	120	57	65
Cyclohexanone (108-94-1)				2,900	4.0				
Ethyl Benzene (100-41-4)		Yes	1000	13	5.7	5.5	5.8	2.7	3.1
Isopropyl Alcohol (67-63-0)		Yes	3500		8.1	7.3	7.6	3.6	4.1
Naphthalene (91-20-3)		Yes	4.5	79	6.7				
Phenol (108-95-2)		Yes	100	430	5.4	5.3	7.3	3.5	3.9
Toluene (108-88-3)		Yes	150		7.5	7.4	7.8	3.7	4.2
Analysis Name: Aldehyde-DNPH									
Acetone (67-64-1)						29	44	21	24
Analysis Name: TVOC									
TVOC					2,100	1,100	3,200	1,500	1,700

* Results for chemicals marked with an asterisk were calculated based on internal standard (chlorobenzene-d5).

Analytical Results Summary

Sample Information

Sample ID: 9

Material Type:	Carpet	Date Manufactured:	03/13/2000
Manufacturer:	M1	Date Arrived:	11/08/2001
Product Name:	AC9M1	Date Conditioning Started:	12/07/2001
Adhesive Used:	Yes	Date Test Started:	12/17/2001

Sample Analyzed in Duplicate? Yes

Chamber: 1

Compound Name (CAS Number)	Prop. 65 Chemical	ARB TAC	1/2 CREL (ug/m^3)	Olfactory Threshold (ug/m^3)	Emission Factors (ug/(m^2*hr)) 24-Hr	48-Hr	96-Hr	96-Hr. Air Conc. (ug/m^3) Class-room	Office
Analysis Name: VOCs-Thermal Desorption - GC/MS									
1,4-Diisopropyl Benzene (100-18-5) *					51	49	53	25	29
2-Ethyl-1-hexanol (104-76-7) *				1,300	35	33	44	21	24
2-Methoxy Ethanol (109-86-4)	Yes		30	3,600	9.7	10	13	6.4	7.2
2-Norbornene (498-66-8) *				370	36	31	28	13	15
5-Vinyl-2-Norbornene (3048-64-4) *					42	35	29	14	16
Benzene (71-43-2)	Yes	Yes	30		9.2	7.2			
Caprolactam (105-60-2) *		Yes			220	160	260	120	140
Ethyl Benzene (100-41-4)		Yes	1000	13	8.5	7.8	6.8	3.2	3.7
Indene (95-13-6) *				43	42	36	32	15	17
Isopropyl Alcohol (67-63-0)		Yes	3500		7.7	7.3	7.3	3.5	4.0
m/p-Xylene (108-38-3/106-42-3)		Yes	350	2,100	4.7	4.4			
Methyl Cyclohexane (108-87-2)					4.9	4.7			
Methylene Chloride (75-09-2)	Yes	Yes	200		7.2	6.5			
Naphthalene (91-20-3)		Yes	4.5	79	35	32	35	17	19
Nonane (111-84-2)					9.7	7.4	5.7	2.7	3.1
o-Xylene (95-47-6)		Yes	350	3,800	6.2	5.9	5.6	2.7	3.0
Phenol (108-95-2)		Yes	100	430	5.3	5.4	5.7	2.7	3.1
Styrene (100-42-5)		Yes	450	630	9.4	7.9	6.9	3.3	3.7
Toluene (108-88-3)		Yes	150		20	13	8.5	4.0	4.6
Trichloroethylene (79-01-6)	Yes	Yes	300		17	17			
Undecane (1120-21-4)				7,800	4.2	4.3			

* Results for chemicals marked with an asterisk were calculated based on internal standard (chlorobenzene-d5).

Analysis Name: TVOC									
TVOC					1,400	1,400	1,700	830	940

Analytical Results Summary

Sample Information

Sample ID: 9

Material Type:	Carpet	Date Manufactured:	03/13/2000
Manufacturer:	M1	Date Arrived:	11/08/2001
Product Name:	AC9M1	Date Conditioning Started:	12/07/2001
Adhesive Used:	Yes	Date Test Started:	12/17/2001

Sample Analyzed in Duplicate? Yes

Chamber: 2

Compound Name (CAS Number)	Prop. 65 Chemical	ARB TAC	1/2 CREL (ug/m^3)	Olfactory Threshold (ug/m^3)	Emission Factors ($ug/(m^2*hr)$) 24-Hr	48-Hr	96-Hr	96-Hr. Air Conc. (ug/m^3) Class-room	Office
Analysis Name: VOCs-Thermal Desorption - GC/MS									
1,4-Diisopropyl Benzene (100-18-5) *					65	73	91	43	49
2-Ethoxy Ethanol (110-80-5)	Yes		35		7.6		7.7	3.7	4.1
2-Ethyl-1-hexanol (104-76-7) *				1,300	43	45	58	27	31
2-Methoxy Ethanol (109-86-4)	Yes		30	3,600	14	14	16	7.8	8.8
2-Norbornene (498-66-8) *				370	55	57	64	30	34
5-Vinyl-2-Norbornene (3048-64-4) *					69	70	76	36	41
Benzene (71-43-2)	Yes	Yes	30		8.8	7.3	6.1	2.9	3.3
Caprolactam (105-60-2) *		Yes			170	210	260	130	140
Ethyl Benzene (100-41-4)		Yes	1000	13	12	12	11	5.4	6.1
Indene (95-13-6) *				43	69	72	79	38	43
Isopropyl Alcohol (67-63-0)		Yes	3500		7.7	7.7	7.6	3.6	4.1
m/p-Xylene (108-38-3/106-42-3)		Yes	350	2,100	5.7	5.7	5.5	2.6	3.0
Methyl Cyclohexane (108-87-2)					4.9	5.1	3.3	1.6	1.8
Methylene Chloride (75-09-2)	Yes	Yes	200		7.0	6.4			
Naphthalene (91-20-3)		Yes	4.5	79	42	47	59	28	32
Nonane (111-84-2)					17	16	15	7.2	8.2
o-Xylene (95-47-6)		Yes	350	3,800	6.8	6.8	6.7	3.2	3.6
Phenol (108-95-2)		Yes	100	430	5.4	5.4	5.3	2.5	2.9
Styrene (100-42-5)		Yes	450	630	16	16	15	7.3	8.3
Toluene (108-88-3)		Yes	150		21	15	11	5.2	5.9
Trichloroethylene (79-01-6)	Yes	Yes	300		17	17			
Undecane (1120-21-4)				7,800			4.8	2.3	2.6

* Results for chemicals marked with an asterisk were calculated based on internal standard (chlorobenzene-d5).

Analysis Name: TVOC									
TVOC					2,200	2,400	2,900	1,400	1,500

Analytical Results Summary

Sample Information

Sample ID: 18

Material Type:	Carpet	Date Manufactured:	Not Known
Manufacturer:	M4	Date Arrived:	11/01/2001
Product Name:	SC18M4	Date Conditioning Started:	11/18/2001
Adhesive Used:	Yes	Date Test Started:	11/28/2001

Sample Analyzed in Duplicate? No

Chamber: 1

Compound Name (CAS Number)	Prop. 65 Chemical	ARB TAC	1/2 CREL (ug/m3)	Olfactory Threshold (ug/m3)	Emission Factors (ug/(m2*hr)) 24-Hr	48-Hr	96-Hr	96-Hr. Air Conc. (ug/m3) Class-room	Office
Analysis Name: VOCs-Thermal Desorption - GC/MS									
1,4-Diisopropyl Benzene (100-18-5) *					57	70	65	31	35
1-Decene (872-05-9) *					180	210	200	97	110
2-Ethoxy Ethyl Acetate (111-15-9)	Yes		150	1,000	12	13	11	5.4	6.1
2-Norbornene (498-66-8) *				370	52	60	50	24	27
5-Vinyl-2-Norbornene (3048-64-4) *					66	76	61	29	33
Benzene (71-43-2)	Yes	Yes	30		6.1	6.1	6.8	3.2	3.7
Caprolactam (105-60-2) *		Yes			180	270	210	99	110
Decane (124-18-5)				4,400		4.5			
Ethyl Benzene (100-41-4)		Yes	1000	13	10	10	8.7	4.1	4.7
Ethylene Glycol (107-21-1)		Yes	200		130				
Indene (95-13-6) *				43	67	75	59	28	32
Isopropyl Alcohol (67-63-0)		Yes	3500		7.7	7.7	7.6	3.6	4.1
m/p-Xylene (108-38-3/106-42-3)		Yes	350	2,100	4.8		7.2	3.4	3.9
Methylene Chloride (75-09-2)	Yes	Yes	200				7.4	3.5	4.0
Naphthalene (91-20-3)		Yes	4.5	79	44	55	50	24	27
Nonane (111-84-2)					14	15	12	5.6	6.3
o-Xylene (95-47-6)		Yes	350	3,800	6.4		6.2	2.9	3.3
Phenol (108-95-2)		Yes	100	430	5.9	6.0	6.4	3.0	3.4
Styrene (100-42-5)		Yes	450	630	12	13	9.8	4.7	5.3
Toluene (108-88-3)		Yes	150		8.6	8.7	9.5	4.5	5.1
Undecane (1120-21-4)				7,800	4.4				

* Results for chemicals marked with an asterisk were calculated based on internal standard (chlorobenzene-d5).

Analysis Name: Aldehyde-DNPH									
Acetone (67-64-1)					110	120	110	54	61
Analysis Name: TVOC									
TVOC					1,600	1,900	1,900	930	1,100

Analytical Results Summary

Sample Information

Sample ID: 19

Material Type:	Carpet	Date Manufactured:	Not Known
Manufacturer:	M4	Date Arrived:	11/01/2001
Product Name:	SC19M4	Date Conditioning Started:	11/18/2001
Adhesive Used:	Yes	Date Test Started:	11/28/2001

Sample Analyzed in Duplicate? No

Chamber: 2

Compound Name (CAS Number)	Prop. 65 Chemical	ARB TAC	1/2 CREL (ug/m3)	Olfactory Threshold (ug/m3)	Emission Factors (ug/(m2*hr)) 24-Hr	48-Hr	96-Hr	96-Hr. Air Conc. (ug/m3) Class-room	Office
Analysis Name: VOCs-Thermal Desorption - GC/MS									
1,4-Diisopropyl Benzene (100-18-5) *					41	28	21	10.0	11
2-Norbornene (498-66-8) *				370	48	31	21	10	12
4-Phenylcyclohexene (4994-16-5) *				2.5	43	31	22	11	12
Benzene (71-43-2)	Yes	Yes	30		7.4	6.6	6.5	3.1	3.5
Caprolactam (105-60-2) *		Yes			110	130	83	40	45
Decane (124-18-5)				4,400	4.6	3.9	3.7	1.7	2.0
Ethyl Benzene (100-41-4)		Yes	1000	13	18	13	11	5.1	5.8
Ethylene Glycol (107-21-1)		Yes	200		130				
Indene (95-13-6) *				43	76	52	37	18	20
Isopropyl Alcohol (67-63-0)		Yes	3500		8.3	7.6	7.6	3.6	4.1
m/p-Xylene (108-38-3/106-42-3)		Yes	350	2,100	7.2	5.7	5.0	2.4	2.7
Methyl Cyclohexane (108-87-2)					3.6				
Methylene Chloride (75-09-2)	Yes	Yes	200				6.8	3.2	3.7
Naphthalene (91-20-3)		Yes	4.5	79	31	24	20	9.7	11
n-Heptane (142-82-5)					12				
Nonanal (124-19-6) *				13	41				
Nonane (111-84-2)					21	14	11	5.1	5.8
Octane (111-65-9) *					33	21	15	7.0	8.0
o-Xylene (95-47-6)		Yes	350	3,800	7.5	6.5	6.2	2.9	3.3
Phenol (108-95-2)		Yes	100	430	5.5	5.2	5.2	2.5	2.8
Styrene (100-42-5)		Yes	450	630	30	20	15	7.3	8.3
Toluene (108-88-3)		Yes	150		13	11	10	5.0	5.6
Undecane (1120-21-4)				7,800	5.2	4.6			

* Results for chemicals marked with an asterisk were calculated based on internal standard (chlorobenzene-d5).

Analysis Name: Aldehyde-DNPH									
Acetone (67-64-1)					61	60	61	29	33
Analysis Name: TVOC									
TVOC					1,500	1,100	860	410	460

Analytical Results Summary

Sample Information

Sample ID: 34

Material Type:	Carpet	Date Manufactured:	05/03/2002
Manufacturer:	M15	Date Arrived:	05/10/2002
Product Name:	SC34M15	Date Conditioning Started:	05/10/2002
Adhesive Used:	Yes	Date Test Started:	05/20/2002

Sample Analyzed in Duplicate? No

Chamber: 1

Compound Name (CAS Number)	Prop. 65 Chemical	ARB TAC	1/2 CREL (ug/m^3)	Olfactory Threshold (ug/m^3)	Emission Factors ($ug/(m^2*hr)$) 24-Hr	48-Hr	96-Hr	96-Hr. Air Conc. (ug/m^3) Class-room	Office
Analysis Name: VOCs-Thermal Desorption - GC/MS									
1-(2-methoxy-1-methylethoxy)-2-propanol (20324-32-7) *					270	410	200	93	110
1-(2-Methoxypropoxy)-2-Propanol (13429-07-7) *					340	520	270	130	140
1,3-Diisopropyl Benzene (99-62-7) *					53	58	58	28	31
1,4-Diisopropyl Benzene (100-18-5) *					45	51	55	26	30
2-Ethyl-1-hexanol (104-76-7) *				1,300	43	55	44	21	24
2-Norbornene (498-66-8) *				370	89	94	88	42	48
4-Phenylcyclohexene (4994-16-5) *				2.5	22	24	22	11	12
5-Vinyl-2-Norbornene (3048-64-4) *					32	28	27	13	15
Caprolactam (105-60-2) *		Yes			480	690	840	400	450
Cyclohexanone (108-94-1)				2,900	5.0	4.9	4.0	1.9	2.1
Decane (124-18-5)				4,400	8.5		8.2	3.9	4.4
Decanol (112-30-1) *				120	57	75	76	36	41
Dicyclopentadiene (77-73-6) *					50	49	47	22	25
Ethyl Benzene (100-41-4)		Yes	1000	13	7.6	7.3	6.6	3.1	3.6
Indene (95-13-6) *				43	59	63	58	28	32
Isopropyl Alcohol (67-63-0)		Yes	3500		9.1	8.5	8.5	4.0	4.6
Linalyl Propanoate (144-39-8) *					89	100	130	62	70
Longifolene (475-20-7) *					170	200	240	110	130
m/p-Xylene (108-38-3/106-42-3)		Yes	350	2,100	6.3	6.1	4.8	2.3	2.6
Naphthalene (91-20-3)		Yes	4.5	79	8.6	8.9	9.2	4.4	5.0
n-Heptane (142-82-5)					8.9	8.7			
n-Hexane (110-54-3)		Yes	3500		8.4				
Nonanal (124-19-6) *				13	64	80	68	32	36
Nonane (111-84-2)					3.2	3.3	2.9	1.4	1.6
o-Xylene (95-47-6)		Yes	350	3,800	6.7	6.6	6.0	2.9	3.2
Phenol (108-95-2)		Yes	100	430	6.3	8.6	5.9	2.8	3.2
Styrene (100-42-5)		Yes	450	630	21	18	14	6.6	7.4
Tetrachloroethylene (127-18-4)	Yes	Yes	17.5		15	14	13	6.4	7.2
Toluene (108-88-3)		Yes	150		8.3	8.2	7.8	3.7	4.2
Trimethyl Silanol (1066-40-6) *					35	39	50	24	27

* Results for chemicals marked with an asterisk were calculated based on internal standard (chlorobenzene-d5).

Analytical Results Summary

Sample Information

Material Type:	Carpet	Sample ID:	34
Manufacturer:	M15	Date Manufactured:	05/03/2002
Product Name:	SC34M15	Date Arrived:	05/10/2002
Adhesive Used:	Yes	Date Conditioning Started:	05/10/2002
Sample Analyzed in Duplicate?	No	Date Test Started:	05/20/2002

Chamber: 1

Compound Name (CAS Number)	Prop. 65 Chemical	ARB TAC	1/2 CREL (ug/m^3)	Olfactory Threshold (ug/m^3)	Emission Factors ($ug/(m^2*hr)$) 24-Hr	48-Hr	96-Hr	96-Hr. Air Conc. (ug/m^3) Class-room	Office
Analysis Name: VOCs-Thermal Desorption - GC/MS									
Analysis Name: Aldehyde-DNPH									
Acetaldehyde (75-07-0)	Yes	Yes	4.5		5.5				
Acetone (67-64-1)					96	100	69	33	37
Formaldehyde (50-00-0) **	Yes	Yes	16.5	1,100	6.3	3.4			
Analysis Name: TVOC									
TVOC					2,800	3,300	9,100	4,300	4,900

**CREL Note: Based on 1/2 of a total maximum of 27 ppb from all sources. The 27 ppb guideline is based on OEHHA's current acute 1-hour Reference Exposure Level (REL) of 76 ppb (94 $\mu g/m^3$), extrapolated to an 8-hour exposure period.

In addition to the compounds listed above, various terpenes, and cyclic and branched alkanes. These included a-pinene, dimethyl-decanes, and a few tenatively identified branched cyclohexanes.

Analytical Results Summary

Sample Information

Sample ID: 35

Material Type:	Carpet	Date Manufactured:	05/06/2002
Manufacturer:	M16	Date Arrived:	05/07/2002
Product Name:	SCT35M16	Date Conditioning Started:	05/10/2002
Adhesive Used:	Yes	Date Test Started:	05/20/2002

Sample Analyzed in Duplicate? No

Chamber: 2

Compound Name (CAS Number)	Prop. 65 Chemical	ARB TAC	1/2 CREL (ug/m^3)	Olfactory Threshold (ug/m^3)	Emission Factors ($ug/(m^2*hr)$) 24-Hr	48-Hr	96-Hr	96-Hr. Air Conc. (ug/m^3) Class-room	Office
Analysis Name: VOCs-Thermal Desorption - GC/MS									
1,2,4-Trimethylbenzene (95-36-6) *	Yes	Yes		770	20	24	18	8.7	9.8
1,3,5-Trimethyl Benzene (108-67-8)				1,200	7.2	7.5	6.9	3.3	3.7
2-dimethylamino-ethanol (108-01-0) *					54	300	520	250	280
2-Ethyl-1-hexanol (104-76-7) *				1,300	300	300	180	88	100
4-Phenylcyclohexene (4994-16-5) *				2.5	9.6	7.8	5.0	2.4	2.7
5-Vinyl-2-Norbornene (3048-64-4) *					31	35	25	12	14
Benzene (71-43-2)	Yes	Yes	30		6.1				
Caprolactam (105-60-2) *		Yes			180	390	290	140	160
Decanal (112-31-2) *				5.9	31	62	57	27	31
Decanol (112-30-1) *				120	49	66	51	24	28
Ethyl Benzene (100-41-4)		Yes	1000	13	9.7	10	8.8	4.2	4.7
Indene (95-13-6) *				43	16	19	19	9.2	10
Isopropyl Alcohol (67-63-0)		Yes	3500		8.8	8.7	8.3	4.0	4.5
m/p-Xylene (108-38-3/106-42-3)		Yes	350	2,100	9.1	9.8	8.0	3.8	4.3
Naphthalene (91-20-3)		Yes	4.5	79	11	13	11	5.4	6.1
Nonanal (124-19-6) *				13	26	26	7.2	3.4	3.9
Nonane (111-84-2)					2.9	3.0			
Octanal (124-13-0) *				7.2	17	26	22	10	12
o-Xylene (95-47-6)		Yes	350	3,800	9.3	9.8	8.5	4.0	4.6
Styrene (100-42-5)		Yes	450	630	10	11	9.1	4.3	4.9
Toluene (108-88-3)		Yes	150		8.9	9.3	8.6	4.1	4.6
Trimethyl Silanol (1066-40-6) *					50	59	54	26	29
Undecane (1120-21-4)				7,800	5.3	5.5	5.1	2.4	2.7

- Results for chemicals marked with an asterisk were calculated based on internal standard (chlorobenzene-d5).

Analysis Name: Aldehyde-DNPH									
Acetaldehyde (75-07-0)	Yes	Yes	4.5		11		11	5.3	6.0
Acetone (67-64-1)					76	80	82	39	44
Formaldehyde (50-00-0) **	Yes	Yes	16.5	1,100	57	37	41	20	22

**CREL Note: Based on 1/2 of a total maximum of 27 ppb from all sources. The 27 ppb guideline is based on OEHHA's current acute 1-hour Reference Exposure Level (REL) of 76 ppb (94 µg/m^3), extrapolated to an 8-hour exposure period.

Analysis Name: TVOC									
TVOC					1,200	1,800	1,700	820	930

Analytical Results Summary

Sample Information

Sample ID: 36

Material Type:	Carpet	Date Manufactured:	05/06/2002
Manufacturer:	M16	Date Arrived:	05/07/2002
Product Name:	ACT36M16	Date Conditioning Started:	05/24/2002
Adhesive Used:	Yes	Date Test Started:	06/03/2002

Sample Analyzed in Duplicate? Yes

Chamber: 1

Compound Name (CAS Number)	Prop. 65 Chemical	ARB TAC	1/2 CREL (ug/m^3)	Olfactory Threshold (ug/m^3)	Emission Factors ($ug/(m^2*hr)$) 24-Hr	48-Hr	96-Hr	96-Hr. Air Conc. (ug/m^3) Class-room	Office
Analysis Name: VOCs-Thermal Desorption - GC/MS									
1-Decene (872-05-9) *					55	53	44	21	24
2-Ethyl-1-hexanol (104-76-7) *				1,300	130	130	140	69	78
2-Ethylhexyl Acetate (103-09-3) *				2,300	140	150	180	86	98
2-Methyl-2-propenoic acid, methyl ester (80-62-6) *		Yes		1,500	25	19	19	8.9	10
Chlorodecane (1002-69-3) *				390	26	32	31	15	17
Chlorododecane (112-52-7) *					44	44	44	21	24
Decanol (112-30-1) *				120	18	37	19	9.2	10
Ethyl Benzene (100-41-4)		Yes	1000	13	5.5	5.5			
m/p-Xylene (108-38-3/106-42-3)		Yes	350	2,100	3.7	3.8			
Nonanal (124-19-6) *				13	20	27	11	5.2	5.9
Nonane (111-84-2)						2.9			
o-Xylene (95-47-6)		Yes	350	3,800	5.5	5.6	5.6	2.7	3.0
Phenol (108-95-2)		Yes	100	430	6.7	7.3	6.8	3.2	3.7
Styrene (100-42-5)		Yes	450	630		4.6	4.6	2.2	2.5
Toluene (108-88-3)		Yes	150				8.7	4.1	4.7
Undecane (1120-21-4)				7,800	9.0	9.1	9.4	4.5	5.1

* Results for chemicals marked with an asterisk were calculated based on internal standard (chlorobenzene-d5).
In addition to the compounds listed above, sample emitted many branched alkanes in the eight to thirteen carbon range.

Compound Name (CAS Number)	Prop. 65 Chemical	ARB TAC	1/2 CREL (ug/m^3)	Olfactory Threshold (ug/m^3)	Emission Factors ($ug/(m^2*hr)$) 24-Hr	48-Hr	96-Hr	96-Hr. Air Conc. (ug/m^3) Class-room	Office
Analysis Name: Aldehyde-DNPH									
Acetaldehyde (75-07-0)	Yes	Yes	4.5		33	38	37	18	20
Acetone (67-64-1)					100	110	120	55	63
Formaldehyde (50-00-0) **	Yes	Yes	16.5	1,100	18	14	15	7.0	7.9

**CREL Note: Based on 1/2 of a total maximum of 27 ppb from all sources. The 27 ppb guideline is based on OEHHA's current acute 1-hour Reference Exposure Level (REL) of 76 ppb (94 $\mu g/m^3$), extrapolated to an 8-hour exposure period.

Compound Name (CAS Number)	Prop. 65 Chemical	ARB TAC	1/2 CREL (ug/m^3)	Olfactory Threshold (ug/m^3)	Emission Factors ($ug/(m^2*hr)$) 24-Hr	48-Hr	96-Hr	96-Hr. Air Conc. (ug/m^3) Class-room	Office
Analysis Name: TVOC									
TVOC					1,300	1,300	1,600	750	850

Analytical Results Summary

Sample Information

Sample ID: 36

Material Type:	Carpet	Date Manufactured:	05/06/2002
Manufacturer:	M16	Date Arrived:	05/07/2002
Product Name:	ACT36M16	Date Conditioning Started:	05/24/2002
Adhesive Used:	Yes	Date Test Started:	06/03/2002

Sample Analyzed in Duplicate? Yes

Chamber: 2

Compound Name (CAS Number)	Prop. 65 Chemical	ARB TAC	1/2 CREL (ug/m^3)	Olfactory Threshold (ug/m^3)	Emission Factors ($ug/(m^2*hr)$) 24-Hr	48-Hr	96-Hr	96-Hr. Air Conc. (ug/m^3) Class-room	Office
Analysis Name: VOCs-Thermal Desorption - GC/MS									
1-Decene (872-05-9) *					53	55	54	26	29
2-Ethyl-1-hexanol (104-76-7) *				1,300	160	150	150	72	82
2-Ethylhexyl Acetate (103-09-3) *				2,300	160	160	180	87	98
2-Methyl-2-propenoic acid, methyl ester (80-62-6) *		Yes		1,500	26	21	19	9.0	10
Benzene (71-43-2)	Yes	Yes	30		8.2				
Chlorodecane (1002-69-3) *				390	31	27	30	14	16
Chlorododecane (112-52-7) *					46	45	56	27	30
Decanol (112-30-1) *				120	25	22	21	10	11
Ethyl Benzene (100-41-4)		Yes	1000	13	5.6	5.5			
m/p-Xylene (108-38-3/106-42-3)		Yes	350	2,100	3.9	3.7			
Methylene Chloride (75-09-2)	Yes	Yes	200		7.2	14			
Nonanal (124-19-6) *				13	26	16	11	5.3	6.0
o-Xylene (95-47-6)		Yes	350	3,800	5.7	5.6	5.6	2.7	3.0
Phenol (108-95-2)		Yes	100	430	9.4	7.6	6.6	3.1	3.6
Styrene (100-42-5)		Yes	450	630	4.7	4.6	4.6	2.2	2.5
Toluene (108-88-3)		Yes	150		12	9.0	8.8	4.2	4.7
Undecane (1120-21-4)				7,800	10	9.1	8.8	4.2	4.7

* Results for chemicals marked with an asterisk were calculated based on internal standard (chlorobenzene-d5).
In addition to the compounds listed above, sample emitted many branched alkanes in the 8 to13 carbon range.

Analysis Name: Aldehyde-DNPH									
Acetaldehyde (75-07-0)	Yes	Yes	4.5		52	52	31	15	16
Acetone (67-64-1)					120	140	120	57	65
Formaldehyde (50-00-0) **	Yes	Yes	16.5	1,100	28	20	17	8.0	9.1

**CREL Note: Based on 1/2 of a total maximum of 27 ppb from all sources. The 27 ppb guideline is based on OEHHA's current acute 1-hour Reference Exposure Level (REL) of 76 ppb (94 $\mu g/m^3$), extrapolated to an 8-hour exposure period.

Analysis Name: TVOC									
TVOC					1,700	1,400	1,500	730	830

Analytical Results Summary

Sample Information

Sample ID: 37

Material Type:	Carpet	Date Manufactured:	Not Known
Manufacturer:	M17	Date Arrived:	05/20/2002
Product Name:	ACT37M17	Date Conditioning Started:	05/31/2002
Adhesive Used:	Yes	Date Test Started:	06/10/2002

Sample Analyzed in Duplicate? No

Chamber: 1

Compound Name (CAS Number)	Prop. 65 Chemical	ARB TAC	1/2 CREL (ug/m^3)	Olfactory Threshold (ug/m^3)	Emission Factors ($ug/(m^2*hr)$) 24-Hr	48-Hr	96-Hr	96-Hr. Air Conc. (ug/m^3) Class-room	Office
Analysis Name: VOCs-Thermal Desorption - GC/MS									
2-Ethyl-1-hexanol (104-76-7) *				1,300	59	57	59	28	32
Cyclohexanone (108-94-1)				2,900	3.7	3.8	4.4	2.1	2.4
Decanal (112-31-2) *				5.9	9.5	8.8	8.5	4.0	4.6
Ethyl Benzene (100-41-4)		Yes	1000	13	6.1	6.0	6.0	2.8	3.2
m/p-Xylene (108-38-3/106-42-3)		Yes	350	2,100	5.7	5.6	5.5	2.6	3.0
n-Butyl ethanoate (123-86-4) *					19	20	19	9.2	10
n-Butyl ether (142-96-1) *				250	110	120	120	55	63
n-Butyl propanoate (590-01-2) *				14	46	49	51	24	28
Nonanal (124-19-6) *				13	13	12	11	5.5	6.2
o-Xylene (95-47-6)		Yes	350	3,800	6.3	6.4	6.3	3.0	3.4
Phenol (108-95-2)		Yes	100	430	6.9	7.2	8.6	4.1	4.7
Styrene (100-42-5)		Yes	450	630	4.7	4.7	4.7	2.2	2.5
Toluene (108-88-3)		Yes	150		8.9	8.8	8.6	4.1	4.7
Undecane (1120-21-4)				7,800		5.0	5.0	2.4	2.7

* Results for chemicals marked with an asterisk were calculated based on internal standard (chlorobenzene-d5).

Analysis Name: TVOC									
TVOC					480	650	390	190	210

Analytical Results Summary

Sample Information

Sample ID: 38

Material Type:	Carpet	Date Manufactured:	Not Known
Manufacturer:	M17	Date Arrived:	05/20/2002
Product Name:	ACT38M17	Date Conditioning Started:	05/31/2002
Adhesive Used:	Yes	Date Test Started:	06/10/2002

Sample Analyzed in Duplicate? No

Chamber: 2

Compound Name (CAS Number)	Prop. 65 Chemical	ARB TAC	1/2 CREL (ug/m^3)	Olfactory Threshold (ug/m^3)	Emission Factors ($ug/(m^2*hr)$) 24-Hr	48-Hr	96-Hr	96-Hr. Air Conc. (ug/m^3) Class-room	Office
Analysis Name: VOCs-Thermal Desorption - GC/MS									
2-Ethyl-1-hexanol (104-76-7) *				1,300	26	24	18	8.5	9.6
Cyclohexanone (108-94-1)				2,900		3.8	3.9	1.9	2.1
Decanal (112-31-2) *				5.9	11	11			
Ethyl Benzene (100-41-4)		Yes	1000	13	6.1	6.0			
m/p-Xylene (108-38-3/106-42-3)		Yes	350	2,100	5.9	5.6	5.1	2.4	2.7
n-Butyl ethanoate (123-86-4) *					18	17	12	5.6	6.3
n-Butyl ether (142-96-1) *				250	110	100	83	40	45
n-Butyl propanoate (590-01-2) *				14	64	62	50	24	27
Nonanal (124-19-6) *				13	15	18	11	5.0	5.7
o-Xylene (95-47-6)		Yes	350	3,800	6.4	6.4	6.1	2.9	3.3
Phenol (108-95-2)		Yes	100	430	7.8	8.1	7.3	3.5	4.0
Styrene (100-42-5)		Yes	450	630	4.8	4.7	4.6	2.2	2.5
Toluene (108-88-3)		Yes	150		9.1	8.8	8.3	4.0	4.5
Undecane (1120-21-4)				7,800		5.4	5.0	2.4	2.7

* Results for chemicals marked with an asterisk were calculated based on internal standard (chlorobenzene-d5).

Analysis Name: TVOC									
TVOC					440	390	270	130	150

Analytical Results Summary

Sample Information

Sample ID: 39

Material Type:	Carpet	Date Manufactured:	05/07/2002
Manufacturer:	M15	Date Arrived:	05/24/2002
Product Name:	SC39M15	Date Conditioning Started:	07/24/2002
Adhesive Used:	Yes	Date Test Started:	08/03/2002

Sample Analyzed in Duplicate? No

Chamber: 1

Compound Name (CAS Number)	Prop. 65 Chemical	ARB TAC	1/2 CREL (ug/m^3)	Olfactory Threshold (ug/m^3)	Emission Factors ($ug/(m^2*hr)$) 24-Hr	48-Hr	96-Hr	96-Hr. Air Conc. (ug/m^3) Class-room	Office
Analysis Name: VOCs-Thermal Desorption - GC/MS									
1-(2-methoxy-1-methylethoxy)-2-propanol (20324-32-7) *					110	110	150	69	78
1-(2-Methoxypropoxy)-2-Propanol (13429-07-7) *					130	130	190	88	100
1,3-Diisopropyl Benzene (99-62-7) *					11	12	16	7.5	8.5
2-Norbornene (498-66-8) *				370	25	23	61	29	33
Caprolactam (105-60-2) *		Yes			58	70	83	39	45
Indene (95-13-6) *				43	11	11	15	7.0	7.9
Linalyl Propanoate (144-39-8) *						22	41	19	22
Longifolene (475-20-7) *					45	56	130	63	72
m/p-Xylene (108-38-3/106-42-3)		Yes	350	2,100	5.0	6.0	7.2	3.4	3.9
Naphthalene (91-20-3)		Yes	4.5	79	7.0	7.2	7.7	3.7	4.2
Trimethyl Silanol (1066-40-6) *					29	29	89	42	48

* Results for chemicals marked with an asterisk were calculated based on internal standard (chlorobenzene-d5).
In addition to the compounds listed above, sample emitted many long-chain alkylbenzenes and branched alkanes. The alkylbenzenes included compounds such as butylhexylbenzene, propylheptylbenzene and ethyloctylbenzene. The branched alkanes included many isomers in the 11 to 15 carbon range (dimethyl decane, dimethyl undectane, etc).

Analysis Name: Aldehyde-DNPH									
Acetone (67-64-1)					86	92	49	23	27
Analysis Name: TVOC									
TVOC					1,100	1,400	2,200	1,100	1,200

Analytical Results Summary

Sample Information

Sample ID: 40

Material Type:	Carpet	Date Manufactured:	Not Known
Manufacturer:	M17	Date Arrived:	05/24/2002
Product Name:	SCT40M17	Date Conditioning Started:	07/24/2002
Adhesive Used:	Yes	Date Test Started:	08/03/2002

Sample Analyzed in Duplicate? No

Chamber: 2

Compound Name (CAS Number)	Prop. 65 Chemical	ARB TAC	1/2 CREL (ug/m^3)	Olfactory Threshold (ug/m^3)	Emission Factors ($ug/(m^2*hr)$) 24-Hr	48-Hr	96-Hr	96-Hr. Air Conc. (ug/m^3) Class-room	Office
Analysis Name: VOCs-Thermal Desorption - GC/MS									
Ethyl Benzene (100-41-4)		Yes	1000	13		5.8	6.8	3.2	3.7
m/p-Xylene (108-38-3/106-42-3)		Yes	350	2,100	5.3	4.9	8.1	3.9	4.4
n-Butyl ethanoate (123-86-4) *					41	30	97	46	52
n-Butyl ether (142-96-1) *				250	300	230	690	330	370
n-Butyl propanoate (590-01-2) *				14	140	120	380	180	200
Nonanal (124-19-6) *				13	13	12	26	12	14
o-Xylene (95-47-6)		Yes	350	3,800	7.7	7.3	12	5.6	6.3
Analysis Name: Aldehyde-DNPH									
Acetone (67-64-1)					27	51	54	26	29
Analysis Name: TVOC									
TVOC	940	810	2,300	1,100	1,200				

* Results for chemicals marked with an asterisk were calculated based on internal standard (chlorobenzene-d5).
Also emitted by this sample were a large number of alkyl benzenes. These alkylbenzenes had various 10 and 11 carbon chains, such as 1-butylhexyl-benzene and 1-propyloctyl-benzene.

Appendix D
Analytical Results Summary for Fiberboards

Analytical Results Summary

Sample Information

Sample ID: 20

Material Type:	Fiberboard	Date Manufactured:	Not Known
Manufacturer:	M11	Date Arrived:	11/14/2001
Product Name:	AMDF20M11	Date Conditioning Started:	01/22/2002
Adhesive Used:	No	Date Test Started:	02/01/2002

Sample Analyzed in Duplicate? No

Chamber: 1

Compound Name (CAS Number)	Prop. 65 Chemical	ARB TAC	1/2 CREL (ug/m^3)	Olfactory Threshold (ug/m^3)	Emission Factors (ug/(m^2*hr)) 24-Hr	48-Hr	96-Hr	96-Hr. Air Conc. (ug/m^3) Class-room	Office
Analysis Name: VOCs-Thermal Desorption - GC/MS									
1,3,5-Trimethyl Benzene (108-67-8)				1,200			7.1	0.18	1.0
2-Ethoxy Ethanol (110-80-5)	Yes		35			7.7			
Benzene (71-43-2)	Yes	Yes	30		6.1	6.1	13	0.31	1.8
Butyl Cyclohexane (1678-93-9)							4.3	0.11	0.63
Decane (124-18-5)				4,400	3.5	3.4	8.9	0.22	1.3
Ethyl Benzene (100-41-4)		Yes	1000	13	5.6	5.7	12	0.31	1.8
Ethylene Glycol (107-21-1)		Yes	200		150	150	200	5.0	30
Isopropyl Alcohol (67-63-0)		Yes	3500		7.7	7.4	9.4	0.23	1.4
m/p-Xylene (108-38-3/106-42-3)		Yes	350	2,100	3.7	3.8	26	0.65	3.8
Methyl Cyclohexane (108-87-2)							4.2	0.10	0.61
Naphthalene (91-20-3)		Yes	4.5	79			6.9	0.17	1.0
n-Heptane (142-82-5)							50	1.2	7.3
n-Hexane (110-54-3)		Yes	3500				11	0.28	1.6
Nonane (111-84-2)							5.7	0.14	0.83
o-Xylene (95-47-6)		Yes	350	3,800			13	0.32	1.9
Phenol (108-95-2)		Yes	100	430	5.5		9.1	0.23	1.3
Styrene (100-42-5)		Yes	450	630			5.5	0.14	0.81
Tetrachloroethylene (127-18-4)	Yes	Yes	17.5				15	0.36	2.1
Toluene (108-88-3)		Yes	150		7.8	7.9	42	1.0	6.1
Undecane (1120-21-4)				7,800			5.9	0.15	0.87

* Results for chemicals marked with an asterisk were calculated based on internal standard (chlorobenzene-d5).

Analysis Name: Aldehyde-DNPH									
Acetaldehyde (75-07-0)	Yes	Yes	4.5				13	0.33	1.9
Acetone (67-64-1)							13	0.33	1.9
Formaldehyde (50-00-0) **	Yes	Yes	16.5	1,100			14	0.35	2.1

**CREL Note: Based on 1/2 of a total maximum of 27 ppb from all sources. The 27 ppb guideline is based on OEHHA's current acute 1-hour Reference Exposure Level (REL) of 76 ppb (94 µg/m^3), extrapolated to an 8-hour exposure period.

Analysis Name: TVOC									
TVOC					120	100	640	16	93

Analytical Results Summary

Sample Information

Sample ID: 21

Material Type:	Medium Density Fiberboard	Date Manufactured:	Not Known
Manufacturer:	M12	Date Arrived:	11/13/2001
Product Name:	AMDF21M12	Date Conditioning Started:	01/22/2002
Adhesive Used:	No	Date Test Started:	02/01/2002

Sample Analyzed in Duplicate? No

Chamber: 2

Compound Name (CAS Number)	Prop. 65 Chemical	ARB TAC	1/2 CREL (ug/m^3)	Olfactory Threshold (ug/m^3)	Emission Factors ($ug/(m^2*hr)$) 24-Hr	48-Hr	96-Hr	96-Hr. Air Conc. (ug/m^3) Class-room	Office
Analysis Name: VOCs-Thermal Desorption - GC/MS									
1,3,5-Trimethyl Benzene (108-67-8)				1,200			7.7	0.19	1.1
Benzene (71-43-2)	Yes	Yes	30		6.1	6.1	13	0.32	1.9
Butyl Cyclohexane (1678-93-9)							4.4	0.11	0.64
Cyclohexanone (108-94-1)				2,900			4.1	0.10	0.60
Decane (124-18-5)				4,400	3.9	3.5	9.5	0.24	1.4
Ethyl Benzene (100-41-4)		Yes	1000	13	5.6		14	0.34	2.0
Ethylene Glycol (107-21-1)		Yes	200		130	130	200	4.9	29
Isopropyl Alcohol (67-63-0)		Yes	3500		8.1	7.5	8.5	0.21	1.3
m/p-Xylene (108-38-3/106-42-3)		Yes	350	2,100	3.7		30	0.74	4.4
Methyl Cyclohexane (108-87-2)							4.1	0.10	0.61
Naphthalene (91-20-3)		Yes	4.5	79	6.6	6.5	8.2	0.20	1.2
n-Heptane (142-82-5)							53	1.3	7.8
Nonane (111-84-2)							6.3	0.16	0.92
o-Xylene (95-47-6)		Yes	350	3,800			15	0.36	2.1
Pentadecane (629-62-9) *					24	27	11	0.28	1.6
Phenol (108-95-2)		Yes	100	430	4.9	4.8			
Styrene (100-42-5)		Yes	450	630			5.6	0.14	0.83
Tetrachloroethylene (127-18-4)	Yes	Yes	17.5				14	0.36	2.1
Tetradecane (629-59-4) *					17	18	12	0.29	1.7
Toluene (108-88-3)		Yes	150		7.6	7.5	46	1.1	6.7
Trichloroethylene (79-01-6)	Yes	Yes	300				17	0.43	2.5
Undecane (1120-21-4)				7,800	4.2	4.0	7.0	0.17	1.0

* Results for chemicals marked with an asterisk were calculated based on internal standard (chlorobenzene-d5).

Analysis Name: Aldehyde-DNPH									
Acetaldehyde (75-07-0)	Yes	Yes	4.5				32	0.79	4.6
Acetone (67-64-1)						11	29	0.71	4.2
Formaldehyde (50-00-0) **	Yes	Yes	16.5	1,100	30	16			

**CREL Note: Based on 1/2 of a total maximum of 27 ppb from all sources. The 27 ppb guideline is based on OEHHA's current acute 1-hour Reference Exposure Level (REL) of 76 ppb (94 µg/m^3), extrapolated to an 8-hour exposure period.

Analysis Name: TVOC									
TVOC					280	280	850	21	120

Analytical Results Summary

Sample Information

Sample ID: 24

Material Type:	Medium Density Fiberboard	Date Manufactured:	Not Known
Manufacturer:	M11	Date Arrived:	01/18/2002
Product Name:	AMDF24M11	Date Conditioning Started:	02/01/2002
Adhesive Used:	No	Date Test Started:	02/11/2002

Sample Analyzed in Duplicate? No

Chamber: 2

Compound Name (CAS Number)	Prop. 65 Chemical	ARB TAC	1/2 CREL (ug/m^3)	Olfactory Threshold (ug/m^3)	Emission Factors ($ug/(m^2*hr)$) 24-Hr	48-Hr	96-Hr	96-Hr. Air Conc. (ug/m^3) Class-room	Office
Analysis Name: VOCs-Thermal Desorption - GC/MS									
2-Methoxy Ethanol (109-86-4)	Yes		30	3,600	8.6				
4,7-Dimethyl-1-Methylethyl Naphthalene (31983-22-9) *					130	43	270	6.6	39
Benzene (71-43-2)	Yes	Yes	30		6.1	6.1			
Copaene (3856-25-5) *					44	26	24	0.60	3.5
d-Cadinene (483-76-1) *					29	120	130	3.2	19
Decane (124-18-5)				4,400	3.8	3.6			
Ethyl Benzene (100-41-4)		Yes	1000	13	5.5	5.6	5.6	0.14	0.82
Ethylene Glycol (107-21-1)		Yes	200		300	290	290	7.1	42
Hexanal (66-25-1) *				58	25	21	18	0.45	2.6
Isopropyl Alcohol (67-63-0)		Yes	3500		8.8	7.8	7.4	0.18	1.1
m/p-Xylene (108-38-3/106-42-3)		Yes	350	2,100	4.1	3.9	3.8	0.094	0.55
Naphthalene (91-20-3)		Yes	4.5	79	6.5				
Nonanal (124-19-6) *				13	13	12	11	0.26	1.6
Phenol (108-95-2)		Yes	100	430			4.8	0.12	0.70
Toluene (108-88-3)		Yes	150		8.1	7.9	7.7	0.19	1.1
Undecane (1120-21-4)				7,800	6.9	6.5	6.2	0.15	0.91

* Results for chemicals marked with an asterisk were calculated based on internal standard (chlorobenzene-d5).

Compound Name (CAS Number)	Prop. 65 Chemical	ARB TAC	1/2 CREL (ug/m^3)	Olfactory Threshold (ug/m^3)	Emission Factors ($ug/(m^2*hr)$) 24-Hr	48-Hr	96-Hr	96-Hr. Air Conc. (ug/m^3) Class-room	Office
Analysis Name: Aldehyde-DNPH									
Acetaldehyde (75-07-0)	Yes	Yes	4.5		13				
Acetone (67-64-1)					50				
Formaldehyde (50-00-0) **	Yes	Yes	16.5	1,100	21				

**CREL Note: Based on 1/2 of a total maximum of 27 ppb from all sources. The 27 ppb guideline is based on OEHHA's current acute 1-hour Reference Exposure Level (REL) of 76 ppb (94 µg/m^3), extrapolated to an 8-hour exposure period.

Compound Name (CAS Number)	Prop. 65 Chemical	ARB TAC	1/2 CREL (ug/m^3)	Olfactory Threshold (ug/m^3)	Emission Factors ($ug/(m^2*hr)$) 24-Hr	48-Hr	96-Hr	96-Hr. Air Conc. (ug/m^3) Class-room	Office
Analysis Name: TVOC									
TVOC					450	380	410	10	59

Analytical Results Summary

Sample Information

Sample ID: 51

Material Type:	Medium Density Fiberboard	Date Manufactured:	07/14/2002
Manufacturer:	M11	Date Arrived:	07/24/2002
Product Name:	SMDF51M11	Date Conditioning Started:	07/31/2002
Adhesive Used:	No	Date Test Started:	08/09/2002

Sample Analyzed in Duplicate? No

Chamber: 1

Compound Name (CAS Number)	Prop. 65 Chemical	ARB TAC	1/2 CREL (ug/m^3)	Olfactory Threshold (ug/m^3)	Emission Factors ($ug/(m^2*hr)$) 24-Hr	48-Hr	96-Hr	96-Hr. Air Conc. (ug/m^3) Class-room	Office
Analysis Name: VOCs-Thermal Desorption - GC/MS									
Acetic Acid (64-19-7) *				360	23	25	26	0.64	3.8
Linalyl Propanoate (144-39-8) *					6.9	7.9	7.0	0.17	1.0
trans-Ethyl Cinnamate (103-36-6) *						6.9	6.2	0.15	0.90
Analysis Name: Aldehyde-DNPH									
Acetone (67-64-1)					70	62	67	1.7	9.8
Formaldehyde (50-00-0) **	Yes	Yes	16.5	1,100	550	540	570	14	84
Analysis Name: TVOC									
TVOC					39	51	52	1.3	7.6

* Results for chemicals marked with an asterisk were calculated based on internal standard (chlorobenzene-d5).

**CREL Note: Based on 1/2 of a total maximum of 27 ppb from all sources. The 27 ppb guideline is based on OEHHA's current acute 1-hour Reference Exposure Level (REL) of 76 ppb (94 $\mu g/m^3$), extrapolated to an 8-hour exposure period.

Analytical Results Summary

Sample Information

Sample ID: 52

Material Type:	Medium Density Fiberboard	Date Manufactured:	07/18/2002
Manufacturer:	M11	Date Arrived:	07/26/2002
Product Name:	SMDF52M11	Date Conditioning Started:	07/31/2002
Adhesive Used:	No	Date Test Started:	08/09/2002

Sample Analyzed in Duplicate? No

Chamber: 2

Compound Name (CAS Number)	Prop. 65 Chemical	ARB TAC	1/2 CREL (ug/m^3)	Olfactory Threshold (ug/m^3)	Emission Factors (ug/(m^2*hr)) 24-Hr	48-Hr	96-Hr	96-Hr. Air Conc. (ug/m^3) Class-room	Office
Analysis Name: VOCs-Thermal Desorption - GC/MS									
2-Furancarboxaldehyde (98-01-1) *				3,200	5.0	3.8			
Acetic Acid (64-19-7) *				360	21	19	16	0.39	2.3
Linalyl Propanoate (144-39-8) *					20	18	18	0.44	2.6
Phenol (108-95-2)		Yes	100	430	2.6	2.6	2.3	0.058	0.34
trans-Ethyl Cinnamate (103-36-6) *					14	13	13	0.31	1.8

* Results for chemicals marked with an asterisk were calculated based on internal standard (chlorobenzene-d5).

Analysis Name: Aldehyde-DNPH									
Acetone (67-64-1)					78	71	66	1.6	9.7
Formaldehyde (50-00-0) **	Yes	Yes	16.5	1,100	640	580	500	12	73

**CREL Note: Based on 1/2 of a total maximum of 27 ppb from all sources. The 27 ppb guideline is based on OEHHA's current acute 1-hour Reference Exposure Level (REL) of 76 ppb (94 µg/m^3), extrapolated to an 8-hour exposure period.

Analysis Name: TVOC									
TVOC					73	66	55	1.4	8.1

Appendix E
Analytical Results Summary for Gypsum Boards

Analytical Results Summary

Sample Information

Sample ID: 57

Material Type:	Gypboard	Date Manufactured:	Not Known
Manufacturer:	M31	Date Arrived:	08/07/2002
Product Name:	SGB57M31	Date Conditioning Started:	02/28/2003
Adhesive Used:	No	Date Test Started:	03/10/2003

Sample Analyzed in Duplicate? No

Chamber: 1

Compound Name (CAS Number)	Prop. 65 Chemical	ARB TAC	1/2 CREL (ug/m^3)	Olfactory Threshold (ug/m^3)	Emission Factors ($ug/(m^2*hr)$) 24-Hr	48-Hr	96-Hr	96-Hr. Air Conc. (ug/m^3) Class-room	Office
Analysis Name: VOCs-Thermal Desorption - GC/MS									
Decanal (112-31-2) *				5.9	2.0	3.2			
Heptanal (111-71-7) *				23	4.4	2.8			
Hexanal (66-25-1) *				58	6.9	7.6			
Nonanal (124-19-6) *				13	6.2	8.8	2.1	1.1	4.8
Octanal (124-13-0) *				7.2	5.1	5.3			
Analysis Name: Aldehyde-DNPH									
Acetone (67-64-1)					34	46	39	20	86
Formaldehyde (50-00-0) **	Yes	Yes	16.5	1,100	21	8.7	15	7.8	35
Analysis Name: TVOC									
TVOC					36	34	4.4	2.2	9.8

* Results for chemicals marked with an asterisk were calculated based on internal standard (chlorobenzene-d5).

**CREL Note: Based on 1/2 of a total maximum of 27 ppb from all sources. The 27 ppb guideline is based on OEHHA's current acute 1-hour Reference Exposure Level (REL) of 76 ppb (94 $\mu g/m^3$), extrapolated to an 8-hour exposure period.

Analytical Results Summary

Sample Information

Material Type:	Gypboard	Sample ID: 58	
Manufacturer:	M10	Date Manufactured:	Not Known
Product Name:	SGB58M10	Date Arrived:	08/07/2002
Adhesive Used:	No	Date Conditioning Started:	02/28/2003
Sample Analyzed in Duplicate?	No	Date Test Started:	03/10/2003

Chamber: 2

Compound Name (CAS Number)	Prop. 65 Chemical	ARB TAC	1/2 CREL (ug/m^3)	Olfactory Threshold (ug/m^3)	Emission Factors (ug/(m^2*hr)) 24-Hr	48-Hr	96-Hr	96-Hr. Air Conc. (ug/m^3) Class-room	Office
Analysis Name: VOCs-Thermal Desorption - GC/MS									
Decanal (112-31-2) *				5.9		1.7			
Hexanal (66-25-1) *				58		1.5			
Nonanal (124-19-6) *				13	1.3	3.0			

* Results for chemicals marked with an asterisk were calculated based on internal standard (chlorobenzene-d5).
No VOC's were detected in the 96-hr test.

Compound Name (CAS Number)	Prop. 65 Chemical	ARB TAC	1/2 CREL (ug/m^3)	Olfactory Threshold (ug/m^3)	Emission Factors (ug/(m^2*hr)) 24-Hr	48-Hr	96-Hr	96-Hr. Air Conc. (ug/m^3) Class-room	Office
Analysis Name: Aldehyde-DNPH									
Acetone (67-64-1)					52	45	35	18	79
Formaldehyde (50-00-0) **	Yes	Yes	16.5	1,100	8.8	5.9	19	9.4	42

**CREL Note: Based on 1/2 of a total maximum of 27 ppb from all sources. The 27 ppb guideline is based on OEHHA's current acute 1-hour Reference Exposure Level (REL) of 76 ppb (94 µg/m^3), extrapolated to an 8-hour exposure period.

Compound Name (CAS Number)	Prop. 65 Chemical	ARB TAC	1/2 CREL (ug/m^3)	Olfactory Threshold (ug/m^3)	Emission Factors (ug/(m^2*hr)) 24-Hr	48-Hr	96-Hr	96-Hr. Air Conc. (ug/m^3) Class-room	Office
Analysis Name: TVOC									
TVOC					4.1	8.0			

No VOC's were detected in the 96-hr test.

Analytical Results Summary

Sample Information

Sample ID: 59

Material Type:	Gypboard	Date Manufactured:	Not Known
Manufacturer:	M32	Date Arrived:	08/19/2002
Product Name:	AGB59M32	Date Conditioning Started:	03/07/2003
Adhesive Used:	No	Date Test Started:	03/17/2003

Sample Analyzed in Duplicate? No

Chamber: 2

Compound Name (CAS Number)	Prop. 65 Chemical	ARB TAC	1/2 CREL (ug/m^3)	Olfactory Threshold (ug/m^3)	Emission Factors ($ug/(m^2*hr)$) 24-Hr	48-Hr	96-Hr	96-Hr. Air Conc. (ug/m^3) Class-room	Office
Analysis Name: VOCs-Thermal Desorption - GC/MS									
Nonanal (124-19-6) *				13		1.6	1.6	0.83	3.7
Analysis Name: TVOC									
TVOC						1.6	3.2	1.6	7.1

* Results for chemicals marked with an asterisk were calculated based on internal standard (chlorobenzene-d5).

Analytical Results Summary

Sample Information

Sample ID: 60

Material Type:	Gypboard	Date Manufactured:	Not Known
Manufacturer:	M33	Date Arrived:	08/19/2002
Product Name:	AGB60M33	Date Conditioning Started:	03/07/2003
Adhesive Used:	No	Date Test Started:	03/17/2003

Sample Analyzed in Duplicate? No

Chamber: 1

Compound Name (CAS Number)	Prop. 65 Chemical	ARB TAC	1/2 CREL (ug/m^3)	Olfactory Threshold (ug/m^3)	Emission Factors ($ug/(m^2*hr)$) 24-Hr	48-Hr	96-Hr	96-Hr. Air Conc. (ug/m^3) Class-room	Office
Analysis Name: VOCs-Thermal Desorption - GC/MS									
Heptanal (111-71-7) *				23	1.8				
Hexanal (66-25-1) *				58	10	2.3			
Nonanal (124-19-6) *				13	3.0	2.1	2.7	1.3	6.0
Octanal (124-13-0) *				7.2	1.6				

* Results for chemicals marked with an asterisk were calculated based on internal standard (chlorobenzene-d5).

Analysis Name: Aldehyde-DNPH									
Formaldehyde (50-00-0) **	Yes	Yes	16.5	1,100	2.6				

**CREL Note: Based on 1/2 of a total maximum of 27 ppb from all sources. The 27 ppb guideline is based on OEHHA's current acute 1-hour Reference Exposure Level (REL) of 76 ppb (94 µg/m^3), extrapolated to an 8-hour exposure period.

Analysis Name: TVOC									
TVOC					17	7.2	6.7	3.4	15

Analytical Results Summary

Sample Information

Sample ID: 91

Material Type:	Gypboard	Date Manufactured:	Not Known
Manufacturer:	M51	Date Arrived:	05/01/2002
Product Name:	SGB91M51	Date Conditioning Started:	05/03/2002
Adhesive Used:	No	Date Test Started:	05/13/2002

Sample Analyzed in Duplicate? Yes

Chamber: 1

Compound Name (CAS Number)	Prop. 65 Chemical	ARB TAC	1/2 CREL (ug/m^3)	Olfactory Threshold (ug/m^3)	Emission Factors ($ug/(m^2*hr)$) 24-Hr	48-Hr	96-Hr	96-Hr. Air Conc. (ug/m^3) Class-room	Office
Analysis Name: VOCs-Thermal Desorption - GC/MS									
2-Hydroxybenzaldehyde (90-02-8) *				38	5.5				
Cyclohexanone (108-94-1)				2,900	6.8				
Decanal (112-31-2) *				5.9	5.8	5.6			
Hexanal (66-25-1) *				58	13	4.9			
Naphthalene (91-20-3)		Yes	4.5	79	7.6				
Nonanal (124-19-6) *				13	16	18	28	14	62
Octanal (124-13-0) *				7.2	4.6	5.7			
Phenol (108-95-2)		Yes	100	430	8.6				

* Results for chemicals marked with an asterisk were calculated based on internal standard (chlorobenzene-d5). Gypsum-board obtained to use as paint test substrate.

Analysis Name: Aldehyde-DNPH									
Acetone (67-64-1)					180	98	110	54	240
Formaldehyde (50-00-0) **	Yes	Yes	16.5	1,100	3.5				

**CREL Note: Based on 1/2 of a total maximum of 27 ppb from all sources. The 27 ppb guideline is based on OEHHA's current acute 1-hour Reference Exposure Level (REL) of 76 ppb (94 $\mu g/m^3$), extrapolated to an 8-hour exposure period.

Analysis Name: TVOC									
TVOC					79	38	61	31	140

Analytical Results Summary

Sample Information

Sample ID: 91

Material Type:	Gypboard	Date Manufactured:	Not Known
Manufacturer:	M51	Date Arrived:	05/01/2002
Product Name:	SGB91M51	Date Conditioning Started:	05/03/2002
Adhesive Used:	No	Date Test Started:	05/13/2002

Sample Analyzed in Duplicate? Yes

Chamber: 2

Compound Name (CAS Number)	Prop. 65 Chemical	ARB TAC	1/2 CREL (ug/m^3)	Olfactory Threshold (ug/m^3)	Emission Factors ($ug/(m^2*hr)$) 24-Hr	48-Hr	96-Hr	96-Hr. Air Conc. (ug/m^3) Class-room	Office
Analysis Name: VOCs-Thermal Desorption - GC/MS									
Decanal (112-31-2) *				5.9	8.7	6.9			
Hexanal (66-25-1) *				58	9.7	3.9			
Nonanal (124-19-6) *				13	23	17	6.3	3.2	14
Octanal (124-13-0) *				7.2	6.5	5.2			
* Results for chemicals marked with an asterisk were calculated based on internal standard (chlorobenzene-d5). Gypsum board obtained to use as paint test substrate.									
Analysis Name: Aldehyde-DNPH									
Acetone (67-64-1)					230	170	74	37	170
**CREL Note: Based on 1/2 of a total maximum of 27 ppb from all sources. The 27 ppb guideline is based on OEHHA's current acute 1-hour Reference Exposure Level (REL) of 76 ppb (94 $\mu g/m^3$), extrapolated to an 8-hour exposure period.									
Analysis Name: TVOC									
TVOC					51	40	15	7.3	32

Appendix F
Analytical Results Summary for Paints

Analytical Results Summary

Sample Information

Sample ID: 41

Material Type:	Paint	Date Manufactured:	04/01/2002
Manufacturer:	M18	Date Arrived:	06/12/2002
Product Name:	SPNT41M18	Date Conditioning Started:	06/15/2002
Adhesive Used:	No	Date Test Started:	06/24/2002

Sample Analyzed in Duplicate? No

Chamber: 1

Compound Name (CAS Number)	Prop. 65 Chemical	ARB TAC	1/2 CREL (ug/m^3)	Olfactory Threshold (ug/m^3)	Emission Factors ($ug/(m^2*hr)$) 24-Hr	48-Hr	96-Hr	96-Hr. Air Conc. (ug/m^3) Class-room	Office
Analysis Name: VOCs-Thermal Desorption - GC/MS									
2,2,4-Trimethyl-1,3-pentanediol (144-19-4) *					100	65	34	17	77
2,2,4-Trimethyl-1,3-pentanediol Isobutyrate (25265-77-4) *					2,000	1,200	760	390	1,700
2-Methyl Propanoic Acid (79-31-2) *				72	42	29	22	11	48
Dipropylene Glycol (106-62-7) *					34	18	12	6.0	27
Hexanal (66-25-1) *				58	11	6.6	16	8.1	36
Isobutyl butyrate (539-90-2) *					1,000	500	250	120	550
Nonanal (124-19-6) *				13	21	8.8	13	6.5	29
Propylene Glycol (57-55-6) *					120	98	63	32	140

* Results for chemicals marked with an asterisk were calculated based on internal standard (chlorobenzene-d5).

Analysis Name: Aldehyde-DNPH									
Formaldehyde (50-00-0) **	Yes	Yes	16.5	1,100	8.0	0.66			

**CREL Note: Based on 1/2 of a total maximum of 27 ppb from all sources. The 27 ppb guideline is based on OEHHA's current acute 1-hour Reference Exposure Level (REL) of 76 ppb (94 $\mu g/m^3$), extrapolated to an 8-hour exposure period.

Analysis Name: TVOC									
TVOC					3,600	2,100	1,400	690	3,000

Analytical Results Summary

Sample Information

Material Type:	Paint	Sample ID: 42	
Manufacturer:	M18	Date Manufactured:	04/01/2002
Product Name:	SPNT42M18	Date Arrived:	06/12/2002
Adhesive Used:	No	Date Conditioning Started:	06/15/2002
Sample Analyzed in Duplicate?	No	Date Test Started:	06/25/2002

Chamber: 2

Compound Name (CAS Number)	Prop. 65 Chemical	ARB TAC	1/2 CREL (ug/m^3)	Olfactory Threshold (ug/m^3)	Emission Factors ($ug/(m^2*hr)$) 24-Hr	48-Hr	96-Hr	96-Hr. Air Conc. (ug/m^3) Class-room	Office
Analysis Name: VOCs-Thermal Desorption - GC/MS									
2,2,4-Trimethyl-1,3-pentanediol (144-19-4) *					26	30	22	11	49
2,2,4-Trimethyl-1,3-pentanediol Isobutyrate (25265-77-4) *					2,200	2,500	2,100	1,000	4,600
Isobutyl butyrate (539-90-2) *					1,100	1,300	980	500	2,200
n-Butyl ether (142-96-1) *				250	25	27			
Triethylene glycol monomethyl ether (112-35-6) *					31	31	20	10	45
Analysis Name: TVOC									
TVOC					3,400	3,900	3,100	1,600	7,000

* Results for chemicals marked with an asterisk were calculated based on internal standard (chlorobenzene-d5).

Analytical Results Summary

Sample Information

Sample ID: 43

Material Type:	Paint	Date Manufactured:	02/23/2001
Manufacturer:	M19	Date Arrived:	06/17/2002
Product Name:	APNT43M19	Date Conditioning Started:	06/21/2002
Adhesive Used:	No	Date Test Started:	07/01/2002

Sample Analyzed in Duplicate? Yes

Chamber: 1

Compound Name (CAS Number)	Prop. 65 Chemical	ARB TAC	1/2 CREL (ug/m^3)	Olfactory Threshold (ug/m^3)	Emission Factors ($ug/(m^2*hr)$) 24-Hr	48-Hr	96-Hr	96-Hr. Air Conc. (ug/m^3) Class-room	Office
Analysis Name: VOCs-Thermal Desorption - GC/MS									
2,2,4-Trimethyl-1,3-pentanediol Isobutyrate (25265-77-4) *					250	100	38	19	86
Isobutyl butyrate (539-90-2) *					58	34	11	5.5	25
Linalyl Propanoate (144-39-8) *					24	24	6.9	3.5	15
Analysis Name: Aldehyde-DNPH									
Acetone (67-64-1)					87	85	71	36	160
Analysis Name: TVOC									
TVOC					940	570	170	85	380

* Results for chemicals marked with an asterisk were calculated based on internal standard (chlorobenzene-d5).

Analytical Results Summary

Sample Information

Material Type:	Paint	Sample ID: 43	
Manufacturer:	M19	Date Manufactured:	02/23/2001
Product Name:	APNT43M19	Date Arrived:	06/17/2002
Adhesive Used:	No	Date Conditioning Started:	06/21/2002
Sample Analyzed in Duplicate?	Yes	Date Test Started:	07/01/2002

Chamber: 2

Compound Name (CAS Number)	Prop. 65 Chemical	ARB TAC	1/2 CREL (ug/m^3)	Olfactory Threshold (ug/m^3)	Emission Factors ($ug/(m^2*hr)$) 24-Hr	48-Hr	96-Hr	96-Hr. Air Conc. (ug/m^3) Class-room	Office
Analysis Name: VOCs-Thermal Desorption - GC/MS									
2,2,4-Trimethyl-1,3-pentanediol Isobutyrate (25265-77-4) *					120	72	41	21	92
Isobutyl butyrate (539-90-2) *					28	21	12	6.1	27
Linalyl Propanoate (144-39-8) *					36	32	7.0	3.5	16
Analysis Name: Aldehyde-DNPH									
Acetone (67-64-1)					100	110	120	63	280
Analysis Name: TVOC									
TVOC					710	440	170	87	390

* Results for chemicals marked with an asterisk were calculated based on internal standard (chlorobenzene-d5).

Analytical Results Summary

Sample Information

Sample ID: 44

Material Type: Paint
Manufacturer: M20
Product Name: APNT44M20
Adhesive Used: No
Sample Analyzed in Duplicate? No

Date Manufactured: 08/01/2001
Date Arrived: 06/14/2002
Date Conditioning Started: 06/28/2002
Date Test Started: 07/08/2002

Chamber: 1

Compound Name (CAS Number)	Prop. 65 Chemical	ARB TAC	1/2 CREL (ug/m^3)	Olfactory Threshold (ug/m^3)	Emission Factors ($ug/(m^2*hr)$) 24-Hr	48-Hr	96-Hr	96-Hr. Air Conc. (ug/m^3) Class-room	Office
Analysis Name: VOCs-Thermal Desorption - GC/MS									
2,2,4-Trimethyl-1,3-pentanediol Isobutyrate (25265-77-4) *					790	720	400	200	890
Isobutyl butyrate (539-90-2) *					410	340	170	88	390
Nonanal (124-19-6) *				13	11	24	24	12	53
Octanoic Acid (124-07-2) *				24	13	18	10	5.1	23
Propylene Glycol (57-55-6) *					44	40	25	13	56
Analysis Name: Aldehyde-DNPH									
Acetone (67-64-1)						85	79	40	180
Analysis Name: TVOC									
TVOC					1,600	1,500	930	470	2,100

* Results for chemicals marked with an asterisk were calculated based on internal standard (chlorobenzene-d5).

Analytical Results Summary

Sample Information

Sample ID: 45

Material Type: Paint
Manufacturer: M22
Product Name: SPNT45M22
Adhesive Used: No
Sample Analyzed in Duplicate? No

Date Manufactured: 04/01/2002
Date Arrived: 06/12/2002
Date Conditioning Started: 06/28/2002
Date Test Started: 07/08/2002

Chamber: 2

Compound Name (CAS Number)	Prop. 65 Chemical	ARB TAC	1/2 CREL (ug/m^3)	Olfactory Threshold (ug/m^3)	Emission Factors ($ug/(m^2*hr)$) 24-Hr	48-Hr	96-Hr	96-Hr. Air Conc. (ug/m^3) Class-room	Office
Analysis Name: VOCs-Thermal Desorption - GC/MS									
1-(2-Methoxypropoxy)-2-Propanol (13429-07-7) *					68	42	28	14	63
1,3,5-Trimethyl Benzene (108-67-8)				1,200	8.5	7.5	7.2	3.6	16
2-(2-Butoxyethoxy) Ethanol (112-34-5) *		Yes			920	610	400	200	890
2,2,4-Trimethyl-1,3-pentanediol Isobutyrate (25265-77-4) *					1,500	1,100	820	420	1,800
2,2'-Oxybis-ethanol (111-46-6) *					1,200	910	610	310	1,400
2-Ethyl-1-hexanol (104-76-7) *				1,300	21	16	13	6.5	29
Isobutyl butyrate (539-90-2) *					780	560	400	200	900
Analysis Name: Aldehyde-DNPH									
Acetone (67-64-1)					100	100	88	45	200
Analysis Name: TVOC									
TVOC					6,200	4,400	3,000	1,500	6,700

* Results for chemicals marked with an asterisk were calculated based on internal standard (chlorobenzene-d5).

Analytical Results Summary

Sample Information

Sample ID: 46

Material Type:	Paint	Date Manufactured:	02/01/2002
Manufacturer:	M23	Date Arrived:	06/24/2002
Product Name:	SPNT46M23	Date Conditioning Started:	07/05/2002
Adhesive Used:	No	Date Test Started:	07/15/2002

Sample Analyzed in Duplicate? No

Chamber: 1

Compound Name (CAS Number)	Prop. 65 Chemical	ARB TAC	1/2 CREL (ug/m^3)	Olfactory Threshold (ug/m^3)	Emission Factors ($ug/(m^2*hr)$) 24-Hr	48-Hr	96-Hr	96-Hr. Air Conc. (ug/m^3) Class-room	Office
Analysis Name: VOCs-Thermal Desorption - GC/MS									
1-(2-Methoxypropoxy)-2-Propanol (13429-07-7) *					110	260	50	25	110
2-(2-Butoxyethoxy) Ethanol (112-34-5) *		Yes			450	830	250	130	560
2,2,4-Trimethyl-1,3-pentanediol Isobutyrate (25265-77-4) *					2,200	4,500	1,600	790	3,500
Decanol (112-30-1) *				120	47	100	28	14	62
Dipropylene Glycol (106-62-7) *					67	78	31	15	68
Ethylene Glycol (107-21-1)		Yes	200		440	800	190	98	430
Isobutyl butyrate (539-90-2) *					1,100	2,500	690	350	1,600
Propylene Glycol (57-55-6) *					28	57	6.3	3.2	14
Analysis Name: Aldehyde-DNPH									
Acetone (67-64-1)					69	86	85	43	190
Analysis Name: TVOC									
TVOC					11,000	10,000	3,100	1,600	7,000

* Results for chemicals marked with an asterisk were calculated based on internal standard (chlorobenzene-d5).

Analytical Results Summary

Sample Information

Sample ID: 47

Material Type:	Paint	Date Manufactured:	02/01/2002
Manufacturer:	M23	Date Arrived:	06/24/2002
Product Name:	APNT47M23	Date Conditioning Started:	07/05/2002
Adhesive Used:	No	Date Test Started:	07/15/2002

Sample Analyzed in Duplicate? No

Chamber: 2

Compound Name (CAS Number)	Prop. 65 Chemical	ARB TAC	1/2 CREL (ug/m^3)	Olfactory Threshold (ug/m^3)	Emission Factors ($ug/(m^2*hr)$) 24-Hr	48-Hr	96-Hr	96-Hr. Air Conc. (ug/m^3) Class-room	Office
Analysis Name: VOCs-Thermal Desorption - GC/MS									
2-(2-Butoxyethoxy) Ethanol (112-34-5) *		Yes			57	75	42	21	93
2,2,4-Trimethyl-1,3-pentanediol Isobutyrate (25265-77-4) *					140	220	180	93	410
Decanal (112-31-2) *				5.9	9.3				
Decanol (112-30-1) *				120	10	16			
Isobutyl butyrate (539-90-2) *					26	47	30	15	67
n-Butyl ether (142-96-1) *				250	23	30	11	5.7	25
n-Butyl propanoate (590-01-2) *				14	6.6	7.2			
Nonanal (124-19-6) *				13	17				

* Results for chemicals marked with an asterisk were calculated based on internal standard (chlorobenzene-d5).

Analysis Name: TVOC									
TVOC					320	450	300	150	670

Analytical Results Summary

Sample Information

Sample ID: 48

Material Type:	Paint	Date Manufactured:	07/12/2000
Manufacturer:	M24	Date Arrived:	07/12/2002
Product Name:	APNT48M24	Date Conditioning Started:	07/12/2002
Adhesive Used:	No	Date Test Started:	07/22/2002

Sample Analyzed in Duplicate? Yes

Chamber: 1

Compound Name (CAS Number)	Prop. 65 Chemical	ARB TAC	1/2 CREL (ug/m^3)	Olfactory Threshold (ug/m^3)	Emission Factors ($ug/(m^2*hr)$) 24-Hr	48-Hr	96-Hr	96-Hr. Air Conc. (ug/m^3) Class-room	Office
Analysis Name: VOCs-Thermal Desorption - GC/MS									
1,3,5-Trimethyl Benzene (108-67-8)				1,200	8.0				
2-(2-Butoxyethoxy) Ethanol (112-34-5) *		Yes			3,800	3,100	2,200	1,100	4,900
2-(2-Methoxyethyoxy)-Ethanol (111-77-3) *					150	110	63	32	140
2,2,4-Trimethyl-1,3-pentanediol (144-19-4) *					170	160	120	61	270
2,2,4-Trimethyl-1,3-pentanediol Isobutyrate (25265-77-4) *					2,200	2,000	1,700	880	3,900
2-Methyl-2,4-pentanediol (107-41-5) *					140	120	77	39	170
Decanol (112-30-1) *				120	230	180	150	74	330
Isobutyl butyrate (539-90-2) *					1,000	930	780	400	1,800
Analysis Name: TVOC									
TVOC					7,700	6,500	5,100	2,600	12,000

* Results for chemicals marked with an asterisk were calculated based on internal standard (chlorobenzene-d5).

Analytical Results Summary

Sample Information

Sample ID: 48

Material Type: Paint
Manufacturer: M24
Product Name: APNT48M24
Adhesive Used: No
Sample Analyzed in Duplicate? Yes

Date Manufactured: 07/12/2000
Date Arrived: 07/12/2002
Date Conditioning Started: 07/12/2002
Date Test Started: 07/22/2002

Chamber: 2

Compound Name (CAS Number)	Prop. 65 Chemical	ARB TAC	1/2 CREL (ug/m^3)	Olfactory Threshold (ug/m^3)	Emission Factors ($ug/(m^2*hr)$) 24-Hr	48-Hr	96-Hr	96-Hr. Air Conc. (ug/m^3) Class-room	Office
Analysis Name: VOCs-Thermal Desorption - GC/MS									
2-(2-Butoxyethoxy) Ethanol (112-34-5) *		Yes			3,000	2,500	1,500	740	3,300
2-(2-Methoxyethyoxy)-Ethanol (111-77-3) *					100	71			
2,2,4-Trimethyl-1,3-pentanediol (144-19-4) *					130	120	75	38	170
2,2,4-Trimethyl-1,3-pentanediol Isobutyrate (25265-77-4) *					1,800	1,500	1,100	580	2,500
2-Methyl-2,4-pentanediol (107-41-5) *					97	84	46	23	100
Decanol (112-30-1) *				120	180	150	95	48	210
Isobutyl butyrate (539-90-2) *					760	660	470	240	1,000
Analysis Name: TVOC									
TVOC					6,000	5,100	3,300	1,700	7,300

* Results for chemicals marked with an asterisk were calculated based on internal standard (chlorobenzene-d5).

Analytical Results Summary

Sample Information

Sample ID: 49

Material Type:	Paint	Date Manufactured:	08/17/2001
Manufacturer:	M25	Date Arrived:	07/12/2002
Product Name:	APNT49M25	Date Conditioning Started:	07/19/2002
Adhesive Used:	No	Date Test Started:	07/29/2002

Sample Analyzed in Duplicate? No

Chamber: 1

Compound Name (CAS Number)	Prop. 65 Chemical	ARB TAC	1/2 CREL (ug/m^3)	Olfactory Threshold (ug/m^3)	Emission Factors ($ug/(m^2*hr)$) 24-Hr	48-Hr	96-Hr	96-Hr. Air Conc. (ug/m^3) Class-room	Office
Analysis Name: VOCs-Thermal Desorption - GC/MS									
2-(2-Butoxyethoxy) Ethanol (112-34-5) *		Yes			790	580	350	180	790
2,2,4-Trimethyl-1,3-pentanediol (144-19-4) *					55	180	34	17	76
2,2,4-Trimethyl-1,3-pentanediol Isobutyrate (25265-77-4) *					1,800	3,300	1,200	590	2,600
Ethyl Benzene (100-41-4)		Yes	1000	13		7.4			
Isobutyl butyrate (539-90-2) *					900	1,700	560	280	1,300
Nonane (111-84-2)							14	7.0	31
Octanal (124-13-0) *				7.2		74	17	8.8	39
Propylene Glycol (57-55-6) *						160			
Undecane (1120-21-4)				7,800		55	6.6	3.3	15

* Results for chemicals marked with an asterisk were calculated based on internal standard (chlorobenzene-d5).

Analysis Name: TVOC									
TVOC					3,600	6,000	2,200	1,100	4,800

Analytical Results Summary

Sample Information

Sample ID: 50

Material Type: Paint
Manufacturer: M26
Product Name: APNT50M26
Adhesive Used: No
Sample Analyzed in Duplicate? No

Date Manufactured: Not Known
Date Arrived: 07/18/2002
Date Conditioning Started: 07/19/2002
Date Test Started: 07/29/2002

Chamber: 2

Compound Name (CAS Number)	Prop. 65 Chemical	ARB TAC	1/2 CREL (ug/m^3)	Olfactory Threshold (ug/m^3)	Emission Factors ($ug/(m^2*hr)$) 24-Hr	48-Hr	96-Hr	96-Hr. Air Conc. (ug/m^3) Class-room	Office
Analysis Name: VOCs-Thermal Desorption - GC/MS									
2-(2-Butoxyethoxy) Ethanol (112-34-5) *		Yes			870	710	480	240	1,100
2,2,4-Trimethyl-1,3-pentanediol (144-19-4) *					270	81	180	92	410
2,2,4-Trimethyl-1,3-pentanediol Isobutyrate (25265-77-4) *					4,500	2,400	3,500	1,800	7,800
Isobutyl butyrate (539-90-2) *					2,500	1,200	1,800	910	4,000
m/p-Xylene (108-38-3/106-42-3)		Yes	350	2,100	37		22	11	48
Nonane (111-84-2)					33	20	22	11	48
Octanal (124-13-0) *				7.2	120	24	63	32	140
Propylene Glycol (57-55-6) *					310		86	43	190
Undecane (1120-21-4)				7,800	76		47	24	110

* Results for chemicals marked with an asterisk were calculated based on internal standard (chlorobenzene-d5).

Analysis Name: TVOC									
TVOC					8,700	4,500	6,200	3,100	14,000

Appendix G
Analytical Results Summary for Particleboard

Analytical Results Summary

Sample Information

Sample ID: 22

Material Type:	Particleboard	Date Manufactured:	Not Known
Manufacturer:	M13	Date Arrived:	12/11/2001
Product Name:	APB22M13	Date Conditioning Started:	01/27/2002
Adhesive Used:	No	Date Test Started:	02/07/2002

Sample Analyzed in Duplicate? Yes

Chamber: 1

Compound Name (CAS Number)	Prop. 65 Chemical	ARB TAC	1/2 CREL (ug/m^3)	Olfactory Threshold (ug/m^3)	Emission Factors ($ug/(m^2*hr)$) 24-Hr	48-Hr	96-Hr	96-Hr. Air Conc. (ug/m^3) Class-room	Office
Analysis Name: VOCs-Thermal Desorption - GC/MS									
Benzene (71-43-2)	Yes	Yes	30		6.1		6.1	0.25	0.89
Butyl Cyclohexane (1678-93-9)					4.7	4.6	4.4	0.19	0.65
Decane (124-18-5)				4,400	3.4	3.7	3.8	0.16	0.55
Ethyl Benzene (100-41-4)		Yes	1000	13	5.7	5.5	5.5	0.23	0.81
Ethylene Glycol (107-21-1)		Yes	200		210	190	200	8.1	29
Hexanal (66-25-1) *				58	270	230	240	9.8	35
Isopropyl Alcohol (67-63-0)		Yes	3500		7.8	7.5	7.4	0.31	1.1
m/p-Xylene (108-38-3/106-42-3)		Yes	350	2,100	3.9				
Nonanal (124-19-6) *				13	5.6	5.1	5.3	0.22	0.78
Pentanal (110-62-3) *				22	23	20	19	0.81	2.9
Phenol (108-95-2)		Yes	100	430	5.0	5.0			
Toluene (108-88-3)		Yes	150		8.6	8.1	8.2	0.34	1.2
Undecane (1120-21-4)				7,800			4.9	0.21	0.72

* Results for chemicals marked with an asterisk were calculated based on internal standard (chlorobenzene-d5).

Analysis Name: Aldehyde-DNPH									
Acetaldehyde (75-07-0)	Yes	Yes	4.5			15			
Hexanal (66-25-1)				58	200	170	120	5.1	18

Hexanal and other long-chain aldehydes can be detected by both the GC/MS and HPLC methods. The GC/MS method is more sensitive than the HPLC method; however, the air concentration for hexanal derived from the HPLC method is more accurate as the GC/MS amount was based on the internal standard (chlorobenzene-d5) while the HPLC amount is based on the calibration curve for hexanal.

Analysis Name: TVOC									
TVOC					480	440	420	18	62

Analytical Results Summary

Sample Information

Sample ID: 22

Material Type:	Particleboard	Date Manufactured:	Not Known
Manufacturer:	M13	Date Arrived:	12/11/2001
Product Name:	APB22M13	Date Conditioning Started:	01/27/2002
Adhesive Used:	No	Date Test Started:	02/07/2002

Sample Analyzed in Duplicate? Yes

Chamber: 2

Compound Name (CAS Number)	Prop. 65 Chemical	ARB TAC	1/2 CREL (ug/m^3)	Olfactory Threshold (ug/m^3)	Emission Factors ($ug/(m^2*hr)$) 24-Hr	48-Hr	96-Hr	96-Hr. Air Conc. (ug/m^3) Class-room	Office
Analysis Name: VOCs-Thermal Desorption - GC/MS									
Benzene (71-43-2)	Yes	Yes	30		6.2	6.1			
Butyl Cyclohexane (1678-93-9)					4.4	4.2	4.1	0.17	0.60
Cyclohexanone (108-94-1)				2,900		3.7			
Decane (124-18-5)				4,400	3.8	3.5	3.3	0.14	0.49
Ethyl Benzene (100-41-4)		Yes	1000	13	5.6	5.6	5.5	0.23	0.81
Ethylene Glycol (107-21-1)		Yes	200		200	190	170	6.9	24
Hexanal (66-25-1) *				58	260	220	150	6.1	22
Isopropyl Alcohol (67-63-0)		Yes	3500		7.9	7.6	7.3	0.30	1.1
Naphthalene (91-20-3)		Yes	4.5	79	6.5				
Nonanal (124-19-6) *				13	9.4	7.6	5.4	0.23	0.80
Nonane (111-84-2)					2.7				
Pentanal (110-62-3) *				22	22	18	11	0.48	1.7
Toluene (108-88-3)		Yes	150		8.9	8.3	7.9	0.33	1.2
Undecane (1120-21-4)				7,800	5.7	5.3	4.9	0.20	0.71

* Results for chemicals marked with an asterisk were calculated based on internal standard (chlorobenzene-d5).

Analysis Name: Aldehyde-DNPH									
Acetaldehyde (75-07-0)	Yes	Yes	4.5			15			
Hexanal (66-25-1)				58	190	140	93	3.9	14

Hexanal and other long-chain aldehydes can be detected by both the GC/MS and HPLC methods. The GC/MS method is more sensitive than the HPLC method, however, the air concentration for hexanal derived from the HPLC method is more accurate as the GC/MS amount was based on the internal standard (chlorobenzene-d5) while the HPLC amount is based on the calibration curve for hexanal.

Analysis Name: TVOC									
TVOC					460	360	240	9.9	35

Analytical Results Summary

Sample Information

Sample ID: 23

Material Type:	Particleboard	Date Manufactured:	Not Known
Manufacturer:	M11	Date Arrived:	01/18/2002
Product Name:	SPB23M11	Date Conditioning Started:	02/01/2002
Adhesive Used:	No	Date Test Started:	02/11/2002

Sample Analyzed in Duplicate? No

Chamber: 1

Compound Name (CAS Number)	Prop. 65 Chemical	ARB TAC	1/2 CREL (ug/m^3)	Olfactory Threshold (ug/m^3)	Emission Factors ($ug/(m^2*hr)$) 24-Hr	48-Hr	96-Hr	96-Hr. Air Conc. (ug/m^3) Class-room	Office
Analysis Name: VOCs-Thermal Desorption - GC/MS									
3-Carene (13466-78-9) *					14	20	32	1.3	4.7
Benzaldehyde (100-52-7) *				190	13	16	20	0.81	2.9
beta-Pinene (127-91-3) *					20	25	33	1.4	4.8
Butyl Cyclohexane (1678-93-9)					4.0	4.1	4.1	0.17	0.61
Cyclohexanone (108-94-1)				2,900	4.3	4.3	4.7	0.20	0.69
Decane (124-18-5)				4,400	6.4	6.5	7.2	0.30	1.1
Ethyl Benzene (100-41-4)		Yes	1000	13	5.7	5.5	5.7	0.24	0.84
Ethylene Glycol (107-21-1)		Yes	200		140	140	140	6.0	21
Hexanal (66-25-1) *				58	49	58	67	2.8	9.8
Isopropyl Alcohol (67-63-0)		Yes	3500		7.5	7.4	7.3	0.30	1.1
Limonene (138-86-3) *				2,500	8.0	10	16	0.65	2.3
Linalyl Propanoate (144-39-8) *					32	20	39	1.6	5.7
Longifolene (475-20-7) *					42	42	49	2.1	7.2
n-Heptane (142-82-5)					22	21	22	0.90	3.2
Nonanal (124-19-6) *				13	19	18	21	0.89	3.1
Phenol (108-95-2)		Yes	100	430	5.0	4.9			
Toluene (108-88-3)		Yes	150		8.0	7.7	8.1	0.34	1.2
Undecane (1120-21-4)				7,800	7.5	7.5	8.0	0.33	1.2

* Results for chemicals marked with an asterisk were calculated based on internal standard (chlorobenzene-d5).

Analysis Name: Aldehyde-DNPH									
Acetaldehyde (75-07-0)	Yes	Yes	4.5		15	55	55	2.3	8.1
Formaldehyde (50-00-0) **	Yes	Yes	16.5	1,100	140	120	97	4.0	14
Hexanal (66-25-1)				58	10	40			

Analysis Name: Aldehyde-DNPH

**CREL Note: Based on 1/2 of a total maximum of 27 ppb from all sources. The 27 ppb guideline is based on OEHHA's current acute 1-hour Reference Exposure Level (REL) of 76 ppb (94 $\mu g/m^3$), extrapolated to an 8-hour exposure period. Hexanal and other long-chain aldehydes can be detected by both the GC/MS and HPLC methods. The GC/MS method is more sensitive than the HPLC method; however, the air concentration for hexanal derived from the HPLC method is more accurate as the GC/MS amount was based on the internal standard (chlorobenzene-d5) while the HPLC amount is based on the calibration curve for hexanal.

Analysis Name: TVOC									
TVOC					420	440	510	21	75

Appendix H

Analytical Results Summary for Plastic Laminates and Assemblies

Analytical Results Summary

Sample Information

Sample ID: 55

Material Type:	Plastic Laminant (P-Lam)	Date Manufactured:	Not Known
Manufacturer:	M29	Date Arrived:	08/05/2002
Product Name:	SPLAM55M29	Date Conditioning Started:	08/09/2002
Adhesive Used:	No	Date Test Started:	08/19/2002

Sample Analyzed in Duplicate? No

Chamber: 1

Compound Name (CAS Number)	Prop. 65 Chemical	ARB TAC	1/2 CREL (ug/m^3)	Olfactory Threshold (ug/m^3)	Emission Factors ($ug/(m^2*hr)$) 24-Hr	48-Hr	96-Hr	96-Hr. Air Conc. (ug/m^3) Class-room	Office
Analysis Name: VOCs-Thermal Desorption - GC/MS									
Nonanal (124-19-6) *				13		9.2			
Phenol (108-95-2)		Yes	100	430	15	8.9	7.7	0.20	1.1
Toluene (108-88-3)		Yes	150		7.5				
Analysis Name: Aldehyde-DNPH									
Acetone (67-64-1)					180	170	120	3.0	17
Formaldehyde (50-00-0) **	Yes	Yes	16.5	1,100	38	24	19	0.48	2.7
Analysis Name: TVOC									
TVOC					25	34	7.7	0.20	1.1

* Results for chemicals marked with an asterisk were calculated based on internal standard (chlorobenzene-d5).

**CREL Note: Based on 1/2 of a total maximum of 27 ppb from all sources. The 27 ppb guideline is based on OEHHA's current acute 1-hour Reference Exposure Level (REL) of 76 ppb (94 $\mu g/m^3$), extrapolated to an 8-hour exposure period.

Analytical Results Summary

Sample Information

Sample ID: 56

Material Type:	Plastic Laminant (P-Lam)	Date Manufactured:	Not Known
Manufacturer:	M30	Date Arrived:	08/05/2002
Product Name:	SPLAM56M30	Date Conditioning Started:	08/09/2002
Adhesive Used:	No	Date Test Started:	08/19/2002

Sample Analyzed in Duplicate? No

Chamber: 2

Compound Name (CAS Number)	Prop. 65 Chemical	ARB TAC	1/2 CREL (ug/m^3)	Olfactory Threshold (ug/m^3)	Emission Factors (ug/(m^2*hr)) 24-Hr	48-Hr	96-Hr	96-Hr. Air Conc. (ug/m^3) Class-room	Office
Analysis Name: VOCs-Thermal Desorption - GC/MS									
Benzaldehyde (100-52-7) *				190		5.1			
Decanal (112-31-2) *				5.9		12			
Nonanal (124-19-6) *				13	5.1	21			
Octanal (124-13-0) *				7.2		7.5			
Phenol (108-95-2)		Yes	100	430	9.0	11	6.3	0.16	0.91
Analysis Name: Aldehyde-DNPH									
Acetaldehyde (75-07-0)	Yes	Yes	4.5			6.2			
Acetone (67-64-1)					120	160	150	3.8	21
Formaldehyde (50-00-0) **	Yes	Yes	16.5	1,100	8.3	11	12	0.29	1.7
Analysis Name: TVOC									
TVOC					14	56	6.3	0.16	0.91

* Results for chemicals marked with an asterisk were calculated based on internal standard (chlorobenzene-d5).

**CREL Note: Based on 1/2 of a total maximum of 27 ppb from all sources. The 27 ppb guideline is based on OEHHA's current acute 1-hour Reference Exposure Level (REL) of 76 ppb (94 µg/m^3), extrapolated to an 8-hour exposure period.

Analytical Results Summary

Sample Information

Sample ID: 61

Material Type:	Plastic Laminant Assembly	Date Manufactured:	03/14/2003
Manufacturer:	M30	Date Arrived:	03/14/2003
Product Name:	SPASM61M30	Date Conditioning Started:	03/14/2003
Adhesive Used:	Yes	Date Test Started:	03/24/2003

Sample Analyzed in Duplicate? No

Chamber: 1

Compound Name (CAS Number)	Prop. 65 Chemical	ARB TAC	1/2 CREL (ug/m^3)	Olfactory Threshold (ug/m^3)	Emission Factors ($ug/(m^2*hr)$) 24-Hr	48-Hr	96-Hr	96-Hr. Air Conc. (ug/m^3) Class-room	Office
Analysis Name: VOCs-Thermal Desorption - GC/MS									
2-Chloro-1,3-butadiene (126-99-8) *					8.9	6.6	5.7	0.29	1.6
2-Hydroxybenzaldehyde (90-02-8) *				38	3.0	2.6	1.8	0.093	0.50
Decanal (112-31-2) *				5.9	5.2	3.6	2.1	0.11	0.58
Longifolene (475-20-7) *					13	8.9	10	0.53	2.8
Nonanal (124-19-6) *				13	5.6	4.6	2.5	0.13	0.67
Phenol (108-95-2)		Yes	100	430	22	19	19	0.97	5.1
Toluene (108-88-3)		Yes	150		52	38	30	1.5	8.2
Undecane (1120-21-4)				7,800	3.2				

* Results for chemicals marked with an asterisk were calculated based on internal standard (chlorobenzene-d5).
In addition to the chemicals listed above, several unidentified chlorinated hydrocarbons were emitted.

Analysis Name: Aldehyde-DNPH									
Acetaldehyde (75-07-0)	Yes	Yes	4.5		3.5	4.3			
Acetone (67-64-1)					11	12	4.8	0.25	1.3
Formaldehyde (50-00-0) **	Yes	Yes	16.5	1,100	100	88			

**CREL Note: Based on 1/2 of a total maximum of 27 ppb from all sources. The 27 ppb guideline is based on OEHHA's current acute 1-hour Reference Exposure Level (REL) of 76 ppb (94 $\mu g/m^3$), extrapolated to an 8-hour exposure period.

Analysis Name: TVOC									
TVOC					450	340	300	16	83

Analytical Results Summary

Sample Information

Sample ID: 62

Material Type:	Plastic Laminant Assembly	Date Manufactured:	09/07/2002
Manufacturer:	M30	Date Arrived:	09/07/2002
Product Name:	SPASM62M30	Date Conditioning Started:	09/07/2002
Adhesive Used:	Yes	Date Test Started:	09/17/2002

Sample Analyzed in Duplicate? Yes

Chamber: 1

Compound Name (CAS Number)	Prop. 65 Chemical	ARB TAC	1/2 CREL (ug/m^3)	Olfactory Threshold (ug/m^3)	Emission Factors ($ug/(m^2*hr)$) 24-Hr	48-Hr	96-Hr	96-Hr. Air Conc. (ug/m^3) Class-room	Office
Analysis Name: VOCs-Thermal Desorption - GC/MS									
2-Chloro-1,3-butadiene (126-99-8) *					3.5	16	2.7	0.14	0.74
Decane (124-18-5)				4,400	2.5	3.4			
Ethyl Benzene (100-41-4)		Yes	1000	13	1.9	2.2			
m/p-Xylene (108-38-3/106-42-3)		Yes	350	2,100	2.0	2.5			
Nonane (111-84-2)					1.7	2.0			
Phenol (108-95-2)		Yes	100	430	5.5	16	4.4	0.23	1.2
Toluene (108-88-3)		Yes	150		220	910	91	4.7	25
Undecane (1120-21-4)				7,800		3.5			
Analysis Name: Aldehyde-DNPH									
Acetaldehyde (75-07-0)	Yes	Yes	4.5		0.49	1.5			
Acetone (67-64-1)					28	29	32	1.6	8.7
Formaldehyde (50-00-0) **	Yes	Yes	16.5	1,100	12	12	14	0.72	3.9
Analysis Name: TVOC									
TVOC					750	2,900	310	16	86

* Results for chemicals marked with an asterisk were calculated based on internal standard (chlorobenzene-d5).
In addition to the chemicals listed above, several unidentified chlorinated hydrocarbons were emitted.

**CREL Note: Based on 1/2 of a total maximum of 27 ppb from all sources. The 27 ppb guideline is based on OEHHA's current acute 1-hour Reference Exposure Level (REL) of 76 ppb (94 $\mu g/m^3$), extrapolated to an 8-hour exposure period.

Analytical Results Summary

Sample Information

Sample ID: 62

Material Type:	Plastic Laminant Assembly	Date Manufactured:	09/07/2002
Manufacturer:	M30	Date Arrived:	09/07/2002
Product Name:	SPASM62M30	Date Conditioning Started:	09/07/2002
Adhesive Used:	Yes	Date Test Started:	09/17/2002

Sample Analyzed in Duplicate? Yes

Chamber: 2

Compound Name (CAS Number)	Prop. 65 Chemical	ARB TAC	1/2 CREL (ug/m^3)	Olfactory Threshold (ug/m^3)	Emission Factors ($ug/(m^2*hr)$) 24-Hr	48-Hr	96-Hr	96-Hr. Air Conc. (ug/m^3) Class-room	Office
Analysis Name: VOCs-Thermal Desorption - GC/MS									
2-Chloro-1,3-butadiene (126-99-8) *					22	87	120	6.0	32
Decane (124-18-5)				4,400	2.8	5.3			
Ethyl Benzene (100-41-4)		Yes	1000	13	2.0	2.5			
m/p-Xylene (108-38-3/106-42-3)		Yes	350	2,100	2.2	3.0			
Nonane (111-84-2)					1.7				
Phenol (108-95-2)		Yes	100	430	5.4	14	4.5	0.23	1.2
Toluene (108-88-3)		Yes	150		280	840	110	5.6	30
Undecane (1120-21-4)				7,800	3.3	4.7			

* Results for chemicals marked with an asterisk were calculated based on internal standard (chlorobenzene-d5).
In addition to the chemicals listed above, several unidentified chlorinated hydrocarbons were emitted.

Analysis Name: Aldehyde-DNPH									
Acetone (67-64-1)					27	21	20	1.0	5.6
Formaldehyde (50-00-0) **	Yes	Yes	16.5	1,100	26	29	29	1.5	8.0

**CREL Note: Based on 1/2 of a total maximum of 27 ppb from all sources. The 27 ppb guideline is based on OEHHA's current acute 1-hour Reference Exposure Level (REL) of 76 ppb (94 $\mu g/m^3$), extrapolated to an 8-hour exposure period.

Analysis Name: TVOC									
TVOC					750	2,900	310	16	86

Appendix I

Analytical Results Summary for Resilient Flooring (Non-Rubber-Based)

Analytical Results Summary

Sample Information

Sample ID: 11

Material Type:	Resilient Flooring	Date Manufactured:	Not Known
Manufacturer:	M5	Date Arrived:	11/05/2001
Product Name:	SRFT11M5	Date Conditioning Started:	12/28/2001
Adhesive Used:	Yes	Date Test Started:	01/07/2002

Sample Analyzed in Duplicate? Yes

Chamber: 1

Compound Name (CAS Number)	Prop. 65 Chemical	ARB TAC	1/2 CREL (ug/m^3)	Olfactory Threshold (ug/m^3)	Emission Factors ($ug/(m^2*hr)$) 24-Hr	48-Hr	96-Hr	96-Hr. Air Conc. (ug/m^3) Class-room	Office
Analysis Name: VOCs-Thermal Desorption - GC/MS									
Cyclohexanone (108-94-1)				2,900		17			
Unidentified Peak *					140	620	130	60	68

* Results for chemicals marked with an asterisk were calculated based on internal standard (chlorobenzene-d5).

Analysis Name: TVOC									
TVOC					240	740	270	130	150

Analytical Results Summary

Sample Information

Sample ID: 11

Material Type:	Resilient Flooring	Date Manufactured:	Not Known
Manufacturer:	M5	Date Arrived:	11/05/2001
Product Name:	SRFT11M5	Date Conditioning Started:	12/28/2001
Adhesive Used:	Yes	Date Test Started:	01/07/2002

Sample Analyzed in Duplicate? Yes

Chamber: 2

Compound Name (CAS Number)	Prop. 65 Chemical	ARB TAC	1/2 CREL (ug/m3)	Olfactory Threshold (ug/m3)	Emission Factors (ug/(m2*hr)) 24-Hr	48-Hr	96-Hr	96-Hr. Air Conc. (ug/m3) Class-room	Office
Analysis Name: VOCs-Thermal Desorption - GC/MS									
2-Ethoxy Ethyl Acetate (111-15-9)	Yes		150	1,000		20			
Cyclohexanone (108-94-1)				2,900		13			
Nonane (111-84-2)						5.3			
Unidentified Peak *					260	1,000	330	160	180

* Results for chemicals marked with an asterisk were calculated based on internal standard (chlorobenzene-d5).

Analysis Name: TVOC									
TVOC					390	1,500	330	160	180

Analytical Results Summary

Sample Information

Sample ID: 12

Material Type:	Resilient Flooring	Date Manufactured:	Not Known
Manufacturer:	M6	Date Arrived:	01/09/2002
Product Name:	ARF12M6	Date Conditioning Started:	01/11/2002
Adhesive Used:	Yes	Date Test Started:	01/22/2002

Sample Analyzed in Duplicate? No

Chamber: 1

Compound Name (CAS Number)	Prop. 65 Chemical	ARB TAC	1/2 CREL (ug/m^3)	Olfactory Threshold (ug/m^3)	Emission Factors ($ug/(m^2*hr)$) 24-Hr	48-Hr	96-Hr	96-Hr. Air Conc. (ug/m^3) Class-room	Office
Analysis Name: VOCs-Thermal Desorption - GC/MS									
2-Butoxy-Ethanol (111-76-2) *		Yes		1,700	17	21	24	12	13
2-Ethoxy Ethyl Acetate (111-15-9)	Yes		150	1,000	9.3	9.3	9.3	4.4	5.0
2-pyrrolidinone (616-45-5) *					6.6		12	5.8	6.6
Benzaldehyde (100-52-7) *				190	11	13	15	7.2	8.2
Benzene (71-43-2)	Yes	Yes	30		39	34			
Butyl Cyclohexane (1678-93-9)					5.4	5.4	5.5	2.6	3.0
Cyclohexanone (108-94-1)				2,900	4.8	5.0			
Ethyl Benzene (100-41-4)		Yes	1000	13	6.1	6.3	5.9	2.8	3.2
Ethylene Glycol (107-21-1)		Yes	200		190	210	210	100	110
Heptanoic Acid (111-14-8) *				150	24	27	27	13	14
Hexanal (66-25-1) *				58	110	110	120	56	64
Isopropyl Alcohol (67-63-0)		Yes	3500		8.2	7.8	7.5	3.6	4.0
m/p-Xylene (108-38-3/106-42-3)		Yes	350	2,100	4.2	5.0			
Methylene Chloride (75-09-2)	Yes	Yes	200		9.4	8.9			
Naphthalene (91-20-3)		Yes	4.5	79	6.7	6.7	6.7	3.2	3.6
n-Heptane (142-82-5)						22	21	9.9	11
Nonanal (124-19-6) *				13	19	20	19	9.2	10
Nonane (111-84-2)					6.4	6.6			
Nonanoic Acid (112-05-0) *				13	8.8	11	14	6.7	7.6
Octanal (124-13-0) *				7.2	27	29	28	13	15
Octanoic Acid (124-07-2) *				24	26	30	32	15	17
o-Xylene (95-47-6)		Yes	350	3,800	8.0	7.7			
Pentanal (110-62-3) *				22	17	20	23	11	12
Pentanoic Acid (109-52-4) *				20	15	16	18	8.6	9.8
Styrene (100-42-5)		Yes	450	630	5.3	5.4	5.4	2.6	2.9
Toluene (108-88-3)		Yes	150		49	43	7.7	3.7	4.2
Undecane (1120-21-4)				7,800		8.6	8.2	3.9	4.4

* Results for chemicals marked with an asterisk were calculated based on internal standard (chlorobenzene-d5).

Analytical Results Summary

Sample Information

Material Type:	Resilient Flooring	Sample ID:	12
Manufacturer:	M6	Date Manufactured:	Not Known
Product Name:	ARF12M6	Date Arrived:	01/09/2002
Adhesive Used:	Yes	Date Conditioning Started:	01/11/2002
Sample Analyzed in Duplicate?	No	Date Test Started:	01/22/2002

Chamber: 1

Compound Name (CAS Number)	Prop. 65 Chemical	ARB TAC	1/2 CREL (ug/m^3)	Olfactory Threshold (ug/m^3)	Emission Factors ($ug/(m^2*hr)$) 24-Hr	48-Hr	96-Hr	96-Hr. Air Conc. (ug/m^3) Class-room	Office
Analysis Name: Aldehyde-DNPH									
Acetaldehyde (75-07-0)	Yes	Yes	4.5		48	54	49	23	26
Acetone (67-64-1)					63	48	47	22	25
Hexanal (66-25-1)				58	53	57	53	25	29
Propionaldehyde (123-38-6)		Yes			87	73	91	43	49
Analysis Name: TVOC									
TVOC					880	900	840	400	450

**CREL Note: Based on 1/2 of a total maximum of 27 ppb from all sources. The 27 ppb guideline is based on OEHHA's current acute 1-hour Reference Exposure Level (REL) of 76 ppb (94 µg/m3), extrapolated to an 8-hour exposure period.
2) Hexanal and other long-chain aldehydes can be detected by both the GC/MS and HPLC methods. The GC/MS method is more sensitive than the HPLC method; however, the air concentration for hexanal derived from the HPLC method is more accurate as the GC/MS amount was based on the internal standard (chlorobenzene-d5) while the HPLC amount is based on the calibration curve for hexanal.

Analytical Results Summary

Sample Information

Sample ID: 13

Material Type:	Resilient Flooring	Date Manufactured:	Not Known
Manufacturer:	M5	Date Arrived:	11/30/2001
Product Name:	SRF13M5	Date Conditioning Started:	01/11/2002
Adhesive Used:	Yes	Date Test Started:	01/22/2002

Sample Analyzed in Duplicate? No

Chamber: 2

Compound Name (CAS Number)	Prop. 65 Chemical	ARB TAC	1/2 CREL (ug/m^3)	Olfactory Threshold (ug/m^3)	Emission Factors ($ug/(m^2*hr)$) 24-Hr	48-Hr	96-Hr	96-Hr. Air Conc. (ug/m^3) Class-room	Office
Analysis Name: VOCs-Thermal Desorption - GC/MS									
1-(2-Methoxypropoxy)-2-Propanol (13429-07-7) *					140	160	140	65	74
1,3,5-Trimethyl Benzene (108-67-8)				1,200		5.4			
1-Tetradecene (1120-36-1) *					160	190	160	75	85
3,3'-Oxybis-2-Butanol (54305-61-2) *					200	220	190	90	100
4-Methyl-2-Dodecene (56851-45-7) *					260	290	250	120	130
Benzene (71-43-2)	Yes	Yes	30		46	35	6.1	2.9	3.3
Butyl Cyclohexane (1678-93-9)						4.1	4.1	2.0	2.2
Decane (124-18-5)				4,400	6.7	8.9	9.5	4.5	5.1
Dipropylene Glycol (106-62-7) *					110	120	110	52	58
Ethyl Benzene (100-41-4)		Yes	1000	13	6.1	6.1	5.8	2.7	3.1
Ethylene Glycol (107-21-1)		Yes	200		140	140			
Isopropyl Alcohol (67-63-0)		Yes	3500		8.9	8.6	7.9	3.7	4.2
m/p-Xylene (108-38-3/106-42-3)		Yes	350	2,100	4.5	4.4			
Methylene Chloride (75-09-2)	Yes	Yes	200		10	9.1			
Nonane (111-84-2)					8.6	8.9	5.6	2.7	3.0
o-Xylene (95-47-6)		Yes	350	3,800	8.7	7.6	5.4	2.6	2.9
Phenol (108-95-2)		Yes	100	430	11	11	10.0	4.8	5.4
Styrene (100-42-5)		Yes	450	630	6.3	7.3	7.5	3.6	4.1
Toluene (108-88-3)		Yes	150		58	44	8.8	4.2	4.8
trans-2-Methyl-3-Heptene (692-96-6) *					180	180	170	83	94
trans-3-Octene (14419-01-8) *					180	200	110	52	58
Undecane (1120-21-4)				7,800	5.2	5.8	5.8	2.7	3.1

* Results for chemicals marked with an asterisk were calculated based on internal standard (chlorobenzene-d5).

Analysis Name: Aldehyde-DNPH									
Acetaldehyde (75-07-0)	Yes	Yes	4.5			18			
Analysis Name: TVOC									
TVOC					2,200	2,400	2,100	980	1,100

Analytical Results Summary

Sample Information

Sample ID: 14

Material Type:	Resilient Flooring	Date Manufactured:	Not Known
Manufacturer:	M7	Date Arrived:	11/27/2001
Product Name:	ARFT14M7	Date Conditioning Started:	01/04/2002
Adhesive Used:	No	Date Test Started:	01/14/2002

Sample Analyzed in Duplicate? No

Chamber: 1

Compound Name (CAS Number)	Prop. 65 Chemical	ARB TAC	1/2 CREL (ug/m^3)	Olfactory Threshold (ug/m^3)	Emission Factors ($ug/(m^2*hr)$) 24-Hr	48-Hr	96-Hr	96-Hr. Air Conc. (ug/m^3) Class-room	Office
Analysis Name: VOCs-Thermal Desorption - GC/MS									
2-(2-Butoxyethoxy) Ethanol (112-34-5) *		Yes			110	90	81	38	44
2-Ethyl Hexanoic Acid (149-57-5) *					160	130	130	63	72
Benzene (71-43-2)	Yes	Yes	30		6.3	6.2	6.2	2.9	3.3
Butyl Cyclohexane (1678-93-9)						4.0			
Ethyl Benzene (100-41-4)		Yes	1000	13	5.5	5.5			
Ethylene Glycol (107-21-1)		Yes	200		130	130	130	61	69
Isopropyl Alcohol (67-63-0)		Yes	3500		8.0	7.3	7.0	3.3	3.8
m/p-Xylene (108-38-3/106-42-3)		Yes	350	2,100	3.9				
Naphthalene (91-20-3)		Yes	4.5	79	6.7	6.6	6.9	3.3	3.7
Nonane (111-84-2)					2.7	2.6			
o-Xylene (95-47-6)		Yes	350	3,800	5.4				
Pentadecane (629-62-9) *					210	170	150	70	80
Phenol (108-95-2)		Yes	100	430	410	340	310	150	170
Tetradecane (629-59-4) *					220	180	170	79	90
Toluene (108-88-3)		Yes	150		9.8	8.0	8.1	3.8	4.4
Undecane (1120-21-4)				7,800	25	21	21	9.9	11

* Results for chemicals marked with an asterisk were calculated based on internal standard (chlorobenzene-d5).

Analysis Name: TVOC									
TVOC					2,600	2,000	1,800	870	990

Analytical Results Summary

Sample Information

Sample ID: 15

Material Type:	Resilient Flooring	Date Manufactured:	Not Known
Manufacturer:	M8	Date Arrived:	12/11/2001
Product Name:	ARFT15M8	Date Conditioning Started:	01/04/2002
Adhesive Used:	Yes	Date Test Started:	01/14/2002

Sample Analyzed in Duplicate? No

Chamber: 2

Compound Name (CAS Number)	Prop. 65 Chemical	ARB TAC	1/2 CREL (ug/m^3)	Olfactory Threshold (ug/m^3)	Emission Factors ($ug/(m^2*hr)$) 24-Hr	48-Hr	96-Hr	96-Hr. Air Conc. (ug/m^3) Class-room	Office
Analysis Name: VOCs-Thermal Desorption - GC/MS									
2,2,4,6,6-pentamethylheptane (13475-82-6) *					16	16	14	6.6	7.4
a-Methyl-styrene (98-83-9) *				760	28	37	40	19	22
Benzene (71-43-2)	Yes	Yes	30		6.3	6.3	6.2	2.9	3.3
Ethyl Benzene (100-41-4)		Yes	1000	13	5.9	5.9	5.8	2.8	3.1
Isopropyl Alcohol (67-63-0)		Yes	3500		8.5	7.8	7.2	3.4	3.9
m/p-Xylene (108-38-3/106-42-3)		Yes	350	2,100		5.8	5.7	2.7	3.1
Naphthalene (91-20-3)		Yes	4.5	79	6.7	6.7	6.7	3.2	3.6
n-Hexane (110-54-3)		Yes	3500		9.5	9.5	9.2	4.4	5.0
o-Xylene (95-47-6)		Yes	350	3,800	5.7	5.7	5.7	2.7	3.1
Phenol (108-95-2)		Yes	100	430	6.2	5.3	6.5	3.1	3.5
Toluene (108-88-3)		Yes	150		10	8.3	8.1	3.9	4.4

* Results for chemicals marked with an asterisk were calculated based on internal standard (chlorobenzene-d5).

Analysis Name: TVOC									
TVOC					72	93	110	50	57

Analytical Results Summary

Sample Information

Sample ID: 79

Material Type:	Resilient Flooring	Date Manufactured:	06/15/2002
Manufacturer:	M44	Date Arrived:	12/05/2002
Product Name:	SRFT79M44	Date Conditioning Started:	12/06/2002
Adhesive Used:	Yes	Date Test Started:	12/16/2002

Sample Analyzed in Duplicate? Yes

Chamber: 1

Compound Name (CAS Number)	Prop. 65 Chemical	ARB TAC	1/2 CREL (ug/m^3)	Olfactory Threshold (ug/m^3)	Emission Factors ($ug/(m^2*hr)$) 24-Hr	48-Hr	96-Hr	96-Hr. Air Conc. (ug/m^3) Class-room	Office
Analysis Name: VOCs-Thermal Desorption - GC/MS									
Decanal (112-31-2) *				5.9	10				
Indene (95-13-6) *				43	7.6	7.8	8.6	4.1	4.7
Naphthalene (91-20-3)		Yes	4.5	79	11	11	13	6.1	6.9
Nonanal (124-19-6) *				13	9.8				
Octanal (124-13-0) *				7.2	5.3				
Pentadecane (629-62-9) *					43	35	44	21	24
Phenol (108-95-2)		Yes	100	430	24	20	22	11	12
Styrene (100-42-5)		Yes	450	630	7.3	7.3	7.6	3.6	4.1
Tetradecane (629-59-4) *					49	41	54	26	29
Toluene (108-88-3)		Yes	150		5.1				
Tridecane (629-59-4) *					28	24	32	15	17
Trimethyl Silanol (1066-40-6) *					6.0	5.7			

* Results for chemicals marked with an asterisk were calculated based on internal standard (chlorobenzene-d5).

Compound Name (CAS Number)	Prop. 65 Chemical	ARB TAC	1/2 CREL (ug/m^3)	Olfactory Threshold (ug/m^3)	Emission Factors ($ug/(m^2*hr)$) 24-Hr	48-Hr	96-Hr	96-Hr. Air Conc. (ug/m^3) Class-room	Office
Analysis Name: Aldehyde-DNPH									
Acetone (67-64-1)					5,100	480	830	390	450
Formaldehyde (50-00-0) **	Yes	Yes	16.5	1,100	140	87	79	38	43

**CREL Note: Based on 1/2 of a total maximum of 27 ppb from all sources. The 27 ppb guideline is based on OEHHA's current acute 1-hour Reference Exposure Level (REL) of 76 ppb (94 $\mu g/m^3$), extrapolated to an 8-hour exposure period.

Compound Name (CAS Number)	Prop. 65 Chemical	ARB TAC	1/2 CREL (ug/m^3)	Olfactory Threshold (ug/m^3)	Emission Factors ($ug/(m^2*hr)$) 24-Hr	48-Hr	96-Hr	96-Hr. Air Conc. (ug/m^3) Class-room	Office
Analysis Name: TVOC									
TVOC					390	280	400	190	220

Analytical Results Summary

Sample Information

Sample ID: 79

Material Type:	Resilient Flooring	Date Manufactured:	06/15/2002
Manufacturer:	M44	Date Arrived:	12/05/2002
Product Name:	SRFT79M44	Date Conditioning Started:	12/06/2002
Adhesive Used:	Yes	Date Test Started:	12/16/2002

Sample Analyzed in Duplicate? Yes

Chamber: 2

Compound Name (CAS Number)	Prop. 65 Chemical	ARB TAC	1/2 CREL (ug/m^3)	Olfactory Threshold (ug/m^3)	Emission Factors ($ug/(m^2*hr)$) 24-Hr	48-Hr	96-Hr	96-Hr. Air Conc. (ug/m^3) Class-room	Office
Analysis Name: VOCs-Thermal Desorption - GC/MS									
Decanal (112-31-2) *				5.9	21				
Indene (95-13-6) *				43	8.5	8.9	9.1	4.4	4.9
Naphthalene (91-20-3)		Yes	4.5	79	12	13	14	6.5	7.4
Nonanal (124-19-6) *				13	17	5.8			
Pentadecane (629-62-9) *					72	57	57	27	31
Phenol (108-95-2)		Yes	100	430	31	29	28	13	15
Styrene (100-42-5)		Yes	450	630	8.0	8.1	8.0	3.8	4.3
Tetradecane (629-59-4) *					94	73	67	32	36
Toluene (108-88-3)		Yes	150		5.0				
Trichloroethylene (79-01-6)	Yes	Yes	300		3.9	3.1			
Tridecane (629-59-4) *					56	44	40	19	22

* Results for chemicals marked with an asterisk were calculated based on internal standard (chlorobenzene-d5).

Compound Name (CAS Number)	Prop. 65 Chemical	ARB TAC	1/2 CREL (ug/m^3)	Olfactory Threshold (ug/m^3)	Emission Factors ($ug/(m^2*hr)$) 24-Hr	48-Hr	96-Hr	96-Hr. Air Conc. (ug/m^3) Class-room	Office
Analysis Name: Aldehyde-DNPH									
Acetone (67-64-1)					1,300	930	270	130	150
Formaldehyde (50-00-0) **	Yes	Yes	16.5	1,100	79	77	47	22	25

**CREL Note: Based on 1/2 of a total maximum of 27 ppb from all sources. The 27 ppb guideline is based on OEHHA's current acute 1-hour Reference Exposure Level (REL) of 76 ppb (94 µg/m^3), extrapolated to an 8-hour exposure period.

Compound Name (CAS Number)	Prop. 65 Chemical	ARB TAC	1/2 CREL (ug/m^3)	Olfactory Threshold (ug/m^3)	Emission Factors ($ug/(m^2*hr)$) 24-Hr	48-Hr	96-Hr	96-Hr. Air Conc. (ug/m^3) Class-room	Office
Analysis Name: TVOC									
TVOC					390	280	400	190	220

Analytical Results Summary

Sample Information

Sample ID: 80

Material Type:	Resilient Flooring	Date Manufactured:	12/21/2000
Manufacturer:	M46	Date Arrived:	11/25/2002
Product Name:	SRFT80M46	Date Conditioning Started:	12/27/2002
Adhesive Used:	Yes	Date Test Started:	01/06/2003

Sample Analyzed in Duplicate? No

Chamber: 1

Compound Name (CAS Number)	Prop. 65 Chemical	ARB TAC	1/2 CREL (ug/m^3)	Olfactory Threshold (ug/m^3)	Emission Factors (ug/(m^2*hr)) 24-Hr	48-Hr	96-Hr	96-Hr. Air Conc. (ug/m^3) Class-room	Office
Analysis Name: VOCs-Thermal Desorption - GC/MS									
Benzaldehyde (100-52-7) *				190	11	9.6	8.2	3.9	4.5
Benzyl Alcohol (100-51-6) *					110	110	82	39	44
Methyl Isobutyl Ketone (108-10-1) *		Yes			20	20	16	7.6	8.6
Nonanal (124-19-6) *				13	14	11	11	5.5	6.2
Trichloroethylene (79-01-6)	Yes	Yes	300		1.2				
* Results for chemicals marked with an asterisk were calculated based on internal standard (chlorobenzene-d5).									
Analysis Name: Aldehyde-DNPH									
Acetaldehyde (75-07-0)	Yes	Yes	4.5				2.9	1.4	1.6
Acetone (67-64-1)					190	110	72	34	39
Formaldehyde (50-00-0) **	Yes	Yes	16.5	1,100			1.1	0.52	0.59
**CREL Note: Based on 1/2 of a total maximum of 27 ppb from all sources. The 27 ppb guideline is based on OEHHA's current acute 1-hour Reference Exposure Level (REL) of 76 ppb (94 µg/m^3), extrapolated to an 8-hour exposure period.									
Analysis Name: TVOC									
TVOC					740	370	270	130	150

Analytical Results Summary

Sample Information

Sample ID: 81

Material Type:	Resilient Flooring	Date Manufactured:	10/15/2002
Manufacturer:	M45	Date Arrived:	12/17/2002
Product Name:	ARFT81M45	Date Conditioning Started:	12/27/2002
Adhesive Used:	Yes	Date Test Started:	01/06/2003

Sample Analyzed in Duplicate? No

Chamber: 2

Compound Name (CAS Number)	Prop. 65 Chemical	ARB TAC	1/2 CREL (ug/m^3)	Olfactory Threshold (ug/m^3)	Emission Factors ($ug/(m^2*hr)$) 24-Hr	48-Hr	96-Hr	96-Hr. Air Conc. (ug/m^3) Class-room	Office
Analysis Name: VOCs-Thermal Desorption - GC/MS									
2-dimethylamino-ethanol (108-01-0) *					34	220	250	120	140
2-Ethyl-1-hexanol (104-76-7) *				1,300	15	20	21	9.8	11
Decanal (112-31-2) *				5.9	7.6	3.3	6.9	3.3	3.7
Methyl Isobutyl Ketone (108-10-1) *		Yes			14	21	21	10	11
Nonanal (124-19-6) *				13	7.6	3.5	7.1	3.4	3.8
Toluene (108-88-3)		Yes	150		15	15	12	5.7	6.5
Trimethyl Silanol (1066-40-6) *					56	54	66	32	36

* Results for chemicals marked with an asterisk were calculated based on internal standard (chlorobenzene-d5).

Compound Name (CAS Number)	Prop. 65 Chemical	ARB TAC	1/2 CREL (ug/m^3)	Olfactory Threshold (ug/m^3)	Emission Factors ($ug/(m^2*hr)$) 24-Hr	48-Hr	96-Hr	96-Hr. Air Conc. (ug/m^3) Class-room	Office
Analysis Name: Aldehyde-DNPH									
Acetaldehyde (75-07-0)	Yes	Yes	4.5			2.1			
Acetone (67-64-1)					290	250	240	110	130
Formaldehyde (50-00-0) **	Yes	Yes	16.5	1,100	13	22	1.6	0.75	0.85

**CREL Note: Based on 1/2 of a total maximum of 27 ppb from all sources. The 27 ppb guideline is based on OEHHA's current acute 1-hour Reference Exposure Level (REL) of 76 ppb (94 $\mu g/m^3$), extrapolated to an 8-hour exposure period.

Compound Name (CAS Number)	Prop. 65 Chemical	ARB TAC	1/2 CREL (ug/m^3)	Olfactory Threshold (ug/m^3)	Emission Factors ($ug/(m^2*hr)$) 24-Hr	48-Hr	96-Hr	96-Hr. Air Conc. (ug/m^3) Class-room	Office
Analysis Name: TVOC									
TVOC					430	530	570	270	310

Analytical Results Summary

Sample Information

Sample ID: 87

Material Type:	Resilient Flooring	Date Manufactured:	11/24/2002
Manufacturer:	M46	Date Arrived:	01/15/2003
Product Name:	SRFT87M46	Date Conditioning Started:	01/17/2003
Adhesive Used:	Yes	Date Test Started:	01/27/2003

Sample Analyzed in Duplicate? No

Chamber: 2

Compound Name (CAS Number)	Prop. 65 Chemical	ARB TAC	1/2 CREL (ug/m^3)	Olfactory Threshold (ug/m^3)	Emission Factors ($ug/(m^2*hr)$) 24-Hr	48-Hr	96-Hr	96-Hr. Air Conc. (ug/m^3) Class-room	Office
Analysis Name: VOCs-Thermal Desorption - GC/MS									
1-(2-Methoxypropoxy)-2-Propanol (13429-07-7) *					13		7.7	3.7	4.2
2-Hydroxybenzaldehyde (90-02-8) *				38	7.1	5.7			
Benzyl Alcohol (100-51-6) *					19	51	13	6.1	6.9
Decanal (112-31-2) *				5.9	21	7.9	11	5.1	5.8
Nonanal (124-19-6) *				13	17	8.8	10	4.9	5.6
Octanal (124-13-0) *				7.2	10	7.5	5.5	2.6	3.0
Styrene (100-42-5)		Yes	450	630	7.2	8.1	7.3	3.5	3.9
Toluene (108-88-3)		Yes	150		5.5	5.5	5.8	2.7	3.1
Trimethyl Silanol (1066-40-6) *					4.3	6.2	6.0	2.9	3.3
Analysis Name: Aldehyde-DNPH									
Acetaldehyde (75-07-0)	Yes	Yes	4.5		18	15	15	7.3	8.3
Analysis Name: TVOC									
TVOC					130	190	100	48	54

* Results for chemicals marked with an asterisk were calculated based on internal standard (chlorobenzene-d5).

Analytical Results Summary

Sample Information

Sample ID: 90

Material Type:	Resilient Flooring	Date Manufactured:	Not Known
Manufacturer:	M5	Date Arrived:	12/06/2002
Product Name:	ARF90M5	Date Conditioning Started:	02/17/2003
Adhesive Used:	Yes	Date Test Started:	03/03/2003

Sample Analyzed in Duplicate? No

Chamber: 1

Compound Name (CAS Number)	Prop. 65 Chemical	ARB TAC	1/2 CREL (ug/m^3)	Olfactory Threshold (ug/m^3)	Emission Factors ($ug/(m^2*hr)$) 24-Hr	48-Hr	96-Hr	96-Hr. Air Conc. (ug/m^3) Class-room	Office
Analysis Name: VOCs-Thermal Desorption - GC/MS									
Acetic Acid (64-19-7) *				360	9.5	5.0			
Benzaldehyde (100-52-7) *				190	7.5				
Butanoic Acid (107-92-6) *				14	17	12	5.1	2.4	2.7
Decanal (112-31-2) *				5.9	18	11	7.6	3.6	4.1
Ethylene Glycol (107-21-1)		Yes	200		130	130			
Heptanal (111-71-7) *				23		6.0	5.2	2.5	2.8
Heptanoic Acid (111-14-8) *				150	12	7.7	12	5.8	6.6
Hexanal (66-25-1) *				58	30	31	16	7.6	8.7
Hexanoic Acid (142-62-1) *				60	81	51	16	7.8	8.8
Nonanal (124-19-6) *				13	29	19	9.6	4.6	5.2
Nonanoic Acid (112-05-0) *				13	8.8	5.7	2.5	1.2	1.4
Octanal (124-13-0) *				7.2	28	15	24	12	13
Octane (111-65-9) *					8.6	9.0	17	8.0	9.1
Octanoic Acid (124-07-2) *				24	27				
Pentanal (110-62-3) *				22	9.1	12	8.6	4.1	4.7
Pentanoic Acid (109-52-4) *				20	16	10	6.6	3.1	3.6
Propanoic Acid (79-09-4) *				110	35	21	13	6.3	7.1
trans-2-Decenal (3913-71-1) *				2.3	18	13	9.1	4.3	4.9
Trimethyl Silanol (1066-40-6) *					2.8	2.8	2.0	0.95	1.1

* Results for chemicals marked with an asterisk were calculated based on internal standard (chlorobenzene-d5).

Analysis Name: Aldehyde-DNPH									
Acetaldehyde (75-07-0)	Yes	Yes	4.5		33	35	41	20	22
Acetone (67-64-1)					52	61	280	130	150
Analysis Name: Aldehyde-DNPH									
Butyraldehyde (123-72-8)				28	5.3	9.2			
Formaldehyde (50-00-0) **	Yes	Yes	16.5	1,100	4.7	1.2	1.9	0.92	1.0
Propionaldehyde (123-38-6)		Yes			29	50	64	31	35

**CREL Note: Based on 1/2 of a total maximum of 27 ppb from all sources. The 27 ppb guideline is based on OEHHA's current acute 1-hour Reference Exposure Level (REL) of 76 ppb (94 $\mu g/m^3$), extrapolated to an 8-hour exposure period.

Analysis Name: TVOC									
TVOC					700	450	290	140	160

Appendix J-1

Analytical Results Summary for Resilient Flooring (Rubber-Based): Classroom and State Office

Analytical Results Summary

Sample Information

Sample ID: 64

Material Type:	Rubberized Resilient Flooring	Date Manufactured:	08/01/2002
Manufacturer:	M36	Date Arrived:	09/03/2002
Product Name:	ARRF64M36	Date Conditioning Started:	09/15/2002
Adhesive Used:	Yes	Date Test Started:	09/30/2002

Sample Analyzed in Duplicate? No

Chamber: 2

Compound Name (CAS Number)	Prop. 65 Chemical	ARB TAC	1/2 CREL (ug/m^3)	Olfactory Threshold (ug/m^3)	Emission Factors ($ug/(m^2*hr)$) 24-Hr	48-Hr	96-Hr	96-Hr. Air Conc. (ug/m^3) Class-room	Office
Analysis Name: VOCs-Thermal Desorption - GC/MS									
2-Ethyl-1-hexanol (104-76-7) *				1,300	88	90	170	83	94
2-Ethylhexyl Acetate (103-09-3) *				2,300	110	110	230	110	120
Benzothiazole (95-16-9) *					110	100	200	94	110
Decanal (112-31-2) *				5.9			7.2	3.4	3.9
Limonene (138-86-3) *				2,500			6.2	3.0	3.3
Methyl Isobutyl Ketone (108-10-1) *		Yes			8.1	7.1			
Nonanal (124-19-6) *				13			11	5.1	5.8
Propylene Glycol (57-55-6) *					280	320	680	330	370
Trimethyl Silanol (1066-40-6) *					7.2	7.6	8.2	3.9	4.4
Unidentified Peak *					14,000	12,000	15,000	7,100	8,000
Analysis Name: TVOC									
TVOC					15,000	13,000	17,000	7,900	9,000

* Results for chemicals marked with an asterisk were calculated based on internal standard (chlorobenzene-d5).
The unidentified peak is probably a long-chain ester.

Analytical Results Summary

Sample Information

Sample ID: 65

Material Type:	Rubberized Resilient Flooring	Date Manufactured:	08/01/2002
Manufacturer:	M36	Date Arrived:	09/03/2002
Product Name:	ARRF65M36	Date Conditioning Started:	09/15/2002
Adhesive Used:	Yes	Date Test Started:	09/30/2002

Sample Analyzed in Duplicate? No

Chamber: 1

Compound Name (CAS Number)	Prop. 65 Chemical	ARB TAC	1/2 CREL (ug/m^3)	Olfactory Threshold (ug/m^3)	Emission Factors ($ug/(m^2*hr)$) 24-Hr	48-Hr	96-Hr	96-Hr. Air Conc. (ug/m^3) Class-room	Office
Analysis Name: VOCs-Thermal Desorption - GC/MS									
2-Ethyl-1-hexanol (104-76-7) *				1,300	50	71	140	67	76
2-Ethylhexyl Acetate (103-09-3) *				2,300	76	51	220	110	120
Benzothiazole (95-16-9) *					30	37	63	30	34
Decanal (112-31-2) *				5.9			6.2	3.0	3.4
Limonene (138-86-3) *				2,500			9.1	4.3	4.9
Methyl Isobutyl Ketone (108-10-1) *		Yes			7.0	7.3	14	6.5	7.3
n-Butyl ether (142-96-1) *				250	4.8	5.0	6.1	2.9	3.3
Nonanal (124-19-6) *				13			10	4.8	5.4
Propylene Glycol (57-55-6) *					66	66	230	110	120
Toluene (108-88-3)		Yes	150		12	11	12	5.5	6.3
Trimethyl Silanol (1066-40-6) *					14	14	17	8.1	9.1
Unidentified Peak *					10,000	11,000	12,000	5,700	6,500
Analysis Name: TVOC									
TVOC					10,000	11,000	13,000	6,300	7,100

* Results for chemicals marked with an asterisk were calculated based on internal standard (chlorobenzene-d5).
The unidentified peak is probably a long-chain ester.

Analytical Results Summary

Sample Information

Sample ID: 66

Material Type:	Rubberized Resilient Flooring	Date Manufactured:	06/01/2002
Manufacturer:	M36	Date Arrived:	09/03/2002
Product Name:	ARRF66M36	Date Conditioning Started:	09/20/2002
Adhesive Used:	Yes	Date Test Started:	10/07/2002

Sample Analyzed in Duplicate? No

Chamber: 1

Compound Name (CAS Number)	Prop. 65 Chemical	ARB TAC	1/2 CREL (ug/m^3)	Olfactory Threshold (ug/m^3)	Emission Factors ($ug/(m^2*hr)$) 24-Hr	48-Hr	96-Hr	96-Hr. Air Conc. (ug/m^3) Class-room	Office
Analysis Name: VOCs-Thermal Desorption - GC/MS									
2-Ethyl-1-hexanol (104-76-7) *				1,300	15	19	26	13	14
2-Ethylhexyl Acetate (103-09-3) *				2,300			17	8.3	9.4
Benzothiazole (95-16-9) *					330	390	400	190	210
Methyl Isobutyl Ketone (108-10-1) *		Yes			73	81	86	41	46
Propylene Glycol (57-55-6) *					140	210	290	140	150
Toluene (108-88-3)		Yes	150		15	15	15	7.1	8.0
Trimethyl Silanol (1066-40-6) *					23	26	25	12	14
Unidentified Peak *					2,800	3,000	3,000	1,500	1,600
Analysis Name: Aldehyde-DNPH									
Acetaldehyde (75-07-0)	Yes	Yes	4.5		19				
Acetone (67-64-1)					19	49	57	27	31
Analysis Name: TVOC									
TVOC					3,800	4,100	4,300	2,100	2,300

* Results for chemicals marked with an asterisk were calculated based on internal standard (chlorobenzene-d5).
The unidentified peak is probably a long-chain ester.

Analytical Results Summary

Sample Information

Sample ID: 67

Material Type:	Rubberized Resilient Flooring	Date Manufactured:	08/01/2002
Manufacturer:	M36	Date Arrived:	09/03/2002
Product Name:	ARRF67M36	Date Conditioning Started:	09/20/2002
Adhesive Used:	Yes	Date Test Started:	10/07/2002

Sample Analyzed in Duplicate? No

Chamber: 2

Compound Name (CAS Number)	Prop. 65 Chemical	ARB TAC	1/2 CREL (ug/m^3)	Olfactory Threshold (ug/m^3)	Emission Factors ($ug/(m^2*hr)$) 24-Hr	48-Hr	96-Hr	96-Hr. Air Conc. (ug/m^3) Class-room	Office
Analysis Name: VOCs-Thermal Desorption - GC/MS									
2-Ethyl-1-hexanol (104-76-7) *				1,300	74	130	120	59	67
2-Ethylhexyl Acetate (103-09-3) *				2,300	61	160	160	78	88
Benzothiazole (95-16-9) *					290	410	280	130	150
Methyl Isobutyl Ketone (108-10-1) *		Yes			26	37	27	13	14
n-Butyl ether (142-96-1) *				250	16	18	11	5.0	5.7
Propylene Glycol (57-55-6) *					160	300	320	150	170
Toluene (108-88-3)		Yes	150		14	14	9.5	4.5	5.1
Trimethyl Silanol (1066-40-6) *					49	58	40	19	21
Unidentified Peak *					17,000	21,000	15,000	7,400	8,400
Analysis Name: Aldehyde-DNPH									
Acetaldehyde (75-07-0)	Yes	Yes	4.5		16	19			
Acetone (67-64-1)					22	0.51	31	15	17
Analysis Name: TVOC									
TVOC					19,000	23,000	17,000	8,100	9,200

* Results for chemicals marked with an asterisk were calculated based on internal standard (chlorobenzene-d5).
The unidentified peak is probably a long-chain ester.

Analytical Results Summary

Sample Information

Sample ID: 70

Material Type:	Rubberized Resilient Flooring	Date Manufactured:	08/01/2002
Manufacturer:	M38	Date Arrived:	09/17/2002
Product Name:	ARRF70M38	Date Conditioning Started:	10/18/2002
Adhesive Used:	Yes	Date Test Started:	10/28/2002

Sample Analyzed in Duplicate? Yes

Chamber: 1

Compound Name (CAS Number)	Prop. 65 Chemical	ARB TAC	1/2 CREL (ug/m^3)	Olfactory Threshold (ug/m^3)	Emission Factors ($ug/(m^2*hr)$) 24-Hr	48-Hr	96-Hr	96-Hr. Air Conc. (ug/m^3) Class-room	Office
Analysis Name: VOCs-Thermal Desorption - GC/MS									
2,2-Dimethyl-1,3-propanediol (126-30-7) *					28	86	53	25	28
2-Ethyl-1-hexanol (104-76-7) *				1,300	9.3	20	34	16	19
2-Ethylhexyl Acetate (103-09-3) *				2,300	6.0	26	74	35	40
Benzaldehyde (100-52-7) *				190	9.5	28	41	20	22
Benzothiazole (95-16-9) *					160	450	590	280	320
Cyclohexanone (108-94-1)				2,900	21	54	54	26	29
Indene (95-13-6) *				43	7.6	8.9	9.0	4.3	4.9
Naphthalene (91-20-3)		Yes	4.5	79	14	22	22	11	12
Octane (111-65-9) *					5.3	19	29	14	16
Propylene Glycol (57-55-6) *					16	110	180	87	98
Styrene (100-42-5)		Yes	450	630	14	28	28	14	15
Trimethyl Silanol (1066-40-6) *					24	88	140	65	74

* Results for chemicals marked with an asterisk were calculated based on internal standard (chlorobenzene-d5).
In addition to the chemicals listed above, small amounts of many hydrocarbons were emitted, including but not limited to, Benzocylcobutane, Benzoic acid, and N-ethyl aniline.

Analysis Name: TVOC									
TVOC					300	1,000	2,000	970	1,100

Analytical Results Summary

Sample Information

Sample ID: 70

Material Type:	Rubberized Resilient Flooring	Date Manufactured:	08/01/2002
Manufacturer:	M38	Date Arrived:	09/17/2002
Product Name:	ARRF70M38	Date Conditioning Started:	10/18/2002
Adhesive Used:	Yes	Date Test Started:	10/28/2002

Sample Analyzed in Duplicate? Yes

Chamber: 2

Compound Name (CAS Number)	Prop. 65 Chemical	ARB TAC	1/2 CREL (ug/m^3)	Olfactory Threshold (ug/m^3)	Emission Factors ($ug/(m^2*hr)$) 24-Hr	48-Hr	96-Hr	96-Hr. Air Conc. (ug/m^3) Class-room	Office
Analysis Name: VOCs-Thermal Desorption - GC/MS									
2,2-Dimethyl-1,3-propanediol (126-30-7) *					15	44	27	13	15
2-Ethyl-1-hexanol (104-76-7) *				1,300	21	87	97	46	52
2-Ethylhexyl Acetate (103-09-3) *				2,300	19	91	160	75	85
Benzaldehyde (100-52-7) *				190	23	56	46	22	25
Benzothiazole (95-16-9) *					210	580	520	250	280
Cyclohexanone (108-94-1)				2,900	38	100	69	33	37
Indene (95-13-6) *				43	8.4	11	9.7	4.6	5.2
Naphthalene (91-20-3)		Yes	4.5	79	19	38	28	13	15
Nonane (111-84-2)							8.2	3.9	4.5
Octane (111-65-9) *					17	49	47	22	25
Propylene Glycol (57-55-6) *					130	440	580	280	310
Styrene (100-42-5)		Yes	450	630	22	51	35	17	19
Trimethyl Silanol (1066-40-6) *					42	110	100	50	56

* Results for chemicals marked with an asterisk were calculated based on internal standard (chlorobenzene-d5).
In addition to the chemicals listed above, small amounts of many hydrocarbons were emitted, including but not limited to, Benzocylcobutane, Benzoic acid, and N-ethyl aniline.

Analysis Name: TVOC								
TVOC				720	2,100	2,500	1,200	1,300

Analytical Results Summary

Sample Information

Sample ID: 71

Material Type:	Rubberized Resilient Flooring	Date Manufactured:	08/20/2002
Manufacturer:	M37	Date Arrived:	08/28/2002
Product Name:	ARRF71M37	Date Conditioning Started:	10/25/2002
Adhesive Used:	Yes	Date Test Started:	11/04/2002

Sample Analyzed in Duplicate? No

Chamber: 1

Compound Name (CAS Number)	Prop. 65 Chemical	ARB TAC	1/2 CREL (ug/m^3)	Olfactory Threshold (ug/m^3)	Emission Factors ($ug/(m^2*hr)$) 24-Hr	48-Hr	96-Hr	96-Hr. Air Conc. (ug/m^3) Class-room	Office
Analysis Name: VOCs-Thermal Desorption - GC/MS									
1,2,3-Trimethylbenzene (526-73-8) *					28	27	88	42	48
1,2,4-Trimethylbenzene (95-36-6) *	Yes	Yes		770	130	120	370	180	200
1,3,5-Trimethyl Benzene (108-67-8)				1,200	21	19	46	22	25
1-Ethyl-2-Methylbenzene (611-11-4) *					39	38	110	54	61
1-Ethyl-3-Methylbenzene (620-14-4) *					160	140	380	180	210
1-Ethyl-4-Methylbenzene (622-96-8) *					98	82	210	100	120
Benzothiazole (95-16-9) *					330	250	540	260	290
Butyl Cyclohexane (1678-93-9)							11	5.3	6.0
Cyclohexanone (108-94-1)				2,900	49	35	64	31	35
Decane (124-18-5)				4,400	53	45	120	55	63
Diethyl Propanedioate (105-53-3) *					120	120	450	220	240
Dodecane (112-40-3) *					23				
m/p-Xylene (108-38-3/106-42-3)		Yes	350	2,100	8.7	7.5	10	4.9	5.6
Methyl Isobutyl Ketone (108-10-1) *		Yes			97	64	120	58	66
Nonane (111-84-2)					37	29	67	32	36
n-Propylbenzene (103-65-1) *					54	46	120	58	66
o-Xylene (95-47-6)		Yes	350	3,800	8.7	8.0	12	5.5	6.3
Pentadecane (629-62-9) *					25	21	42	20	22
Tetradecane (629-59-4) *					37	29	49	23	26
Toluene (108-88-3)		Yes	150		6.5	5.8	7.3	3.5	4.0
Tridecane (629-59-4) *					37	33	57	27	31
Undecane (1120-21-4)				7,800	18	16	32	15	17

* Results for chemicals marked with an asterisk were calculated based on internal standard (chlorobenzene-d5).
Many other chemicals were emitted; these included the following tentatively identified compounds: 3-Methyl nonane, 2,6-dimethyl nonane, 2-methyl Decane, 3-methyl Decane 1,4-diethyl benzene, 2-methyl naphthalene, and several dimethyl naphthalene isomers.

Analysis Name: TVOC									
TVOC					6,000	6,200	8,100	3,900	4,400

Analytical Results Summary

Sample Information

Sample ID: 72

Material Type:	Rubberized Resilient Flooring	Date Manufactured:	08/27/2002
Manufacturer:	M35	Date Arrived:	09/06/2002
Product Name:	ARRF72M35	Date Conditioning Started:	10/25/2002
Adhesive Used:	Yes	Date Test Started:	11/04/2002

Sample Analyzed in Duplicate? No

Chamber: 2

Compound Name (CAS Number)	Prop. 65 Chemical	ARB TAC	1/2 CREL (ug/m^3)	Olfactory Threshold (ug/m^3)	Emission Factors ($ug/(m^2*hr)$) 24-Hr	48-Hr	96-Hr	96-Hr. Air Conc. (ug/m^3) Class-room	Office
Analysis Name: VOCs-Thermal Desorption - GC/MS									
1,2,3-Trimethylbenzene (526-73-8) *						95	120	56	64
1,2,4-Trimethylbenzene (95-36-6) *	Yes	Yes		770	340	120	530	250	280
1,3,5-Trimethyl Benzene (108-67-8)				1,200	60	27	80	38	43
1-Ethyl-2-Methylbenzene (611-11-4) *					170	55	180	84	95
1-Ethyl-3-Methylbenzene (620-14-4) *					470	150	610	290	330
1-Ethyl-4-Methylbenzene (622-96-8) *					270	170	320	150	170
1-Methyl-2-Pyrrolidinone (872-50-4)	Yes					14	26	12	14
2-Ethoxy Ethyl Acetate (111-15-9)	Yes		150	1,000	16	12	18	8.5	9.7
2-Ethyl Hexanoic Acid (149-57-5) *							56	27	30
2-Ethyl-1-hexanol (104-76-7) *				1,300		8.6	12	5.6	6.3
a,a-Dimethylbenzenemethanol (617-94-7) *					6,900	2,600	6,100	2,900	3,300
Acetophenone (98-86-2) *		Yes		1,800	460	980	2,300	1,100	1,200
a-Methyl-styrene (98-83-9) *				760		83	120	59	67
Benzothiazole (95-16-9) *					2,600	160	390	190	210
Butyl Cyclohexane (1678-93-9)					11	8.4	14	6.5	7.3
Cumene (98-82-8) *		Yes		120	75	31	79	38	43
Cyclohexanone (108-94-1)				2,900	130	39	88	42	48
Decane (124-18-5)				4,400	170	64	200	94	110
Diethyl Propanedioate (105-53-3) *					120	58	250	120	130
Ethyl Benzene (100-41-4)		Yes	1000	13	8.5	5.9	7.2	3.4	3.9
Isopropyl Alcohol (67-63-0)		Yes	3500		49	0.75			
m/p-Xylene (108-38-3/106-42-3)		Yes	350	2,100	21	9.2	15	7.1	8.1
Naphthalene (91-20-3)		Yes	4.5	79	15	12	14	6.8	7.7
Nonane (111-84-2)					190	57	140	66	75
n-Propylbenzene (103-65-1) *					170	75	200	96	110
o-Xylene (95-47-6)		Yes	350	3,800	24	11	20	9.6	11
Toluene (108-88-3)		Yes	150		40	13	22	10	12
Undecane (1120-21-4)				7,800	22	13	28	14	15

* Results for chemicals marked with an asterisk were calculated based on internal standard (chlorobenzene-d5). Additionally, many other chemicals were emitted. These included 2-methyl octane, 2-Heptenal, 3-methyl nonane, and 2,5-dimethyl octane.

Analysis Name: TVOC								
TVOC				16,000	6,400	100,000	47,000	54,000

Analytical Results Summary

Sample Information

Sample ID: 73

Material Type:	Rubberized Resilient Flooring	Date Manufactured:	08/19/2002
Manufacturer:	M34	Date Arrived:	09/05/2002
Product Name:	ARRFT73M34	Date Conditioning Started:	11/08/2002
Adhesive Used:	Yes	Date Test Started:	11/18/2002

Sample Analyzed in Duplicate? No

Chamber: 1

Compound Name (CAS Number)	Prop. 65 Chemical	ARB TAC	1/2 CREL (ug/m^3)	Olfactory Threshold (ug/m^3)	Emission Factors ($ug/(m^2*hr)$) 24-Hr	48-Hr	96-Hr	96-Hr. Air Conc. (ug/m^3) Class-room	Office
Analysis Name: VOCs-Thermal Desorption - GC/MS									
1,2,3-Trimethylbenzene (526-73-8) *					14	49	32	15	17
1,2,4-Trimethylbenzene (95-36-6) *	Yes	Yes		770	68	230	130	64	73
1,3,5-Trimethyl Benzene (108-67-8)				1,200	12	24	21	10.0	11
1-Ethyl-2-Methylbenzene (611-11-4) *					21	67	42	20	23
1-Ethyl-3-Methylbenzene (620-14-4) *					80	260	150	70	79
1-Ethyl-4-Methylbenzene (622-96-8) *					50	150	81	38	44
Benzothiazole (95-16-9) *					170	450	220	100	120
Butyl Cyclohexane (1678-93-9)							8.1	3.9	4.4
Cyclohexanone (108-94-1)				2,900	26	55	38	18	21
Decane (124-18-5)				4,400	28	77	44	21	24
Diethyl Propanedioate (105-53-3) *					39	140	120	56	63
Dodecane (112-40-3) *					15	39	20	9.3	11
m/p-Xylene (108-38-3/106-42-3)		Yes	350	2,100	6.7	9.2	6.9	3.3	3.7
Methyl Isobutyl Ketone (108-10-1) *		Yes			35	92	34	16	18
Naphthalene (91-20-3)		Yes	4.5	79			11	5.4	6.2
Nonane (111-84-2)					20	51	26	12	14
n-Propylbenzene (103-65-1) *					28	86	46	22	25
Octane (111-65-9) *					15	39	23	11	12
o-Xylene (95-47-6)		Yes	350	3,800	7.2	10	7.9	3.8	4.3
Pentadecane (629-62-9) *					17	48	27	13	14
Toluene (108-88-3)		Yes	150		5.7	7.3	6.1	2.9	3.3
Tridecane (629-59-4) *					18	50	30	14	16
Undecane (1120-21-4)				7,800	12	22	16	7.7	8.7

* Results for chemicals marked with an asterisk were calculated based on internal standard (chlorobenzene-d5).
Many other chemicals were emitted, these include the methyl Decane isomers, the methyl naphthalene isomers, and the dimethyl naphthalene isomers.

Analysis Name: TVOC									
TVOC					1,400	4,200	2,500	1,200	1,300

Analytical Results Summary

Sample Information

Sample ID: 74

Material Type:	Rubberized Resilient Flooring	Date Manufactured:	Not Known
Manufacturer:	M43	Date Arrived:	10/21/2002
Product Name:	ARRFT74M43	Date Conditioning Started:	11/08/2002
Adhesive Used:	No	Date Test Started:	11/18/2002

Sample Analyzed in Duplicate? No

Chamber: 2

Compound Name (CAS Number)	Prop. 65 Chemical	ARB TAC	1/2 CREL (ug/m^3)	Olfactory Threshold (ug/m^3)	Emission Factors ($ug/(m^2*hr)$) 24-Hr	48-Hr	96-Hr	96-Hr. Air Conc. (ug/m^3) Class-room	Office
Analysis Name: VOCs-Thermal Desorption - GC/MS									
Benzothiazole (95-16-9) *					140	380	210	98	110
Cyclohexanone (108-94-1)				2,900	16	28	17	8.3	9.4
Limonene (138-86-3) *				2,500	15	37	19	9.0	10
m/p-Xylene (108-38-3/106-42-3)		Yes	350	2,100	6.3	7.9	6.6	3.2	3.6
Methyl Isobutyl Ketone (108-10-1) *		Yes			25	59	28	13	15
Toluene (108-88-3)		Yes	150		7.2	11	7.9	3.8	4.3
Triethylphosphate (78-40-0) *					160	430	260	120	140
Undecane (1120-21-4)				7,800			9.3	4.4	5.0
Unidentified Peak *					7,000	17,000	8,500	4,100	4,600

* Results for chemicals marked with an asterisk were calculated based on internal standard (chlorobenzene-d5).
The unidentified peak is probably a long-chain ester.

Analysis Name: TVOC									
TVOC					7,800	19,000	9,700	4,600	5,200

Analytical Results Summary

Sample Information

Sample ID: 75

Material Type:	Rubberized Resilient Flooring	Date Manufactured:	09/10/2002
Manufacturer:	M41	Date Arrived:	11/07/2002
Product Name:	ARRF75M41	Date Conditioning Started:	11/22/2002
Adhesive Used:	Yes	Date Test Started:	12/02/2002

Sample Analyzed in Duplicate? No

Chamber: 1

Compound Name (CAS Number)	Prop. 65 Chemical	ARB TAC	1/2 CREL (ug/m^3)	Olfactory Threshold (ug/m^3)	Emission Factors ($ug/(m^2*hr)$) 24-Hr	48-Hr	96-Hr	96-Hr. Air Conc. (ug/m^3) Class-room	Office
Analysis Name: VOCs-Thermal Desorption - GC/MS									
1,2,3-Trimethylbenzene (526-73-8) *					460	120	97	46	52
1,2,4-Trimethylbenzene (95-36-6) *	Yes	Yes		770	1,100	280	200	97	110
1,3,5-Trimethyl Benzene (108-67-8)				1,200	150	39	18	8.4	9.6
1-Ethyl-2-Methylbenzene (611-11-4) *					340	86	62	29	33
1-Ethyl-3-Methylbenzene (620-14-4) *							130	63	72
1-Ethyl-4-Methylbenzene (622-96-8) *						86	55	26	30
1-Methyl-2-Pyrrolidinone (872-50-4)	Yes				28	17			
2-(2-Butoxyethoxy) Ethanol (112-34-5) *		Yes			25	19	18	8.6	9.7
2-Ethyl-1-hexanol (104-76-7) *				1,300	19	11	9.7	4.6	5.2
3,3,5-Trimethylcyclohexanone (873-94-9) *					1,200	360	290	140	160
Butyl Cyclohexane (1678-93-9)					34	14	12	5.6	6.4
Decane (124-18-5)				4,400	320	79	38	18	20
Diethyl Propanedioate (105-53-3) *					3,600	1,000	910	430	490
Nonane (111-84-2)					86	22	14	6.6	7.5
n-Propylbenzene (103-65-1) *					230	56			
o-Xylene (95-47-6)		Yes	350	3,800	15	8.2	6.9	3.3	3.7
Toluene (108-88-3)		Yes	150			6.0			
Undecane (1120-21-4)				7,800	140	41	32	15	18

* Results for chemicals marked with an asterisk were calculated based on internal standard (chlorobenzene-d5).
Many other chemicals were emitted; some of which have been tentatively identified as 2,6-dimethyl octane, 3-methyl Decane, 4-methyl Decane, 1-methyl-3-propyl-benzene, 2,6- and 3-6- dimethyl Decane.

Analysis Name: TVOC									
TVOC					27,000	7,200	5,900	2,800	3,200

Analytical Results Summary

Sample Information

Sample ID: 76

Material Type:	Rubberized Resilient Flooring	Date Manufactured:	10/01/2002
Manufacturer:	M41	Date Arrived:	11/07/2002
Product Name:	ARRF76M41	Date Conditioning Started:	11/22/2002
Adhesive Used:	Yes	Date Test Started:	12/02/2002

Sample Analyzed in Duplicate? No

Chamber: 2

Compound Name (CAS Number)	Prop. 65 Chemical	ARB TAC	1/2 CREL (ug/m^3)	Olfactory Threshold (ug/m^3)	Emission Factors ($ug/(m^2*hr)$) 24-Hr	48-Hr	96-Hr	96-Hr. Air Conc. (ug/m^3) Class-room	Office
Analysis Name: VOCs-Thermal Desorption - GC/MS									
1,2,3-Trimethylbenzene (526-73-8) *					390	360	260	120	140
1,2,4-Trimethylbenzene (95-36-6) *	Yes	Yes		770	1,000	920	590	280	320
1,3,5-Trimethyl Benzene (108-67-8)				1,200	120	100	71	34	38
1-Ethyl-2-Methylbenzene (611-11-4) *					300	270	170	82	93
1-Ethyl-3-Methylbenzene (620-14-4) *					750	420	370	170	200
1-Ethyl-4-Methylbenzene (622-96-8) *					320	500	150	72	82
1-Methyl-2-Pyrrolidinone (872-50-4)	Yes						5.4	2.6	2.9
2-(2-Butoxyethoxy) Ethanol (112-34-5) *		Yes			15	15	15	7.2	8.1
2-Ethyl-1-hexanol (104-76-7) *				1,300	17	16	14	6.6	7.5
Butyl Cyclohexane (1678-93-9)					25	24	19	9.3	11
Cyclohexanone (108-94-1)				2,900	40	65	20	9.4	11
Decanal (112-31-2) *				5.9	31	34			
Decane (124-18-5)				4,400	220	190	120	59	66
Diethyl Propanedioate (105-53-3) *					900	1,500	1,200	550	630
m/p-Xylene (108-38-3/106-42-3)		Yes	350	2,100	7.1	6.6			
Naphthalene (91-20-3)		Yes	4.5	79	12	12	12	5.6	6.4
Nonanal (124-19-6) *				13	57	63			
Nonane (111-84-2)					42	30	15	7.4	8.4
n-Propylbenzene (103-65-1) *					190	160	93	44	50
o-Xylene (95-47-6)		Yes	350	3,800	11	10	8.0	3.8	4.3
Phenol (108-95-2)		Yes	100	430		14			
Toluene (108-88-3)		Yes	150		6.1	6.2			
Undecane (1120-21-4)				7,800	71	71	59	28	32

* Results for chemicals marked with an asterisk were calculated based on internal standard (chlorobenzene-d5).
In addition to the chemicals listed above, other tentatively identified chemicals were emitted. These chemicals were mostly 7 to 15 carbon molecules. These included the methyl Decane isomers, 3-methyl nonane, and several alkyl benzenes.

Analysis Name: TVOC					
TVOC	12,000	11,000	7,600	3,600	4,100

Analytical Results Summary

Sample Information

Sample ID: 77

Material Type:	Rubberized Resilient Flooring	Date Manufactured:	Not Known
Manufacturer:	M49	Date Arrived:	11/12/2002
Product Name:	ARRF77M49	Date Conditioning Started:	11/27/2002
Adhesive Used:	Yes	Date Test Started:	12/09/2002

Sample Analyzed in Duplicate? No

Chamber: 1

Compound Name (CAS Number)	Prop. 65 Chemical	ARB TAC	1/2 CREL (ug/m^3)	Olfactory Threshold (ug/m^3)	Emission Factors ($ug/(m^2*hr)$) 24-Hr	48-Hr	96-Hr	96-Hr. Air Conc. (ug/m^3) Class-room	Office
Analysis Name: VOCs-Thermal Desorption - GC/MS									
1,2,3-Trimethylbenzene (526-73-8) *					110	130	180	86	98
1,2,4-Trimethylbenzene (95-36-6) *	Yes	Yes		770	400	440	570	270	310
1,3,5-Trimethyl Benzene (108-67-8)				1,200	56	59	72	34	39
1-Ethyl-2-Methylbenzene (611-11-4) *					140	150	190	89	100
1-Ethyl-3-Methylbenzene (620-14-4) *					440	450	530	250	290
1-Ethyl-4-Methylbenzene (622-96-8) *					210	220	250	120	130
1-Methyl-2-Pyrrolidinone (872-50-4)	Yes				10	11	1.5	0.73	0.82
2-Ethyl-1-hexanol (104-76-7) *				1,300	11	11	12	5.8	6.6
Benzothiazole (95-16-9) *					270	300	380	180	210
Butyl Cyclohexane (1678-93-9)					13	13	16	7.5	8.5
Cumene (98-82-8) *		Yes		120	58	54	55	26	30
Cyclohexanone (108-94-1)				2,900	70	68	68	32	37
Decane (124-18-5)				4,400	120	120	140	69	78
Diethyl Propanedioate (105-53-3) *					280	390	760	360	410
m/p-Xylene (108-38-3/106-42-3)		Yes	350	2,100	8.4	7.8	7.5	3.6	4.1
N,N-Dimethylformamide (68-12-2) *		Yes	40		12	10.0	11	5.2	5.9
Naphthalene (91-20-3)		Yes	4.5	79	12	12	12	5.9	6.6
Nonane (111-84-2)					67	59	54	26	29
n-Propylbenzene (103-65-1) *					140	140	150	74	83
o-Xylene (95-47-6)		Yes	350	3,800	12	12	12	5.6	6.3
Toluene (108-88-3)		Yes	150		9.6	7.8	6.4	3.1	3.5
Undecane (1120-21-4)				7,800	25	27	36	17	19

* Results for chemicals marked with an asterisk were calculated based on internal standard (chlorobenzene-d5).
Other chemicals emitted included the following tentatively identified compounds: diethyl benzene isomers, ethyl phenyl ketone, several methyl Decane isomers and 3,3,5-trimethyl cyclohexanone.

Analysis Name: Aldehyde-DNPH									
Acetone (67-64-1)					650	530	400	190	210
Formaldehyde (50-00-0) **	Yes	Yes	16.5	1,100	42	54	9.2	4.4	5.0

**CREL Note: Based on 1/2 of a total maximum of 27 ppb from all sources. The 27 ppb guideline is based on OEHHA's current acute 1-hour Reference Exposure Level (REL) of 76 ppb (94 $\mu g/m^3$), extrapolated to an 8-hour exposure period.

Analysis Name: TVOC									
TVOC					5,900	6,000	7,500	3,600	4,000

Analytical Results Summary

Sample Information

Sample ID: 84

Material Type:	Rubberized Resilient Flooring	Date Manufactured:	Not Known
Manufacturer:	M42	Date Arrived:	12/11/2002
Product Name:	ARRF84M42	Date Conditioning Started:	01/03/2003
Adhesive Used:	Yes	Date Test Started:	01/13/2003

Sample Analyzed in Duplicate? No

Chamber: 2

Compound Name (CAS Number)	Prop. 65 Chemical	ARB TAC	1/2 CREL (ug/m^3)	Olfactory Threshold (ug/m^3)	Emission Factors ($ug/(m^2*hr)$) 24-Hr	48-Hr	96-Hr	96-Hr. Air Conc. (ug/m^3) Class-room	Office
Analysis Name: VOCs-Thermal Desorption - GC/MS									
2-Ethoxy Ethyl Acetate (111-15-9)	Yes		150	1,000			18	8.6	9.8
2-Ethyl-1-hexanol (104-76-7) *				1,300	28	28	26	12	14
Acetophenone (98-86-2) *		Yes		1,800	22	19	18	8.5	9.6
Cyclohexanone (108-94-1)				2,900	87	83	100	47	54
Indene (95-13-6) *				43	9.5	10	11	5.2	5.9
m/p-Xylene (108-38-3/106-42-3)		Yes	350	2,100	7.2	7.0	6.8	3.3	3.7
Methyl Cyclohexane (108-87-2)					10	10	8.6	4.1	4.6
Naphthalene (91-20-3)		Yes	4.5	79	12	12	13	6.2	7.0
Nonane (111-84-2)					20	23	23	11	12
Octane (111-65-9) *					370	380	340	160	180
Styrene (100-42-5)		Yes	450	630	9.6	9.6	9.4	4.5	5.1
Toluene (108-88-3)		Yes	150		6.2	5.8	5.7	2.7	3.1
Undecane (1120-21-4)				7,800	9.3				

* Results for chemicals marked with an asterisk were calculated based on internal standard (chlorobenzene-d5).
In addition to the chemicals listed above, many branched and cylcic hydrocarbons were emitted. These peaks included the following tentatively identified compounds: 2-Methyl Heptane, 3-Methyl Heptane, 4-Methyl Heptane, 2,6-Dimethyl Heptane, Ethylcyclohexane, 1,3-dimethylcyclohexane, 1,4-dimethylcyclohexane, 2-methyl octane, 1,2,4-trimethyl cyclohexane, and 1-ethyl-3-methyl cyclohexane.

Analysis Name: Aldehyde-DNPH									
Acetaldehyde (75-07-0)	Yes	Yes	4.5		5.8				
Acetone (67-64-1)						32	44	21	24
Formaldehyde (50-00-0) **	Yes	Yes	16.5	1,100	0.068	8.4	4.4	2.1	2.4

**CREL Note: Based on 1/2 of a total maximum of 27 ppb from all sources. The 27 ppb guideline is based on OEHHA's current acute 1-hour Reference Exposure Level (REL) of 76 ppb (94 $\mu g/m^3$), extrapolated to an 8-hour exposure period.

Analysis Name: TVOC									
TVOC					1,700	1,700	1,500	730	830

Analytical Results Summary

Sample Information

Sample ID: 85

Material Type:	Rubberized Resilient Flooring	Date Manufactured:	Not Known
Manufacturer:	M42	Date Arrived:	12/11/2002
Product Name:	ARRF85M42	Date Conditioning Started:	01/10/2003
Adhesive Used:	Yes	Date Test Started:	01/20/2003

Sample Analyzed in Duplicate? No

Chamber: 1

Compound Name (CAS Number)	Prop. 65 Chemical	ARB TAC	1/2 CREL (ug/m^3)	Olfactory Threshold (ug/m^3)	Emission Factors ($ug/(m^2*hr)$) 24-Hr	48-Hr	96-Hr	96-Hr. Air Conc. (ug/m^3) Class-room	Office
Analysis Name: VOCs-Thermal Desorption - GC/MS									
1,2,3-Trimethylbenzene (526-73-8) *					92	77	74	35	40
1,2,4-Trimethylbenzene (95-36-6) *	Yes	Yes		770	410	320	290	140	160
1,3,5-Trimethyl Benzene (108-67-8)				1,200	120	140	120	58	65
1-Ethyl-3-Methylbenzene (620-14-4) *					450	320	270	130	150
1-Ethyl-4-Methylbenzene (622-96-8) *					240	170	130	63	71
2-Ethoxy Ethyl Acetate (111-15-9)	Yes		150	1,000	12	11	11	5.2	5.9
2-Ethyl-1-hexanol (104-76-7) *				1,300	11	11	11	5.1	5.8
a,a-Dimethylbenzenemethanol (617-94-7) *					2,200	1,600	1,300	600	680
Acetophenone (98-86-2) *		Yes		1,800	920	610	460	220	250
a-Methyl-styrene (98-83-9) *				760	560	380	320	150	170
Benzothiazole (95-16-9) *					390	250	200	94	110
Butyl Cyclohexane (1678-93-9)					11	10	10	4.9	5.6
Cumene (98-82-8) *		Yes		120	47	39	30	14	16
Cyclohexanone (108-94-1)				2,900	58	40	32	15	17
Decane (124-18-5)				4,400	100	77	73	35	39
Diethyl Propanedioate (105-53-3) *					510	430	440	210	240
Ethyl Benzene (100-41-4)		Yes	1000	13	10	8.3	7.3	3.5	4.0
m/p-Xylene (108-38-3/106-42-3)		Yes	350	2,100	28	18	15	7.2	8.1
Nonane (111-84-2)					74	48	39	18	21
n-Propylbenzene (103-65-1) *					140	100	82	39	44
o-Xylene (95-47-6)		Yes	350	3,800	17	14	12	5.7	6.4
Toluene (108-88-3)		Yes	150		27	17	12	5.9	6.7
Undecane (1120-21-4)				7,800	25	20	21	10	11

* Results for chemicals marked with an asterisk were calculated based on internal standard (chlorobenzene-d5).
Other chemicals emitted include several branched alkane isomers, such as 3-methyl nonane, and 2,6-dimethyl octane; several alkyl benzenes, 4-ethyl-1,2-dimethyl benzene, and 1,2,3,4-tetramethyl benzene among many others.

Analysis Name: TVOC					
TVOC	9,100	6,400	5,300	2,500	2,900

Analytical Results Summary

Sample Information

Sample ID: 86

Material Type:	Rubberized Resilient Flooring	Date Manufactured:	Not Known
Manufacturer:	M42	Date Arrived:	12/11/2002
Product Name:	ARRF86M42	Date Conditioning Started:	03/14/2003
Adhesive Used:	Yes	Date Test Started:	03/24/2003

Sample Analyzed in Duplicate? No

Chamber: 2

Compound Name (CAS Number)	Prop. 65 Chemical	ARB TAC	1/2 CREL (ug/m^3)	Olfactory Threshold (ug/m^3)	Emission Factors ($ug/(m^2*hr)$) 24-Hr	48-Hr	96-Hr	96-Hr. Air Conc. (ug/m^3) Class-room	Office
Analysis Name: VOCs-Thermal Desorption - GC/MS									
1,2,3-Trimethylbenzene (526-73-8) *						100	110	51	57
1,2,4-Trimethylbenzene (95-36-6) *	Yes	Yes		770			410	200	220
1,3,5-Trimethyl Benzene (108-67-8)				1,200	51	42	43	20	23
1-Ethyl-3-Methylbenzene (620-14-4) *					430	330	320	150	170
1-Ethyl-4-Methylbenzene (622-96-8) *					230	180	170	80	91
2-(2-Ethoxyethoxy)-Ethanol (111-90-0) *					15,000	7,300	3,700	1,800	2,000
2-Butoxy-Ethanol (111-76-2) *		Yes		1,700	140	52	24	11	13
2-Ethoxy Ethyl Acetate (111-15-9)	Yes		150	1,000	11				
2-Ethyl-1-hexanol (104-76-7) *				1,300	77	41	26	12	14
2-Ethylhexyl Acetate (103-09-3) *				2,300	44				
a,a-Dimethylbenzenemethanol (617-94-7) *					2,200	1,800	1,700	790	900
Acetophenone (98-86-2) *		Yes		1,800	1,000	790	680	320	370
a-Methyl-styrene (98-83-9) *				760	770	570	540	260	290
Benzothiazole (95-16-9) *						180	160	77	87
Butoxy-2-propanol (5131-66-8) *					70	47			
Butyl Cyclohexane (1678-93-9)					11	11	11	5.3	6.0
Cumene (98-82-8) *		Yes		120	56	43	39	18	21
Cyclohexanone (108-94-1)				2,900	48	36	31	15	17
Decane (124-18-5)				4,400		71	66	32	36
Diethyl Propanedioate (105-53-3) *					570	470	530	250	290
Ethyl Benzene (100-41-4)		Yes	1000	13	8.9	7.2	6.6	3.2	3.6
m/p-Xylene (108-38-3/106-42-3)		Yes	350	2,100	23	15	12	5.9	6.7
Naphthalene (91-20-3)		Yes	4.5	79	12	12			
Nonane (111-84-2)					54	40	34	16	18
n-Propylbenzene (103-65-1) *					140	110	100	49	56
o-Xylene (95-47-6)		Yes	350	3,800	16	12	11	5.4	6.1
Toluene (108-88-3)		Yes	150		16	12	10.0	4.8	5.4
Undecane (1120-21-4)				7,800	27	24	25	12	13
Unidentified Peak *					10,000	6,800	4,800	2,300	2,600

* Results for chemicals marked with an asterisk were calculated based on internal standard (chlorobenzene-d5).
The unidentified peak is most probably an ester or a glycol ether.

Analytical Results Summary

Sample Information

Material Type:	Rubberized Resilient Flooring	Sample ID: 86	
Manufacturer:	M42	Date Manufactured:	Not Known
Product Name:	ARRF86M42	Date Arrived:	12/11/2002
Adhesive Used:	Yes	Date Conditioning Started:	03/14/2003
Sample Analyzed in Duplicate?	No	Date Test Started:	03/24/2003

Chamber: 2

Compound Name (CAS Number)	Prop. 65 Chemical	ARB TAC	1/2 CREL (ug/m^3)	Olfactory Threshold (ug/m^3)	Emission Factors (ug/(m^2*hr)) 24-Hr	48-Hr	96-Hr	96-Hr. Air Conc. (ug/m^3) Class-room	Office
Analysis Name: Aldehyde-DNPH									
Acetone (67-64-1)					26	30	52	25	28
Analysis Name: TVOC									
TVOC					26,000	25,000	18,000	8,700	9,900

Appendix J-2

Analytical Results Summary for Resilient Flooring (Rubber-Based, Tire-Derived): Boardroom and Auditorium @ 3.5 Ach

Analytical Results Summary

Sample Information

Sample ID: 64

Material Type:	Rubberized Resilient Flooring	Date Manufactured:	08/01/2002
Manufacturer:	M36	Date Arrived:	09/03/2002
Product Name:	ARRF64M36	Date Conditioning Started:	09/15/2002
Adhesive Used:	Yes	Date Test Started:	09/30/2002

Sample Analyzed in Duplicate? No

Chamber: 2

Compound Name (CAS Number)	Prop. 65 Chemical	ARB TAC	1/2 CREL (ug/m^3)	Olfactory Threshold (ug/m^3)	Emission Factors ($ug/(m^2*hr)$) 24-Hr	48-Hr	96-Hr	96-Hr. Air Conc. (ug/m^3) B-room	Auditorium
Analysis Name: VOCs-Thermal Desorption - GC/MS									
2-Ethyl-1-hexanol (104-76-7) *				1,300	88	90	170	20	12
2-Ethylhexyl Acetate (103-09-3) *				2,300	110	110	230	26	16
Benzothiazole (95-16-9) *					110	100	200	23	14
Decanal (112-31-2) *				5.9			7.2	0.82	0.50
Limonene (138-86-3) *				2,500			6.2	0.71	0.43
Methyl Isobutyl Ketone (108-10-1) *		Yes			8.1	7.1			
Nonanal (124-19-6) *				13			11	1.2	0.74
Propylene Glycol (57-55-6) *					280	320	680	78	47
Trimethyl Silanol (1066-40-6) *					7.2	7.6	8.2	0.94	0.57
Unidentified Peak *					14,000	12,000	15,000	1,700	1,000

* Results for chemicals marked with an asterisk were calculated based on internal standard (chlorobenzene-d5).
The unidentified peak is probably a long-chain ester.

Analysis Name: TVOC									
TVOC					15,000	13,000	17,000	1,900	1,200

Analytical Results Summary

Sample Information

Sample ID: 65

Material Type:	Rubberized Resilient Flooring	Date Manufactured:	08/01/2002
Manufacturer:	M36	Date Arrived:	09/03/2002
Product Name:	ARRF65M36	Date Conditioning Started:	09/15/2002
Adhesive Used:	Yes	Date Test Started:	09/30/2002

Sample Analyzed in Duplicate? No

Chamber: 1

Compound Name (CAS Number)	Prop. 65 Chemical	ARB TAC	1/2 CREL (ug/m^3)	Olfactory Threshold (ug/m^3)	Emission Factors ($ug/(m^2*hr)$) 24-Hr	48-Hr	96-Hr	96-Hr. Air Conc. (ug/m^3) B-room	Auditorium
Analysis Name: VOCs-Thermal Desorption - GC/MS									
2-Ethyl-1-hexanol (104-76-7) *				1,300	50	71	140	16	9.8
2-Ethylhexyl Acetate (103-09-3) *				2,300	76	51	220	26	16
Benzothiazole (95-16-9) *					30	37	63	7.3	4.4
Decanal (112-31-2) *				5.9			6.2	0.71	0.43
Limonene (138-86-3) *				2,500			9.1	1.0	0.63
Methyl Isobutyl Ketone (108-10-1) *		Yes			7.0	7.3	14	1.6	0.94
n-Butyl ether (142-96-1) *				250	4.8	5.0	6.1	0.69	0.42
Nonanal (124-19-6) *				13			10	1.1	0.70
Propylene Glycol (57-55-6) *					66	66	230	26	16
Toluene (108-88-3)		Yes	150		12	11	12	1.3	0.81
Trimethyl Silanol (1066-40-6) *					14	14	17	1.9	1.2
Unidentified Peak *					10,000	11,000	12,000	1,400	830

* Results for chemicals marked with an asterisk were calculated based on internal standard (chlorobenzene-d5).
The unidentified peak is probably a long-chain ester.

Analysis Name: TVOC									
TVOC					10,000	11,000	13,000	1,500	910

Analytical Results Summary

Sample Information

Sample ID: 66

Material Type:	Rubberized Resilient Flooring	Date Manufactured:	06/01/2002
Manufacturer:	M36	Date Arrived:	09/03/2002
Product Name:	ARRF66M36	Date Conditioning Started:	09/20/2002
Adhesive Used:	Yes	Date Test Started:	10/07/2002

Sample Analyzed in Duplicate? No

Chamber: 1

Compound Name (CAS Number)	Prop. 65 Chemical	ARB TAC	1/2 CREL (ug/m^3)	Olfactory Threshold (ug/m^3)	Emission Factors (ug/(m^2*hr)) 24-Hr	48-Hr	96-Hr	96-Hr. Air Conc. (ug/m^3) B-room	Auditorium
Analysis Name: VOCs-Thermal Desorption - GC/MS									
2-Ethyl-1-hexanol (104-76-7) *				1,300	15	19	26	3.0	1.8
2-Ethylhexyl Acetate (103-09-3) *				2,300			17	2.0	1.2
Benzothiazole (95-16-9) *					330	390	400	45	27
Methyl Isobutyl Ketone (108-10-1) *		Yes			73	81	86	9.8	6.0
Propylene Glycol (57-55-6) *					140	210	290	33	20
Toluene (108-88-3)		Yes	150		15	15	15	1.7	1.0
Trimethyl Silanol (1066-40-6) *					23	26	25	2.9	1.8
Unidentified Peak *					2,800	3,000	3,000	350	210
Analysis Name: Aldehyde-DNPH									
Acetaldehyde (75-07-0)	Yes	Yes	4.5		19				
Acetone (67-64-1)					19	49	57	6.5	4.0
Analysis Name: TVOC									
TVOC					3,800	4,100	4,300	490	300

* Results for chemicals marked with an asterisk were calculated based on internal standard (chlorobenzene-d5).
The unidentified peak is probably a long-chain ester.

Analytical Results Summary

Sample Information

Sample ID: 67

Material Type:	Rubberized Resilient Flooring	Date Manufactured:	08/01/2002
Manufacturer:	M36	Date Arrived:	09/03/2002
Product Name:	ARRF67M36	Date Conditioning Started:	09/20/2002
Adhesive Used:	Yes	Date Test Started:	10/07/2002

Sample Analyzed in Duplicate? No

Chamber: 2

Compound Name (CAS Number)	Prop. 65 Chemical	ARB TAC	1/2 CREL (ug/m^3)	Olfactory Threshold (ug/m^3)	Emission Factors ($ug/(m^2*hr)$) 24-Hr	48-Hr	96-Hr	96-Hr. Air Conc. (ug/m^3) B-room	Auditorium
Analysis Name: VOCs-Thermal Desorption - GC/MS									
2-Ethyl-1-hexanol (104-76-7) *				1,300	74	130	120	14	8.6
2-Ethylhexyl Acetate (103-09-3) *				2,300	61	160	160	19	11
Benzothiazole (95-16-9) *					290	410	280	32	19
Methyl Isobutyl Ketone (108-10-1) *		Yes			26	37	27	3.1	1.9
n-Butyl ether (142-96-1) *				250	16	18	11	1.2	0.73
Propylene Glycol (57-55-6) *					160	300	320	37	22
Toluene (108-88-3)		Yes	150		14	14	9.5	1.1	0.66
Trimethyl Silanol (1066-40-6) *					49	58	40	4.5	2.8
Unidentified Peak *					17,000	21,000	15,000	1,800	1,100
Analysis Name: Aldehyde-DNPH									
Acetaldehyde (75-07-0)	Yes	Yes	4.5		16	19			
Acetone (67-64-1)					22	0.51	31	3.5	2.1
Analysis Name: TVOC									
TVOC					19,000	23,000	17,000	2,000	1,200

* Results for chemicals marked with an asterisk were calculated based on internal standard (chlorobenzene-d5).
The unidentified peak is probably a long-chain ester.

Analytical Results Summary

Sample Information

Sample ID: 71

Material Type:	Rubberized Resilient Flooring	Date Manufactured:	08/20/2002
Manufacturer:	M37	Date Arrived:	08/28/2002
Product Name:	ARRF71M37	Date Conditioning Started:	10/25/2002
Adhesive Used:	Yes	Date Test Started:	11/04/2002

Sample Analyzed in Duplicate? No

Chamber: 1

Compound Name (CAS Number)	Prop. 65 Chemical	ARB TAC	1/2 CREL (ug/m^3)	Olfactory Threshold (ug/m^3)	Emission Factors ($ug/(m^2*hr)$) 24-Hr	48-Hr	96-Hr	96-Hr. Air Conc. (ug/m^3) B-room	Auditorium
Analysis Name: VOCs-Thermal Desorption - GC/MS									
1,2,3-Trimethylbenzene (526-73-8) *					28	27	88	10	6.1
1,2,4-Trimethylbenzene (95-36-6) *	Yes	Yes		770	130	120	370	42	26
1,3,5-Trimethyl Benzene (108-67-8)				1,200	21	19	46	5.2	3.2
1-Ethyl-2-Methylbenzene (611-11-4) *					39	38	110	13	7.9
1-Ethyl-3-Methylbenzene (620-14-4) *					160	140	380	44	26
1-Ethyl-4-Methylbenzene (622-96-8) *					98	82	210	24	15
Benzothiazole (95-16-9) *					330	250	540	61	37
Butyl Cyclohexane (1678-93-9)							11	1.3	0.77
Cyclohexanone (108-94-1)				2,900	49	35	64	7.3	4.5
Decane (124-18-5)				4,400	53	45	120	13	8.0
Diethyl Propanedioate (105-53-3) *					120	120	450	52	31
Dodecane (112-40-3) *					23				
m/p-Xylene (108-38-3/106-42-3)		Yes	350	2,100	8.7	7.5	10	1.2	0.72
Methyl Isobutyl Ketone (108-10-1) *		Yes			97	64	120	14	8.5
Nonane (111-84-2)					37	29	67	7.6	4.6
n-Propylbenzene (103-65-1) *					54	46	120	14	8.5
o-Xylene (95-47-6)		Yes	350	3,800	8.7	8.0	12	1.3	0.81
Pentadecane (629-62-9) *					25	21	42	4.8	2.9
Tetradecane (629-59-4) *					37	29	49	5.6	3.4
Toluene (108-88-3)		Yes	150		6.5	5.8	7.3	0.84	0.51
Tridecane (629-59-4) *					37	33	57	6.5	3.9
Undecane (1120-21-4)				7,800	18	16	32	3.6	2.2

* Results for chemicals marked with an asterisk were calculated based on internal standard (chlorobenzene-d5).

Many other chemicals were emitted; these included the following tentatively identified compounds: 3-Methylnonane, 2,6-dimethylnonane, 2-methyldecane, 3-methyldecane 1,4-diethylbenzene, 2-methylnaphthalene and several dimethyl naphthalene isomers.

Analysis Name: TVOC								
TVOC				6,000	6,200	8,100	930	560

Analytical Results Summary

Sample Information

Sample ID: 72

Material Type:	Rubberized Resilient Flooring	Date Manufactured:	08/27/2002
Manufacturer:	M35	Date Arrived:	09/06/2002
Product Name:	ARRF72M35	Date Conditioning Started:	10/25/2002
Adhesive Used:	Yes	Date Test Started:	11/04/2002

Sample Analyzed in Duplicate? No

Chamber: 2

Compound Name (CAS Number)	Prop. 65 Chemical	ARB TAC	1/2 CREL (ug/m^3)	Olfactory Threshold (ug/m^3)	Emission Factors (ug/(m^2*hr)) 24-Hr	48-Hr	96-Hr	96-Hr. Air Conc. (ug/m^3) B-room	Auditorium
Analysis Name: VOCs-Thermal Desorption - GC/MS									
1,2,3-Trimethylbenzene (526-73-8) *						95	120	13	8.2
1,2,4-Trimethylbenzene (95-36-6) *	Yes	Yes		770	340	120	530	60	37
1,3,5-Trimethyl Benzene (108-67-8)				1,200	60	27	80	9.2	5.6
1-Ethyl-2-Methylbenzene (611-11-4) *					170	55	180	20	12
1-Ethyl-3-Methylbenzene (620-14-4) *					470	150	610	70	43
1-Ethyl-4-Methylbenzene (622-96-8) *					270	170	320	37	22
1-Methyl-2-Pyrrolidinone (872-50-4)	Yes					14	26	2.9	1.8
2-Ethoxy Ethyl Acetate (111-15-9)	Yes		150	1,000	16	12	18	2.0	1.2
2-Ethyl Hexanoic Acid (149-57-5) *							56	6.4	3.9
2-Ethyl-1-hexanol (104-76-7) *				1,300		8.6	12	1.3	0.81
a,a-Dimethylbenzenemethanol (617-94-7) *					6,900	2,600	6,100	700	420
Acetophenone (98-86-2) *		Yes		1,800	460	980	2,300	260	160
a-Methyl-styrene (98-83-9) *				760		83	120	14	8.6
Benzothiazole (95-16-9) *					2,600	160	390	45	27
Butyl Cyclohexane (1678-93-9)					11	8.4	14	1.6	0.94
Cumene (98-82-8) *		Yes		120	75	31	79	9.0	5.5
Cyclohexanone (108-94-1)				2,900	130	39	88	10	6.1
Decane (124-18-5)				4,400	170	64	200	23	14
Diethyl Propanedioate (105-53-3) *					120	58	250	28	17
Ethyl Benzene (100-41-4)		Yes	1000	13	8.5	5.9	7.2	0.82	0.50
Isopropyl Alcohol (67-63-0)		Yes	3500		49	0.75			
m/p-Xylene (108-38-3/106-42-3)		Yes	350	2,100	21	9.2	15	1.7	1.0
Naphthalene (91-20-3)		Yes	4.5	79	15	12	14	1.6	0.99
Nonane (111-84-2)					190	57	140	16	9.6
n-Propylbenzene (103-65-1) *					170	75	200	23	14
o-Xylene (95-47-6)		Yes	350	3,800	24	11	20	2.3	1.4
Toluene (108-88-3)		Yes	150		40	13	22	2.5	1.5
Undecane (1120-21-4)				7,800	22	13	28	3.3	2.0

* Results for chemicals marked with an asterisk were calculated based on internal standard (chlorobenzene-d5).

Additionally, many other chemicals were emitted. These included 2-methyloctane, 2-Heptenal, 3-methylnonane, and 2,5-dimethyloctane.

Analysis Name: TVOC									
TVOC					16,000	6,400	100,000	11,000	6,900

Analytical Results Summary

Sample Information

Sample ID: 73

Material Type:	Rubberized Resilient Flooring	Date Manufactured:	08/19/2002
Manufacturer:	M34	Date Arrived:	09/05/2002
Product Name:	ARRFT73M34	Date Conditioning Started:	11/08/2002
Adhesive Used:	Yes	Date Test Started:	11/18/2002

Sample Analyzed in Duplicate? No

Chamber: 1

Compound Name (CAS Number)	Prop. 65 Chemical	ARB TAC	1/2 CREL (ug/m^3)	Olfactory Threshold (ug/m^3)	Emission Factors ($ug/(m^2*hr)$) 24-Hr	48-Hr	96-Hr	96-Hr. Air Conc. (ug/m^3) B-room	Auditorium
Analysis Name: VOCs-Thermal Desorption - GC/MS									
1,2,3-Trimethylbenzene (526-73-8) *					14	49	32	3.7	2.2
1,2,4-Trimethylbenzene (95-36-6) *	Yes	Yes		770	68	230	130	15	9.4
1,3,5-Trimethyl Benzene (108-67-8)				1,200	12	24	21	2.4	1.5
1-Ethyl-2-Methylbenzene (611-11-4) *					21	67	42	4.8	2.9
1-Ethyl-3-Methylbenzene (620-14-4) *					80	260	150	17	10
1-Ethyl-4-Methylbenzene (622-96-8) *					50	150	81	9.2	5.6
Benzothiazole (95-16-9) *					170	450	220	25	15
Butyl Cyclohexane (1678-93-9)							8.1	0.92	0.56
Cyclohexanone (108-94-1)				2,900	26	55	38	4.4	2.6
Decane (124-18-5)				4,400	28	77	44	5.0	3.1
Diethyl Propanedioate (105-53-3) *					39	140	120	13	8.1
Dodecane (112-40-3) *					15	39	20	2.2	1.4
m/p-Xylene (108-38-3/106-42-3)		Yes	350	2,100	6.7	9.2	6.9	0.79	0.48
Methyl Isobutyl Ketone (108-10-1) *		Yes			35	92	34	3.9	2.4
Naphthalene (91-20-3)		Yes	4.5	79			11	1.3	0.79
Nonane (111-84-2)					20	51	26	3.0	1.8
n-Propylbenzene (103-65-1) *					28	86	46	5.2	3.2
Octane (111-65-9) *					15	39	23	2.6	1.6
o-Xylene (95-47-6)		Yes	350	3,800	7.2	10	7.9	0.91	0.55
Pentadecane (629-62-9) *					17	48	27	3.0	1.8
Toluene (108-88-3)		Yes	150		5.7	7.3	6.1	0.69	0.42
Tridecane (629-59-4) *					18	50	30	3.5	2.1
Undecane (1120-21-4)				7,800	12	22	16	1.8	1.1

* Results for chemicals marked with an asterisk were calculated based on internal standard (chlorobenzene-d5).

Many other chemicals were emitted, these include the methyl Decane isomers, the methyl naphthalene isomers and the dimethyl naphthalene isomers.

Analysis Name: TVOC								
TVOC				1,400	4,200	2,500	280	170

Analytical Results Summary

Sample Information

Sample ID: 74

Material Type:	Rubberized Resilient Flooring	Date Manufactured:	Not Known
Manufacturer:	M43	Date Arrived:	10/21/2002
Product Name:	ARRFT74M43	Date Conditioning Started:	11/08/2002
Adhesive Used:	No	Date Test Started:	11/18/2002

Sample Analyzed in Duplicate? No

Chamber: 2

Compound Name (CAS Number)	Prop. 65 Chemical	ARB TAC	1/2 CREL (ug/m^3)	Olfactory Threshold (ug/m^3)	Emission Factors ($ug/(m^2*hr)$) 24-Hr	48-Hr	96-Hr	96-Hr. Air Conc. (ug/m^3) B-room	Auditorium
Analysis Name: VOCs-Thermal Desorption - GC/MS									
Benzothiazole (95-16-9) *					140	380	210	24	14
Cyclohexanone (108-94-1)				2,900	16	28	17	2.0	1.2
Limonene (138-86-3) *				2,500	15	37	19	2.2	1.3
m/p-Xylene (108-38-3/106-42-3)		Yes	350	2,100	6.3	7.9	6.6	0.76	0.46
Methyl Isobutyl Ketone (108-10-1) *		Yes			25	59	28	3.2	1.9
Toluene (108-88-3)		Yes	150		7.2	11	7.9	0.91	0.55
Triethylphosphate (78-40-0) *					160	430	260	29	18
Undecane (1120-21-4)				7,800			9.3	1.1	0.64
Unidentified Peak *					7,000	17,000	8,500	970	590

* Results for chemicals marked with an asterisk were calculated based on internal standard (chlorobenzene-d5).
The unidentified peak is probably a long-chain ester.

Analysis Name: TVOC									
TVOC					7,800	19,000	9,700	1,100	670

Analytical Results Summary

Sample Information

Sample ID: 76

Material Type: Rubberized Resilient Flooring
Manufacturer: M41
Product Name: ARRF76M41
Adhesive Used: Yes
Sample Analyzed in Duplicate? No

Date Manufactured: 10/01/2002
Date Arrived: 11/07/2002
Date Conditioning Started: 11/22/2002
Date Test Started: 12/02/2002

Chamber: 2

Compound Name (CAS Number)	Prop. 65 Chemical	ARB TAC	1/2 CREL (ug/m^3)	Olfactory Threshold (ug/m^3)	Emission Factors ($ug/(m^2*hr)$) 24-Hr	48-Hr	96-Hr	96-Hr. Air Conc. (ug/m^3) B-room	Auditorium
Analysis Name: VOCs-Thermal Desorption - GC/MS									
1,2,3-Trimethylbenzene (526-73-8) *					390	360	260	30	18
1,2,4-Trimethylbenzene (95-36-6) *	Yes	Yes		770	1,000	920	590	68	41
1,3,5-Trimethyl Benzene (108-67-8)				1,200	120	100	71	8.1	4.9
1-Ethyl-2-Methylbenzene (611-11-4) *					300	270	170	20	12
1-Ethyl-3-Methylbenzene (620-14-4) *					750	420	370	42	25
1-Ethyl-4-Methylbenzene (622-96-8) *					320	500	150	17	11
1-Methyl-2-Pyrrolidinone (872-50-4)	Yes						5.4	0.61	0.37
2-(2-Butoxyethoxy) Ethanol (112-34-5) *		Yes			15	15	15	1.7	1.0
2-Ethyl-1-hexanol (104-76-7) *				1,300	17	16	14	1.6	0.96
Butyl Cyclohexane (1678-93-9)					25	24	19	2.2	1.4
Cyclohexanone (108-94-1)				2,900	40	65	20	2.2	1.4
Decanal (112-31-2) *				5.9	31	34			
Decane (124-18-5)				4,400	220	190	120	14	8.5
Diethyl Propanedioate (105-53-3) *					900	1,500	1,200	130	80
m/p-Xylene (108-38-3/106-42-3)		Yes	350	2,100	7.1	6.6			
Naphthalene (91-20-3)		Yes	4.5	79	12	12	12	1.4	0.82
Nonanal (124-19-6) *				13	57	63			
Nonane (111-84-2)					42	30	15	1.8	1.1
n-Propylbenzene (103-65-1) *					190	160	93	11	6.4
o-Xylene (95-47-6)		Yes	350	3,800	11	10	8.0	0.92	0.56
Phenol (108-95-2)		Yes	100	430		14			
Toluene (108-88-3)		Yes	150		6.1	6.2			
Undecane (1120-21-4)				7,800	71	71	59	6.7	4.1

* Results for chemicals marked with an asterisk were calculated based on internal standard (chlorobenzene-d5).

In addition to the chemicals listed above, other tentatively identified chemicals were emitted. These chemicals were mostly 7 to 15 carbon molecules. These included the methyl Decane isomers, 3-methyl nonane and several alkyl benzenes.

Analysis Name: TVOC									
TVOC					12,000	11,000	7,600	870	530

Analytical Results Summary

Sample Information

Sample ID: 77

Material Type:	Rubberized Resilient Flooring	Date Manufactured:	Not Known
Manufacturer:	M49	Date Arrived:	11/12/2002
Product Name:	ARRF77M49	Date Conditioning Started:	11/27/2002
Adhesive Used:	Yes	Date Test Started:	12/09/2002

Sample Analyzed in Duplicate? No

Chamber: 1

Compound Name (CAS Number)	Prop. 65 Chemical	ARB TAC	1/2 CREL (ug/m^3)	Olfactory Threshold (ug/m^3)	Emission Factors ($ug/(m^2*hr)$) 24-Hr	48-Hr	96-Hr	96-Hr. Air Conc. (ug/m^3) B-room	Auditorium
Analysis Name: VOCs-Thermal Desorption - GC/MS									
1,2,3-Trimethylbenzene (526-73-8) *					110	130	180	21	13
1,2,4-Trimethylbenzene (95-36-6) *	Yes	Yes		770	400	440	570	66	40
1,3,5-Trimethyl Benzene (108-67-8)				1,200	56	59	72	8.3	5.0
1-Ethyl-2-Methylbenzene (611-11-4) *					140	150	190	21	13
1-Ethyl-3-Methylbenzene (620-14-4) *					440	450	530	61	37
1-Ethyl-4-Methylbenzene (622-96-8) *					210	220	250	29	17
1-Methyl-2-Pyrrolidinone (872-50-4)	Yes				10	11	1.5	0.17	0.11
2-Ethyl-1-hexanol (104-76-7) *				1,300	11	11	12	1.4	0.85
Benzothiazole (95-16-9) *					270	300	380	44	26
Butyl Cyclohexane (1678-93-9)					13	13	16	1.8	1.1
Cumene (98-82-8) *		Yes		120	58	54	55	6.3	3.8
Cyclohexanone (108-94-1)				2,900	70	68	68	7.7	4.7
Decane (124-18-5)				4,400	120	120	140	17	10
Diethyl Propanedioate (105-53-3) *					280	390	760	87	53
m/p-Xylene (108-38-3/106-42-3)		Yes	350	2,100	8.4	7.8	7.5	0.86	0.52
N,N-Dimethylformamide (68-12-2) *		Yes	40		12	10.0	11	1.3	0.76
Naphthalene (91-20-3)		Yes	4.5	79	12	12	12	1.4	0.85
Nonane (111-84-2)					67	59	54	6.1	3.7
n-Propylbenzene (103-65-1) *					140	140	150	18	11
o-Xylene (95-47-6)		Yes	350	3,800	12	12	12	1.3	0.81
Toluene (108-88-3)		Yes	150		9.6	7.8	6.4	0.73	0.45
Undecane (1120-21-4)				7,800	25	27	36	4.1	2.5

* Results for chemicals marked with an asterisk were calculated based on internal standard (chlorobenzene-d5).

Other chemicals emitted included the following tentatively identified compounds: diethyl benzene isomers, ethyl phenyl ketone, several methyl Decane isomers and 3,3,5-trimethylcyclohexanone.

Analysis Name: Aldehyde-DNPH									
Acetone (67-64-1)					650	530	400	46	28
Formaldehyde (50-00-0) **	Yes	Yes	16.5	1,100	42	54	9.2	1.1	0.64

**CREL Note: Based on 1/2 of a total maximum of 27 ppb from all sources. The 27 ppb guideline is based on OEHHA's current acute 1-hour Reference Exposure Level (REL) of 76 ppb (94 µg/m3), extrapolated to an 8-hour exposure period.

Analysis Name: TVOC									
TVOC					5,900	6,000	7,500	850	520

Analytical Results Summary

Sample Information

Sample ID: 85

Material Type:	Rubberized Resilient Flooring	Date Manufactured:	Not Known
Manufacturer:	M42	Date Arrived:	12/11/2002
Product Name:	ARRF85M42	Date Conditioning Started:	01/10/2003
Adhesive Used:	Yes	Date Test Started:	01/20/2003

Sample Analyzed in Duplicate? No

Chamber: 1

Compound Name (CAS Number)	Prop. 65 Chemical	ARB TAC	1/2 CREL (ug/m^3)	Olfactory Threshold (ug/m^3)	Emission Factors ($ug/(m^2*hr)$) 24-Hr	48-Hr	96-Hr	96-Hr. Air Conc. (ug/m^3) B-room	Auditorium
Analysis Name: VOCs-Thermal Desorption - GC/MS									
1,2,3-Trimethylbenzene (526-73-8) *					92	77	74	8.5	5.1
1,2,4-Trimethylbenzene (95-36-6) *	Yes	Yes		770	410	320	290	33	20
1,3,5-Trimethyl Benzene (108-67-8)				1,200	120	140	120	14	8.4
1-Ethyl-3-Methylbenzene (620-14-4) *					450	320	270	31	19
1-Ethyl-4-Methylbenzene (622-96-8) *					240	170	130	15	9.1
2-Ethoxy Ethyl Acetate (111-15-9)	Yes		150	1,000	12	11	11	1.3	0.76
2-Ethyl-1-hexanol (104-76-7) *				1,300	11	11	11	1.2	0.74
a,a-Dimethylbenzenemethanol (617-94-7) *					2,200	1,600	1,300	140	88
Acetophenone (98-86-2) *		Yes		1,800	920	610	460	53	32
a-Methyl-styrene (98-83-9) *				760	560	380	320	36	22
Benzothiazole (95-16-9) *					390	250	200	22	14
Butyl Cyclohexane (1678-93-9)					11	10	10	1.2	0.72
Cumene (98-82-8) *		Yes		120	47	39	30	3.4	2.1
Cyclohexanone (108-94-1)				2,900	58	40	32	3.7	2.2
Decane (124-18-5)				4,400	100	77	73	8.4	5.1
Diethyl Propanedioate (105-53-3) *					510	430	440	51	31
Ethyl Benzene (100-41-4)		Yes	1000	13	10	8.3	7.3	0.84	0.51
m/p-Xylene (108-38-3/106-42-3)		Yes	350	2,100	28	18	15	1.7	1.0
Nonane (111-84-2)					74	48	39	4.4	2.7
n-Propylbenzene (103-65-1) *					140	100	82	9.3	5.7
o-Xylene (95-47-6)		Yes	350	3,800	17	14	12	1.4	0.82
Toluene (108-88-3)		Yes	150		27	17	12	1.4	0.86
Undecane (1120-21-4)				7,800	25	20	21	2.4	1.5

* Results for chemicals marked with an asterisk were calculated based on internal standard (chlorobenzene-d5).

Other chemicals emitted include several branched alkane isomers, such as 3-methylnonane, and 2,6-dimethyloctane; several alkylbenzenes, 4-ethyl-1,2-dimethylbenzene and 1,2,3,4-tetramethylbenzene among many others.

Analysis Name: TVOC					
TVOC	9,100	6,400	5,300	610	370

Analytical Results Summary

Sample Information

Sample ID: 86

Material Type:	Rubberized Resilient Flooring	Date Manufactured:	Not Known
Manufacturer:	M42	Date Arrived:	12/11/2002
Product Name:	ARRF86M42	Date Conditioning Started:	03/14/2003
Adhesive Used:	Yes	Date Test Started:	03/24/2003

Sample Analyzed in Duplicate? No

Chamber: 2

Compound Name (CAS Number)	Prop. 65 Chemical	ARB TAC	1/2 CREL (ug/m^3)	Olfactory Threshold (ug/m^3)	Emission Factors ($ug/(m^2*hr)$) 24-Hr	48-Hr	96-Hr	96-Hr. Air Conc. (ug/m^3) B-room	Auditorium
Analysis Name: VOCs-Thermal Desorption - GC/MS									
1,2,3-Trimethylbenzene (526-73-8) *						100	110	12	7.4
1,2,4-Trimethylbenzene (95-36-6) *	Yes	Yes		770			410	47	29
1,3,5-Trimethyl Benzene (108-67-8)				1,200	51	42	43	4.9	3.0
1-Ethyl-3-Methylbenzene (620-14-4) *					430	330	320	37	22
1-Ethyl-4-Methylbenzene (622-96-8) *					230	180	170	19	12
2-(2-Ethoxyethoxy)-Ethanol (111-90-0) *					15,000	7,300	3,700	420	260
2-Butoxy-Ethanol (111-76-2) *		Yes		1,700	140	52	24	2.7	1.7
2-Ethoxy Ethyl Acetate (111-15-9)	Yes		150	1,000	11				
2-Ethyl-1-hexanol (104-76-7) *				1,300	77	41	26	3.0	1.8
2-Ethylhexyl Acetate (103-09-3) *				2,300	44				
a,a-Dimethylbenzenemethanol (617-94-7) *					2,200	1,800	1,700	190	120
Acetophenone (98-86-2) *		Yes		1,800	1,000	790	680	77	47
a-Methyl-styrene (98-83-9) *				760	770	570	540	62	38
Benzothiazole (95-16-9) *						180	160	18	11
Butoxy-2-propanol (5131-66-8) *					70	47			
Butyl Cyclohexane (1678-93-9)					11	11	11	1.3	0.77
Cumene (98-82-8) *		Yes		120	56	43	39	4.4	2.7
Cyclohexanone (108-94-1)				2,900	48	36	31	3.6	2.2
Decane (124-18-5)				4,400		71	66	7.6	4.6
Diethyl Propanedioate (105-53-3) *					570	470	530	61	37
Ethyl Benzene (100-41-4)		Yes	1000	13	8.9	7.2	6.6	0.76	0.46
m/p-Xylene (108-38-3/106-42-3)		Yes	350	2,100	23	15	12	1.4	0.86
Naphthalene (91-20-3)		Yes	4.5	79	12	12			
Nonane (111-84-2)					54	40	34	3.9	2.4
n-Propylbenzene (103-65-1) *					140	110	100	12	7.1
o-Xylene (95-47-6)		Yes	350	3,800	16	12	11	1.3	0.79
Toluene (108-88-3)		Yes	150		16	12	10.0	1.1	0.69
Undecane (1120-21-4)				7,800	27	24	25	2.8	1.7
Unidentified Peak *					10,000	6,800	4,800	550	340

* Results for chemicals marked with an asterisk were calculated based on internal standard (chlorobenzene-d5).
The unidentified peak is most probably an ester or a glycol ether.

Analytical Results Summary

Sample Information

Sample ID: 86

Material Type:	Rubberized Resilient Flooring	Date Manufactured:	Not Known
Manufacturer:	M42	Date Arrived:	12/11/2002
Product Name:	ARRF86M42	Date Conditioning Started:	03/14/2003
Adhesive Used:	Yes	Date Test Started:	03/24/2003

Sample Analyzed in Duplicate? No

Chamber: 2

Compound Name (CAS Number)	Prop. 65 Chemical	ARB TAC	1/2 CREL (ug/m^3)	Olfactory Threshold (ug/m^3)	Emission Factors (ug/(m^2*hr)) 24-Hr	48-Hr	96-Hr	96-Hr. Air Conc. (ug/m^3) B-room	Auditorium
Analysis Name:	**Aldehyde-DNPH**								
Acetone (67-64-1)					26	30	52	6.0	3.6
Analysis Name:	**TVOC**								
TVOC					26,000	25,000	18,000	2,100	1,300

Appendix J-3

Analytical Results Summary for Resilient Flooring (Rubber-Based, Tire-Derived): Boardroom and Auditorium @ 0.75 Ach

Analytical Results Summary

Sample Information

Sample ID: 64

Material Type:	Rubberized Resilient Flooring	Date Manufactured:	08/01/2002
Manufacturer:	M36	Date Arrived:	09/03/2002
Product Name:	ARRF64M36	Date Conditioning Started:	09/15/2002
Adhesive Used:	Yes	Date Test Started:	09/30/2002

Sample Analyzed in Duplicate? No

Chamber: 2

Compound Name (CAS Number)	Prop. 65 Chemical	ARB TAC	1/2 CREL (ug/m^3)	Olfactory Threshold (ug/m^3)	Emission Factors ($ug/(m^2*hr)$) 24-Hr	48-Hr	96-Hr	96-Hr. Air Conc. (ug/m^3) B-room	Auditorium
Analysis Name: VOCs-Thermal Desorption - GC/MS									
2-Ethyl-1-hexanol (104-76-7) *				1,300	88	90	170	93	57
2-Ethylhexyl Acetate (103-09-3) *				2,300	110	110	230	120	73
Benzothiazole (95-16-9) *					110	100	200	110	64
Decanal (112-31-2) *				5.9			7.2	3.8	2.3
Limonene (138-86-3) *				2,500			6.2	3.3	2.0
Methyl Isobutyl Ketone (108-10-1) *		Yes			8.1	7.1			
Nonanal (124-19-6) *				13			11	5.7	3.5
Propylene Glycol (57-55-6) *					280	320	680	360	220
Trimethyl Silanol (1066-40-6) *					7.2	7.6	8.2	4.4	2.7
Unidentified Peak *					14,000	12,000	15,000	7,900	4,800

* Results for chemicals marked with an asterisk were calculated based on internal standard (chlorobenzene-d5).
The unidentified peak is probably a long-chain ester.

Analysis Name: TVOC									
TVOC					15,000	13,000	17,000	8,900	5,400

Analytical Results Summary

Sample Information

Sample ID: 65

Material Type:	Rubberized Resilient Flooring	Date Manufactured:	08/01/2002
Manufacturer:	M36	Date Arrived:	09/03/2002
Product Name:	ARRF65M36	Date Conditioning Started:	09/15/2002
Adhesive Used:	Yes	Date Test Started:	09/30/2002

Sample Analyzed in Duplicate? No

Chamber: 1

Compound Name (CAS Number)	Prop. 65 Chemical	ARB TAC	1/2 CREL (ug/m^3)	Olfactory Threshold (ug/m^3)	Emission Factors ($ug/(m^2*hr)$) 24-Hr	48-Hr	96-Hr	96-Hr. Air Conc. (ug/m^3) B-room	Auditorium
Analysis Name: VOCs-Thermal Desorption - GC/MS									
2-Ethyl-1-hexanol (104-76-7) *				1,300	50	71	140	75	46
2-Ethylhexyl Acetate (103-09-3) *				2,300	76	51	220	120	73
Benzothiazole (95-16-9) *					30	37	63	34	21
Decanal (112-31-2) *				5.9			6.2	3.3	2.0
Limonene (138-86-3) *				2,500			9.1	4.8	2.9
Methyl Isobutyl Ketone (108-10-1) *		Yes			7.0	7.3	14	7.2	4.4
n-Butyl ether (142-96-1) *				250	4.8	5.0	6.1	3.2	2.0
Nonanal (124-19-6) *				13			10	5.4	3.3
Propylene Glycol (57-55-6) *					66	66	230	120	74
Toluene (108-88-3)		Yes	150		12	11	12	6.2	3.8
Trimethyl Silanol (1066-40-6) *					14	14	17	9.0	5.5
Unidentified Peak *					10,000	11,000	12,000	6,400	3,900

* Results for chemicals marked with an asterisk were calculated based on internal standard (chlorobenzene-d5).
The unidentified peak is probably a long-chain ester.

Analysis Name: TVOC									
TVOC					10,000	11,000	13,000	7,000	4,300

Analytical Results Summary

Sample Information

Sample ID: 66

Material Type:	Rubberized Resilient Flooring	Date Manufactured:	06/01/2002
Manufacturer:	M36	Date Arrived:	09/03/2002
Product Name:	ARRF66M36	Date Conditioning Started:	09/20/2002
Adhesive Used:	Yes	Date Test Started:	10/07/2002

Sample Analyzed in Duplicate? No

Chamber: 1

Compound Name (CAS Number)	Prop. 65 Chemical	ARB TAC	1/2 CREL (ug/m^3)	Olfactory Threshold (ug/m^3)	Emission Factors ($ug/(m^2*hr)$) 24-Hr	48-Hr	96-Hr	96-Hr. Air Conc. (ug/m^3) B-room	Auditorium
Analysis Name: VOCs-Thermal Desorption - GC/MS									
2-Ethyl-1-hexanol (104-76-7) *				1,300	15	19	26	14	8.6
2-Ethylhexyl Acetate (103-09-3) *				2,300			17	9.3	5.7
Benzothiazole (95-16-9) *					330	390	400	210	130
Methyl Isobutyl Ketone (108-10-1) *		Yes			73	81	86	46	28
Propylene Glycol (57-55-6) *					140	210	290	150	93
Toluene (108-88-3)		Yes	150		15	15	15	7.9	4.8
Trimethyl Silanol (1066-40-6) *					23	26	25	14	8.2
Unidentified Peak *					2,800	3,000	3,000	1,600	990
Analysis Name: Aldehyde-DNPH									
Acetaldehyde (75-07-0)	Yes	Yes	4.5		19				
Acetone (67-64-1)					19	49	57	30	18
Analysis Name: TVOC									
TVOC					3,800	4,100	4,300	2,300	1,400

* Results for chemicals marked with an asterisk were calculated based on internal standard (chlorobenzene-d5).
The unidentified peak is probably a long-chain ester.

Analytical Results Summary

Sample Information

Sample ID: 67

Material Type:	Rubberized Resilient Flooring	Date Manufactured:	08/01/2002
Manufacturer:	M36	Date Arrived:	09/03/2002
Product Name:	ARRF67M36	Date Conditioning Started:	09/20/2002
Adhesive Used:	Yes	Date Test Started:	10/07/2002

Sample Analyzed in Duplicate? No

Chamber: 2

Compound Name (CAS Number)	Prop. 65 Chemical	ARB TAC	1/2 CREL (ug/m^3)	Olfactory Threshold (ug/m^3)	Emission Factors ($ug/(m^2*hr)$) 24-Hr	48-Hr	96-Hr	96-Hr. Air Conc. (ug/m^3) B-room	Auditorium
Analysis Name: VOCs-Thermal Desorption - GC/MS									
2-Ethyl-1-hexanol (104-76-7) *				1,300	74	130	120	66	40
2-Ethylhexyl Acetate (103-09-3) *				2,300	61	160	160	87	53
Benzothiazole (95-16-9) *					290	410	280	150	89
Methyl Isobutyl Ketone (108-10-1) *		Yes			26	37	27	14	8.7
n-Butyl ether (142-96-1) *				250	16	18	11	5.6	3.4
Propylene Glycol (57-55-6) *					160	300	320	170	100
Toluene (108-88-3)		Yes	150		14	14	9.5	5.1	3.1
Trimethyl Silanol (1066-40-6) *					49	58	40	21	13
Unidentified Peak *					17,000	21,000	15,000	8,300	5,000
Analysis Name: Aldehyde-DNPH									
Acetaldehyde (75-07-0)	Yes	Yes	4.5		16	19			
Acetone (67-64-1)					22	0.51	31	16	9.9
Analysis Name: TVOC									
TVOC					19,000	23,000	17,000	9,100	5,500

* Results for chemicals marked with an asterisk were calculated based on internal standard (chlorobenzene-d5).
The unidentified peak is probably a long-chain ester.

Analytical Results Summary

Sample Information

Sample ID: 71

Material Type:	Rubberized Resilient Flooring	Date Manufactured:	08/20/2002
Manufacturer:	M37	Date Arrived:	08/28/2002
Product Name:	ARRF71M37	Date Conditioning Started:	10/25/2002
Adhesive Used:	Yes	Date Test Started:	11/04/2002

Sample Analyzed in Duplicate? No

Chamber: 1

Compound Name (CAS Number)	Prop. 65 Chemical	ARB TAC	1/2 CREL (ug/m^3)	Olfactory Threshold (ug/m^3)	Emission Factors ($ug/(m^2*hr)$) 24-Hr	48-Hr	96-Hr	96-Hr. Air Conc. (ug/m^3) B-room	Auditorium
Analysis Name: VOCs-Thermal Desorption - GC/MS									
1,2,3-Trimethylbenzene (526-73-8) *					28	27	88	47	29
1,2,4-Trimethylbenzene (95-36-6) *	Yes	Yes		770	130	120	370	200	120
1,3,5-Trimethyl Benzene (108-67-8)				1,200	21	19	46	24	15
1-Ethyl-2-Methylbenzene (611-11-4) *					39	38	110	60	37
1-Ethyl-3-Methylbenzene (620-14-4) *					160	140	380	200	120
1-Ethyl-4-Methylbenzene (622-96-8) *					98	82	210	110	69
Benzothiazole (95-16-9) *					330	250	540	290	170
Butyl Cyclohexane (1678-93-9)							11	5.9	3.6
Cyclohexanone (108-94-1)				2,900	49	35	64	34	21
Decane (124-18-5)				4,400	53	45	120	62	38
Diethyl Propanedioate (105-53-3) *					120	120	450	240	150
Dodecane (112-40-3) *					23				
m/p-Xylene (108-38-3/106-42-3)		Yes	350	2,100	8.7	7.5	10	5.5	3.3
Methyl Isobutyl Ketone (108-10-1) *		Yes			97	64	120	65	40
Nonane (111-84-2)					37	29	67	36	22
n-Propylbenzene (103-65-1) *					54	46	120	65	40
o-Xylene (95-47-6)		Yes	350	3,800	8.7	8.0	12	6.2	3.8
Pentadecane (629-62-9) *					25	21	42	22	14
Tetradecane (629-59-4) *					37	29	49	26	16
Toluene (108-88-3)		Yes	150		6.5	5.8	7.3	3.9	2.4
Tridecane (629-59-4) *					37	33	57	30	18
Undecane (1120-21-4)				7,800	18	16	32	17	10

* Results for chemicals marked with an asterisk were calculated based on internal standard (chlorobenzene-d5).

Many other chemicals were emitted; these included the following tentatively identified compounds: 3-Methynonane, 2,6-dimethylnonane, 2-methyldecane, 3-methyldecane 1,4-diethylbenzene, 2-methylnaphthalene and several dimethylnaphthalene isomers.

Analysis Name: TVOC								
TVOC				6,000	6,200	8,100	4,300	2,600

Analytical Results Summary

Sample Information

Sample ID: 72

Material Type:	Rubberized Resilient Flooring	Date Manufactured:	08/27/2002
Manufacturer:	M35	Date Arrived:	09/06/2002
Product Name:	ARRF72M35	Date Conditioning Started:	10/25/2002
Adhesive Used:	Yes	Date Test Started:	11/04/2002

Sample Analyzed in Duplicate? No

Chamber: 2

Compound Name (CAS Number)	Prop. 65 Chemical	ARB TAC	1/2 CREL (ug/m^3)	Olfactory Threshold (ug/m^3)	Emission Factors ($ug/(m^2*hr)$) 24-Hr	48-Hr	96-Hr	96-Hr. Air Conc. (ug/m^3) B-room	Auditorium
Analysis Name: VOCs-Thermal Desorption - GC/MS									
1,2,3-Trimethylbenzene (526-73-8) *						95	120	63	38
1,2,4-Trimethylbenzene (95-36-6) *	Yes	Yes		770	340	120	530	280	170
1,3,5-Trimethyl Benzene (108-67-8)				1,200	60	27	80	43	26
1-Ethyl-2-Methylbenzene (611-11-4) *					170	55	180	94	57
1-Ethyl-3-Methylbenzene (620-14-4) *					470	150	610	330	200
1-Ethyl-4-Methylbenzene (622-96-8) *					270	170	320	170	100
1-Methyl-2-Pyrrolidinone (872-50-4)	Yes					14	26	14	8.3
2-Ethoxy Ethyl Acetate (111-15-9)	Yes		150	1,000	16	12	18	9.6	5.8
2-Ethyl Hexanoic Acid (149-57-5) *							56	30	18
2-Ethyl-1-hexanol (104-76-7) *				1,300		8.6	12	6.2	3.8
a,a-Dimethylbenzenemethanol (617-94-7) *					6,900	2,600	6,100	3,300	2,000
Acetophenone (98-86-2) *		Yes		1,800	460	980	2,300	1,200	730
a-Methyl-styrene (98-83-9) *				760		83	120	66	40
Benzothiazole (95-16-9) *					2,600	160	390	210	130
Butyl Cyclohexane (1678-93-9)					11	8.4	14	7.3	4.4
Cumene (98-82-8) *		Yes		120	75	31	79	42	26
Cyclohexanone (108-94-1)				2,900	130	39	88	47	29
Decane (124-18-5)				4,400	170	64	200	110	64
Diethyl Propanedioate (105-53-3) *					120	58	250	130	79
Ethyl Benzene (100-41-4)		Yes	1000	13	8.5	5.9	7.2	3.8	2.3
Isopropyl Alcohol (67-63-0)		Yes	3500		49	0.75			
m/p-Xylene (108-38-3/106-42-3)		Yes	350	2,100	21	9.2	15	8.0	4.8
Naphthalene (91-20-3)		Yes	4.5	79	15	12	14	7.6	4.6
Nonane (111-84-2)					190	57	140	74	45
n-Propylbenzene (103-65-1) *					170	75	200	110	65
o-Xylene (95-47-6)		Yes	350	3,800	24	11	20	11	6.5
Toluene (108-88-3)		Yes	150		40	13	22	12	7.0
Undecane (1120-21-4)				7,800	22	13	28	15	9.2

* Results for chemicals marked with an asterisk were calculated based on internal standard (chlorobenzene-d5).

Additionally, many other chemicals were emitted. These included 2-methyloctane, 2-Heptenal, 3-methylnonane and 2,5-dimethyloctane.

Analysis Name: TVOC									
TVOC					16,000	6,400	100,000	53,000	32,000

Analytical Results Summary

Sample Information

Sample ID: 73

Material Type:	Rubberized Resilient Flooring	Date Manufactured:	08/19/2002
Manufacturer:	M34	Date Arrived:	09/05/2002
Product Name:	ARRFT73M34	Date Conditioning Started:	11/08/2002
Adhesive Used:	Yes	Date Test Started:	11/18/2002

Sample Analyzed in Duplicate? No

Chamber: 1

Compound Name (CAS Number)	Prop. 65 Chemical	ARB TAC	1/2 CREL (ug/m^3)	Olfactory Threshold (ug/m^3)	Emission Factors ($ug/(m^2*hr)$) 24-Hr	48-Hr	96-Hr	96-Hr. Air Conc. (ug/m^3) B-room	Auditorium
Analysis Name: VOCs-Thermal Desorption - GC/MS									
1,2,3-Trimethylbenzene (526-73-8) *					14	49	32	17	10
1,2,4-Trimethylbenzene (95-36-6) *	Yes	Yes		770	68	230	130	72	44
1,3,5-Trimethyl Benzene (108-67-8)				1,200	12	24	21	11	6.8
1-Ethyl-2-Methylbenzene (611-11-4) *					21	67	42	22	14
1-Ethyl-3-Methylbenzene (620-14-4) *					80	260	150	78	47
1-Ethyl-4-Methylbenzene (622-96-8) *					50	150	81	43	26
Benzothiazole (95-16-9) *					170	450	220	120	70
Butyl Cyclohexane (1678-93-9)							8.1	4.3	2.6
Cyclohexanone (108-94-1)				2,900	26	55	38	20	12
Decane (124-18-5)				4,400	28	77	44	24	14
Diethyl Propanedioate (105-53-3) *					39	140	120	62	38
Dodecane (112-40-3) *					15	39	20	10	6.4
m/p-Xylene (108-38-3/106-42-3)		Yes	350	2,100	6.7	9.2	6.9	3.7	2.2
Methyl Isobutyl Ketone (108-10-1) *		Yes			35	92	34	18	11
Naphthalene (91-20-3)		Yes	4.5	79			11	6.1	3.7
Nonane (111-84-2)					20	51	26	14	8.4
n-Propylbenzene (103-65-1) *					28	86	46	24	15
Octane (111-65-9) *					15	39	23	12	7.5
o-Xylene (95-47-6)		Yes	350	3,800	7.2	10	7.9	4.2	2.6
Pentadecane (629-62-9) *					17	48	27	14	8.6
Toluene (108-88-3)		Yes	150		5.7	7.3	6.1	3.2	2.0
Tridecane (629-59-4) *					18	50	30	16	9.8
Undecane (1120-21-4)				7,800	12	22	16	8.6	5.2

* Results for chemicals marked with an asterisk were calculated based on internal standard (chlorobenzene-d5).

Many other chemicals were emitted, these include the methylDecane isomers, the methylnaphthalene isomers and the dimethylnaphthalene isomers.

Analysis Name: TVOC								
TVOC				1,400	4,200	2,500	1,300	800

Analytical Results Summary

Sample Information

Sample ID: 74

Material Type:	Rubberized Resilient Flooring	Date Manufactured:	Not Known
Manufacturer:	M43	Date Arrived:	10/21/2002
Product Name:	ARRFT74M43	Date Conditioning Started:	11/08/2002
Adhesive Used:	No	Date Test Started:	11/18/2002

Sample Analyzed in Duplicate? No

Chamber: 2

Compound Name (CAS Number)	Prop. 65 Chemical	ARB TAC	1/2 CREL (ug/m^3)	Olfactory Threshold (ug/m^3)	Emission Factors ($ug/(m^2*hr)$) 24-Hr	48-Hr	96-Hr	96-Hr. Air Conc. (ug/m^3) B-room	Auditorium
Analysis Name: VOCs-Thermal Desorption - GC/MS									
Benzothiazole (95-16-9) *					140	380	210	110	67
Cyclohexanone (108-94-1)				2,900	16	28	17	9.3	5.6
Limonene (138-86-3) *				2,500	15	37	19	10	6.1
m/p-Xylene (108-38-3/106-42-3)		Yes	350	2,100	6.3	7.9	6.6	3.5	2.2
Methyl Isobutyl Ketone (108-10-1) *		Yes			25	59	28	15	9.0
Toluene (108-88-3)		Yes	150		7.2	11	7.9	4.2	2.6
Triethylphosphate (78-40-0) *					160	430	260	140	83
Undecane (1120-21-4)				7,800			9.3	5.0	3.0
Unidentified Peak *					7,000	17,000	8,500	4,500	2,800

* Results for chemicals marked with an asterisk were calculated based on internal standard (chlorobenzene-d5).
The unidentified peak is probably a long-chain ester.

Analysis Name: TVOC									
TVOC					7,800	19,000	9,700	5,200	3,100

Analytical Results Summary

Sample Information

Sample ID: 76

Material Type: Rubberized Resilient Flooring
Manufacturer: M41
Product Name: ARRF76M41
Adhesive Used: Yes
Sample Analyzed in Duplicate? No

Date Manufactured: 10/01/2002
Date Arrived: 11/07/2002
Date Conditioning Started: 11/22/2002
Date Test Started: 12/02/2002

Chamber: 2

Compound Name (CAS Number)	Prop. 65 Chemical	ARB TAC	1/2 CREL (ug/m^3)	Olfactory Threshold (ug/m^3)	Emission Factors ($ug/(m^2*hr)$) 24-Hr	48-Hr	96-Hr	96-Hr. Air Conc. (ug/m^3) B-room	Auditorium
Analysis Name: VOCs-Thermal Desorption - GC/MS									
1,2,3-Trimethylbenzene (526-73-8) *					390	360	260	140	85
1,2,4-Trimethylbenzene (95-36-6) *	Yes	Yes		770	1,000	920	590	320	190
1,3,5-Trimethyl Benzene (108-67-8)				1,200	120	100	71	38	23
1-Ethyl-2-Methylbenzene (611-11-4) *					300	270	170	92	56
1-Ethyl-3-Methylbenzene (620-14-4) *					750	420	370	200	120
1-Ethyl-4-Methylbenzene (622-96-8) *					320	500	150	81	49
1-Methyl-2-Pyrrolidinone (872-50-4)	Yes						5.4	2.9	1.7
2-(2-Butoxyethoxy) Ethanol (112-34-5) *		Yes			15	15	15	8.0	4.9
2-Ethyl-1-hexanol (104-76-7) *				1,300	17	16	14	7.4	4.5
Butyl Cyclohexane (1678-93-9)					25	24	19	10	6.3
Cyclohexanone (108-94-1)				2,900	40	65	20	10	6.4
Decanal (112-31-2) *				5.9	31	34			
Decane (124-18-5)				4,400	220	190	120	66	40
Diethyl Propanedioate (105-53-3) *					900	1,500	1,200	620	380
m/p-Xylene (108-38-3/106-42-3)		Yes	350	2,100	7.1	6.6			
Naphthalene (91-20-3)		Yes	4.5	79	12	12	12	6.3	3.8
Nonanal (124-19-6) *				13	57	63			
Nonane (111-84-2)					42	30	15	8.3	5.0
n-Propylbenzene (103-65-1) *					190	160	93	49	30
o-Xylene (95-47-6)		Yes	350	3,800	11	10	8.0	4.3	2.6
Phenol (108-95-2)		Yes	100	430		14			
Toluene (108-88-3)		Yes	150		6.1	6.2			
Undecane (1120-21-4)				7,800	71	71	59	31	19

* Results for chemicals marked with an asterisk were calculated based on internal standard (chlorobenzene-d5).

In addition to the chemicals listed above, other tentatively identified chemicals were emitted. These chemicals were mostly 7 to 15 carbon molecules. These included the methyl Decane isomers, 3-methyl nonane and several alkyl benzenes.

Analysis Name: TVOC								
TVOC				12,000	11,000	7,600	4,100	2,500

Analytical Results Summary

Sample Information

Sample ID: 77

Material Type:	Rubberized Resilient Flooring	Date Manufactured:	Not Known
Manufacturer:	M49	Date Arrived:	11/12/2002
Product Name:	ARRF77M49	Date Conditioning Started:	11/27/2002
Adhesive Used:	Yes	Date Test Started:	12/09/2002

Sample Analyzed in Duplicate? No

Chamber: 1

Compound Name (CAS Number)	Prop. 65 Chemical	ARB TAC	1/2 CREL (ug/m^3)	Olfactory Threshold (ug/m^3)	Emission Factors ($ug/(m^2*hr)$) 24-Hr	48-Hr	96-Hr	96-Hr. Air Conc. (ug/m^3) B-room	Auditorium
Analysis Name: VOCs-Thermal Desorption - GC/MS									
1,2,3-Trimethylbenzene (526-73-8) *					110	130	180	97	59
1,2,4-Trimethylbenzene (95-36-6) *	Yes	Yes		770	400	440	570	310	190
1,3,5-Trimethyl Benzene (108-67-8)				1,200	56	59	72	39	23
1-Ethyl-2-Methylbenzene (611-11-4) *					140	150	190	99	60
1-Ethyl-3-Methylbenzene (620-14-4) *					440	450	530	280	170
1-Ethyl-4-Methylbenzene (622-96-8) *					210	220	250	130	81
1-Methyl-2-Pyrrolidinone (872-50-4)	Yes				10	11	1.5	0.82	0.49
2-Ethyl-1-hexanol (104-76-7) *				1,300	11	11	12	6.5	4.0
Benzothiazole (95-16-9) *					270	300	380	200	120
Butyl Cyclohexane (1678-93-9)					13	13	16	8.4	5.1
Cumene (98-82-8) *		Yes		120	58	54	55	29	18
Cyclohexanone (108-94-1)				2,900	70	68	68	36	22
Decane (124-18-5)				4,400	120	120	140	77	47
Diethyl Propanedioate (105-53-3) *					280	390	760	400	250
m/p-Xylene (108-38-3/106-42-3)		Yes	350	2,100	8.4	7.8	7.5	4.0	2.4
N,N-Dimethylformamide (68-12-2) *		Yes	40		12	10.0	11	5.9	3.6
Naphthalene (91-20-3)		Yes	4.5	79	12	12	12	6.6	4.0
Nonane (111-84-2)					67	59	54	29	17
n-Propylbenzene (103-65-1) *					140	140	150	82	50
o-Xylene (95-47-6)		Yes	350	3,800	12	12	12	6.2	3.8
Toluene (108-88-3)		Yes	150		9.6	7.8	6.4	3.4	2.1
Undecane (1120-21-4)				7,800	25	27	36	19	12

* Results for chemicals marked with an asterisk were calculated based on internal standard (chlorobenzene-d5).

Other chemicals emitted included the following tentatively identified compounds: diethyl benzene isomers, ethyl phenyl ketone, several methyl Decane isomers and 3,3,5-trimethyl cyclohexanone.

Analysis Name: Aldehyde-DNPH									
Acetone (67-64-1)					650	530	400	210	130
Formaldehyde (50-00-0) **	Yes	Yes	16.5	1,100	42	54	9.2	4.9	3.0

**CREL Note: Based on 1/2 of a total maximum of 27 ppb from all sources. The 27 ppb guideline is based on OEHHA's current acute 1-hour Reference Exposure Level (REL) of 76 ppb (94 µg/m3), extrapolated to an 8-hour exposure period.

Analysis Name: TVOC									
TVOC					5,900	6,000	7,500	4,000	2,400

Analytical Results Summary

Sample Information

Sample ID: 85

Material Type:	Rubberized Resilient Flooring	Date Manufactured:	Not Known
Manufacturer:	M42	Date Arrived:	12/11/2002
Product Name:	ARRF85M42	Date Conditioning Started:	01/10/2003
Adhesive Used:	Yes	Date Test Started:	01/20/2003

Sample Analyzed in Duplicate? No

Chamber: 1

Compound Name (CAS Number)	Prop. 65 Chemical	ARB TAC	1/2 CREL (ug/m^3)	Olfactory Threshold (ug/m^3)	Emission Factors ($ug/(m^2*hr)$) 24-Hr	48-Hr	96-Hr	96-Hr. Air Conc. (ug/m^3) B-room	Auditorium
Analysis Name: VOCs-Thermal Desorption - GC/MS									
1,2,3-Trimethylbenzene (526-73-8) *					92	77	74	40	24
1,2,4-Trimethylbenzene (95-36-6) *	Yes	Yes		770	410	320	290	150	94
1,3,5-Trimethyl Benzene (108-67-8)				1,200	120	140	120	65	39
1-Ethyl-3-Methylbenzene (620-14-4) *					450	320	270	140	88
1-Ethyl-4-Methylbenzene (622-96-8) *					240	170	130	70	42
2-Ethoxy Ethyl Acetate (111-15-9)	Yes		150	1,000	12	11	11	5.8	3.5
2-Ethyl-1-hexanol (104-76-7) *				1,300	11	11	11	5.7	3.5
a,a-Dimethylbenzenemethanol (617-94-7) *					2,200	1,600	1,300	670	410
Acetophenone (98-86-2) *		Yes		1,800	920	610	460	250	150
a-Methyl-styrene (98-83-9) *				760	560	380	320	170	100
Benzothiazole (95-16-9) *					390	250	200	100	64
Butyl Cyclohexane (1678-93-9)					11	10	10	5.5	3.4
Cumene (98-82-8) *		Yes		120	47	39	30	16	9.7
Cyclohexanone (108-94-1)				2,900	58	40	32	17	10
Decane (124-18-5)				4,400	100	77	73	39	24
Diethyl Propanedioate (105-53-3) *					510	430	440	240	140
Ethyl Benzene (100-41-4)		Yes	1000	13	10	8.3	7.3	3.9	2.4
m/p-Xylene (108-38-3/106-42-3)		Yes	350	2,100	28	18	15	8.0	4.9
Nonane (111-84-2)					74	48	39	21	13
n-Propylbenzene (103-65-1) *					140	100	82	44	26
o-Xylene (95-47-6)		Yes	350	3,800	17	14	12	6.3	3.8
Toluene (108-88-3)		Yes	150		27	17	12	6.6	4.0
Undecane (1120-21-4)				7,800	25	20	21	11	6.9

* Results for chemicals marked with an asterisk were calculated based on internal standard (chlorobenzene-d5).

Other chemicals emitted include several branched alkane isomers, such as 3-methylnonane, and 2,6-dimethyloctane; several alkylbenzenes, 4-ethyl-1,2-dimethylbenzene and 1,2,3,4-tetramethylbenzene among many others.

Analysis Name: TVOC						
TVOC	9,100	6,400	5,300	2,900	1,700	

Analytical Results Summary

Sample Information

Sample ID: 86

Material Type:	Rubberized Resilient Flooring	Date Manufactured:	Not Known
Manufacturer:	M42	Date Arrived:	12/11/2002
Product Name:	ARRF86M42	Date Conditioning Started:	03/14/2003
Adhesive Used:	Yes	Date Test Started:	03/24/2003

Sample Analyzed in Duplicate? No

Chamber: 2

Compound Name (CAS Number)	Prop. 65 Chemical	ARB TAC	1/2 CREL (ug/m^3)	Olfactory Threshold (ug/m^3)	Emission Factors ($ug/(m^2*hr)$) 24-Hr	48-Hr	96-Hr	96-Hr. Air Conc. (ug/m^3) B-room	Auditorium
Analysis Name: VOCs-Thermal Desorption - GC/MS									
1,2,3-Trimethylbenzene (526-73-8) *						100	110	57	34
1,2,4-Trimethylbenzene (95-36-6) *	Yes	Yes		770			410	220	130
1,3,5-Trimethyl Benzene (108-67-8)				1,200	51	42	43	23	14
1-Ethyl-3-Methylbenzene (620-14-4) *					430	330	320	170	100
1-Ethyl-4-Methylbenzene (622-96-8) *					230	180	170	90	54
2-(2-Ethoxyethoxy)-Ethanol (111-90-0) *					15,000	7,300	3,700	2,000	1,200
2-Butoxy-Ethanol (111-76-2) *		Yes		1,700	140	52	24	13	7.7
2-Ethoxy Ethyl Acetate (111-15-9)	Yes		150	1,000	11				
2-Ethyl-1-hexanol (104-76-7) *				1,300	77	41	26	14	8.5
2-Ethylhexyl Acetate (103-09-3) *				2,300	44				
a,a-Dimethylbenzenemethanol (617-94-7) *					2,200	1,800	1,700	890	540
Acetophenone (98-86-2) *		Yes		1,800	1,000	790	680	360	220
a-Methyl-styrene (98-83-9) *				760	770	570	540	290	180
Benzothiazole (95-16-9) *						180	160	86	52
Butoxy-2-propanol (5131-66-8) *					70	47			
Butyl Cyclohexane (1678-93-9)					11	11	11	5.9	3.6
Cumene (98-82-8) *		Yes		120	56	43	39	21	13
Cyclohexanone (108-94-1)				2,900	48	36	31	17	10
Decane (124-18-5)				4,400		71	66	35	22
Diethyl Propanedioate (105-53-3) *					570	470	530	280	170
Ethyl Benzene (100-41-4)		Yes	1000	13	8.9	7.2	6.6	3.5	2.2
m/p-Xylene (108-38-3/106-42-3)		Yes	350	2,100	23	15	12	6.6	4.0
Naphthalene (91-20-3)		Yes	4.5	79	12	12			
Nonane (111-84-2)					54	40	34	18	11
n-Propylbenzene (103-65-1) *					140	110	100	55	33
o-Xylene (95-47-6)		Yes	350	3,800	16	12	11	6.0	3.7
Toluene (108-88-3)		Yes	150		16	12	10.0	5.3	3.2
Undecane (1120-21-4)				7,800	27	24	25	13	8.0
Unidentified Peak *					10,000	6,800	4,800	2,600	1,600

* Results for chemicals marked with an asterisk were calculated based on internal standard (chlorobenzene-d5).
The unidentified peak is most probably an ester or a glycol ether.

Analytical Results Summary

Sample Information

Sample ID: 86

Material Type:	Rubberized Resilient Flooring	Date Manufactured:	Not Known
Manufacturer:	M42	Date Arrived:	12/11/2002
Product Name:	ARRF86M42	Date Conditioning Started:	03/14/2003
Adhesive Used:	Yes	Date Test Started:	03/24/2003

Sample Analyzed in Duplicate? No

Chamber: 2

Compound Name (CAS Number)	Prop. 65 Chemical	ARB TAC	1/2 CREL (ug/m^3)	Olfactory Threshold (ug/m^3)	Emission Factors ($ug/(m^2*hr)$) 24-Hr	48-Hr	96-Hr	96-Hr. Air Conc. (ug/m^3) B-room	Auditorium
Analysis Name: Aldehyde-DNPH									
Acetone (67-64-1)					26	30	52	28	17
Analysis Name: TVOC									
TVOC					26,000	25,000	18,000	9,700	5,900

Appendix K

Analytical Results Summary For Tackable Wall Panels

Analytical Results Summary

Sample Information

Sample ID: 16

Material Type:	Vinyl Covered Tackable Panel	Date Manufactured:	Not Known
Manufacturer:	M9	Date Arrived:	11/26/2001
Product Name:	SWP16M9	Date Conditioning Started:	01/17/2002
Adhesive Used:	No	Date Test Started:	01/27/2002

Sample Analyzed in Duplicate? No

Chamber: 2

Compound Name (CAS Number)	Prop. 65 Chemical	ARB TAC	1/2 CREL (ug/m^3)	Olfactory Threshold (ug/m^3)	Emission Factors ($ug/(m^2*hr)$) 24-Hr	48-Hr	96-Hr	96-Hr. Air Conc. (ug/m^3) Class-room	Office
Analysis Name: VOCs-Thermal Desorption - GC/MS									
1,2-Bis(trimethylsiloxy)ethane (7381-30-8) *					22	17	16	8.0	0.77
2-Ethyl Hexanoic Acid (149-57-5) *					140	140	180	93	8.9
3-Methyl-1,1'-biphenyl (643-93-6) *					14	14	15	7.7	0.74
Benzene (71-43-2)	Yes	Yes	30				6.0	3.1	0.29
Ethyl Benzene (100-41-4)		Yes	1000	13	5.4	5.4	5.5	2.8	0.27
Isopropyl Alcohol (67-63-0)		Yes	3500		7.2	7.1	7.0	3.5	0.34
Naphthalene (91-20-3)		Yes	4.5	79	6.7	6.6	6.6	3.3	0.32
Phenol (108-95-2)		Yes	100	430	9.4	8.5	9.6	4.9	0.47
Tetradecane (629-59-4) *					13	9.7	9.4	4.8	0.46
Toluene (108-88-3)		Yes	150				7.5	3.8	0.37

* Results for chemicals marked with an asterisk were calculated based on internal standard (chlorobenzene-d5).

Analysis Name: TVOC									
TVOC					400	360	430	220	21

Analytical Results Summary

Sample Information

Sample ID: 17

Material Type:	Vinyl Covered Tackable Panel	Date Manufactured:	Not Known
Manufacturer:	M10	Date Arrived:	12/21/2001
Product Name:	AWP17M10	Date Conditioning Started:	01/17/2002
Adhesive Used:	No	Date Test Started:	01/27/2002

Sample Analyzed in Duplicate? No

Chamber: 1

Compound Name (CAS Number)	Prop. 65 Chemical	ARB TAC	1/2 CREL (ug/m^3)	Olfactory Threshold (ug/m^3)	Emission Factors ($ug/(m^2*hr)$) 24-Hr	48-Hr	96-Hr	96-Hr. Air Conc. (ug/m^3) Class-room	Office
Analysis Name: VOCs-Thermal Desorption - GC/MS									
2-Methoxy Ethanol (109-86-4)	Yes		30	3,600	20	14			
Benzene (71-43-2)	Yes	Yes	30		6.0	6.0			
Decane (124-18-5)				4,400	3.5	3.5	3.4	1.7	0.17
Ethyl Benzene (100-41-4)		Yes	1000	13	5.5	5.5	5.5	2.8	0.27
Isopropyl Alcohol (67-63-0)		Yes	3500				7.0	3.5	0.34
Naphthalene (91-20-3)		Yes	4.5	79	6.6	6.6	6.6	3.3	0.32
Nonanal (124-19-6) *				13	7.7	6.9	4.5	2.3	0.22
Phenol (108-95-2)		Yes	100	430	15	16	11	5.6	0.54
Propylene Glycol (57-55-6) *					52	41	17	8.8	0.85
Toluene (108-88-3)		Yes	150		7.7	7.6	7.8	3.9	0.38
Undecane (1120-21-4)				7,800	5.5	5.2			

* Results for chemicals marked with an asterisk were calculated based on internal standard (chlorobenzene-d5).

Analysis Name: Aldehyde-DNPH									
Acetone (67-64-1)					18				
Analysis Name: TVOC									
TVOC					200	190	100	52	5.0

Appendix L

Analytical Results Summary For Thermal Insulation

Analytical Results Summary

Sample Information

Sample ID: 53

Material Type:	Insulation-Thermal	Date Manufactured:	Not Known
Manufacturer:	M27	Date Arrived:	08/02/2002
Product Name:	AINS53M27	Date Conditioning Started:	08/04/2002
Adhesive Used:	No	Date Test Started:	08/14/2002

Sample Analyzed in Duplicate? No

Chamber: 1

Compound Name (CAS Number)	Prop. 65 Chemical	ARB TAC	1/2 CREL (ug/m^3)	Olfactory Threshold (ug/m^3)	Emission Factors (ug/(m^2*hr)) 24-Hr	48-Hr	96-Hr	96-Hr. Air Conc. (ug/m^3) Class-room	Office
Analysis Name: VOCs-Thermal Desorption - GC/MS									
Decanal (112-31-2) *				5.9			0.87	0.86	2.0
Nonanal (124-19-6) *				13	0.73	1.2	1.4	1.3	3.0
* Results for chemicals marked with an asterisk were calculated based on internal standard (chlorobenzene-d5).									
Analysis Name: Aldehyde-DNPH									
Acetone (67-64-1)						15	15	15	34
Formaldehyde (50-00-0) **	Yes	Yes	16.5	1,100	4.0	6.5	7.7	7.5	17
**CREL Note: Based on 1/2 of a total maximum of 27 ppb from all sources. The 27 ppb guideline is based on OEHHA's current acute 1-hour Reference Exposure Level (REL) of 76 ppb (94 µg/m^3), extrapolated to an 8-hour exposure period.									
Analysis Name: TVOC									
TVOC					0.73	1.7	2.2	2.2	5.0

Analytical Results Summary

Sample Information

Sample ID: 54

Material Type:	Insulation-Thermal	Date Manufactured:	Not Known
Manufacturer:	M28	Date Arrived:	08/02/2002
Product Name:	SINS54M28	Date Conditioning Started:	08/04/2002
Adhesive Used:	No	Date Test Started:	08/14/2002

Sample Analyzed in Duplicate? No

Chamber: 2

Compound Name (CAS Number)	Prop. 65 Chemical	ARB TAC	1/2 CREL (ug/m^3)	Olfactory Threshold (ug/m^3)	Emission Factors ($ug/(m^2*hr)$) 24-Hr	48-Hr	96-Hr	96-Hr. Air Conc. (ug/m^3) Class-room	Office
Analysis Name: VOCs-Thermal Desorption - GC/MS									
Nonanal (124-19-6) *				13	2.6	1.6	1.2	1.2	2.6
Analysis Name: Aldehyde-DNPH									
Acetone (67-64-1)						19	21	20	46
Formaldehyde (50-00-0) **	Yes	Yes	16.5	1,100	12	13	14	13	31
Analysis Name: TVOC									
TVOC					2.6	1.6	1.2	1.2	2.6

* Results for chemicals marked with an asterisk were calculated based on internal standard (chlorobenzene-d5).

**CREL Note: Based on 1/2 of a total maximum of 27 ppb from all sources. The 27 ppb guideline is based on OEHHA's current acute 1-hour Reference Exposure Level (REL) of 76 ppb (94 µg/m3), extrapolated to an 8-hour exposure period.

Analytical Results Summary

Sample Information

Sample ID: 68

Material Type:	Insulation-Thermal	Date Manufactured:	08/15/2002
Manufacturer:	M47	Date Arrived:	08/19/2002
Product Name:	SINS68M47	Date Conditioning Started:	10/11/2002
Adhesive Used:	No	Date Test Started:	10/21/2002

Sample Analyzed in Duplicate? No

Chamber: 1

Compound Name (CAS Number)	Prop. 65 Chemical	ARB TAC	1/2 CREL (ug/m^3)	Olfactory Threshold (ug/m^3)	Emission Factors ($ug/(m^2*hr)$) 24-Hr	48-Hr	96-Hr	96-Hr. Air Conc. (ug/m^3) Class-room	Office
Analysis Name: VOCs-Thermal Desorption - GC/MS									
Decanal (112-31-2) *				5.9	0.57	0.64			
Hexanal (66-25-1) *				58	0.24				
Nonanal (124-19-6) *				13	2.3	1.5	0.57	0.56	1.3
Octanal (124-13-0) *				7.2	0.37	0.38			
Toluene (108-88-3)		Yes	150		0.13	0.13			
Analysis Name: Aldehyde-DNPH									
Acetaldehyde (75-07-0)	Yes	Yes	4.5		0.019		0.074	0.073	0.17
Acetone (67-64-1)					1.5	1.4	1.8	1.8	4.1
Formaldehyde (50-00-0) **	Yes	Yes	16.5	1,100	1.1	0.43	0.35	0.34	0.78
Analysis Name: TVOC									
TVOC					4.3	8.8	0.57	0.56	1.3

* Results for chemicals marked with an asterisk were calculated based on internal standard (chlorobenzene-d5).

**CREL Note: Based on 1/2 of a total maximum of 27 ppb from all sources. The 27 ppb guideline is based on OEHHA's current acute 1-hour Reference Exposure Level (REL) of 76 ppb (94 $\mu g/m^3$), extrapolated to an 8-hour exposure period.

Analytical Results Summary

Sample Information

Sample ID: 69

Material Type:	Insulation-Thermal	Date Manufactured:	08/22/2002
Manufacturer:	M48	Date Arrived:	10/09/2002
Product Name:	AINS69M48	Date Conditioning Started:	10/11/2002
Adhesive Used:	No	Date Test Started:	10/21/2002

Sample Analyzed in Duplicate? No

Chamber: 2

Compound Name (CAS Number)	Prop. 65 Chemical	ARB TAC	1/2 CREL (ug/m^3)	Olfactory Threshold (ug/m^3)	Emission Factors ($ug/(m^2*hr)$) 24-Hr	48-Hr	96-Hr	96-Hr. Air Conc. (ug/m^3) Class-room	Office
Analysis Name: VOCs-Thermal Desorption - GC/MS									
Acetic Acid (64-19-7) *				360	15				
Cyclohexanone (108-94-1)				2,900	4.3	4.3			
Decanal (112-31-2) *				5.9	9.2	9.7			
Ethyl Benzene (100-41-4)		Yes	1000	13	1.1	1.0			
Heptanal (111-71-7) *				23	3.7				
Hexanal (66-25-1) *				58	22	12	5.3	5.2	12
m/p-Xylene (108-38-3/106-42-3)		Yes	350	2,100	1.4	1.2			
Nonanal (124-19-6) *				13	17	16	4.0	3.9	9.0
Nonane (111-84-2)					1.1				
Octanal (124-13-0) *				7.2	6.9	7.2			
o-Xylene (95-47-6)		Yes	350	3,800	1.3	1.2			
Pentanal (110-62-3) *				22	2.0				
Phenol (108-95-2)		Yes	100	430		4.1			
Styrene (100-42-5)		Yes	450	630	1.4				
Toluene (108-88-3)		Yes	150		1.8	1.3	0.97	0.96	2.2

* Results for chemicals marked with an asterisk were calculated based on internal standard (chlorobenzene-d5).

Compound Name (CAS Number)	Prop. 65 Chemical	ARB TAC	1/2 CREL (ug/m^3)	Olfactory Threshold (ug/m^3)	Emission Factors ($ug/(m^2*hr)$) 24-Hr	48-Hr	96-Hr	96-Hr. Air Conc. (ug/m^3) Class-room	Office
Analysis Name: Aldehyde-DNPH									
Acetaldehyde (75-07-0)	Yes	Yes	4.5		2.6				
Acetone (67-64-1)					15	10.0	8.2	8.0	18
Formaldehyde (50-00-0) **	Yes	Yes	16.5	1,100	4.0	3.3	1.7	1.7	3.9

**CREL Note: Based on 1/2 of a total maximum of 27 ppb from all sources. The 27 ppb guideline is based on OEHHA's current acute 1-hour Reference Exposure Level (REL) of 76 ppb (94 $\mu g/m^3$), extrapolated to an 8-hour exposure period.

Compound Name (CAS Number)	Prop. 65 Chemical	ARB TAC	1/2 CREL (ug/m^3)	Olfactory Threshold (ug/m^3)	Emission Factors ($ug/(m^2*hr)$) 24-Hr	48-Hr	96-Hr	96-Hr. Air Conc. (ug/m^3) Class-room	Office
Analysis Name: TVOC									
TVOC					110	70	26	26	59

Appendix M
Analytical Results Summary for Wall Base

Analytical Results Summary

Sample Information

Sample ID: 78

Material Type:	Wall Base	Date Manufactured:	Not Known
Manufacturer:	M39	Date Arrived:	11/25/2002
Product Name:	SWB78M39	Date Conditioning Started:	11/27/2002
Adhesive Used:	Yes	Date Test Started:	12/09/2002

Sample Analyzed in Duplicate? No

Chamber: 2

Compound Name (CAS Number)	Prop. 65 Chemical	ARB TAC	1/2 CREL (ug/m^3)	Olfactory Threshold (ug/m^3)	Emission Factors ($ug/(m^2*hr)$) 24-Hr	48-Hr	96-Hr	96-Hr. Air Conc. (ug/m^3) Class-room	Office
Analysis Name: VOCs-Thermal Desorption - GC/MS									
Decane (124-18-5)				4,400	12	12	14	0.28	0.85
Ethyl Benzene (100-41-4)		Yes	1000	13		7.2	7.5	0.15	0.45
m/p-Xylene (108-38-3/106-42-3)		Yes	350	2,100		8.2	8.8	0.18	0.53
Naphthalene (91-20-3)		Yes	4.5	79	16	15	15	0.31	0.93
Nonane (111-84-2)					11	10	13	0.26	0.77
Octane (111-65-9) *					240	220	300	6.0	18
o-Xylene (95-47-6)		Yes	350	3,800		8.3	8.6	0.17	0.52
Styrene (100-42-5)		Yes	450	630	16	16	20	0.40	1.2
Toluene (108-88-3)		Yes	150		9.6	9.3	10	0.21	0.64
Undecane (1120-21-4)				7,800		13	13	0.27	0.82

* Results for chemicals marked with an asterisk were calculated based on internal standard (chlorobenzene-d5).

Compound Name (CAS Number)	Prop. 65 Chemical	ARB TAC	1/2 CREL (ug/m^3)	Olfactory Threshold (ug/m^3)	Emission Factors ($ug/(m^2*hr)$) 24-Hr	48-Hr	96-Hr	96-Hr. Air Conc. (ug/m^3) Class-room	Office
Analysis Name: Aldehyde-DNPH									
Acetaldehyde (75-07-0)	Yes	Yes	4.5			4.3	9.4	0.19	0.57
Acetone (67-64-1)					420	190	400	8.1	24
Formaldehyde (50-00-0) **	Yes	Yes	16.5	1,100	73	45	61	1.2	3.7

**CREL Note: Based on 1/2 of a total maximum of 27 ppb from all sources. The 27 ppb guideline is based on OEHHA's current acute 1-hour Reference Exposure Level (REL) of 76 ppb (94 $\mu g/m^3$), extrapolated to an 8-hour exposure period.

Compound Name (CAS Number)	Prop. 65 Chemical	ARB TAC	1/2 CREL (ug/m^3)	Olfactory Threshold (ug/m^3)	Emission Factors ($ug/(m^2*hr)$) 24-Hr	48-Hr	96-Hr	96-Hr. Air Conc. (ug/m^3) Class-room	Office
Analysis Name: TVOC									
TVOC					1,000	800	1,200	24	71

Analytical Results Summary

Sample Information

Sample ID: 83

Material Type:	Wall Base	Date Manufactured:	Not Known
Manufacturer:	M50	Date Arrived:	12/17/2002
Product Name:	SWB83M50	Date Conditioning Started:	01/17/2003
Adhesive Used:	Yes	Date Test Started:	01/27/2003

Sample Analyzed in Duplicate? No

Chamber: 1

Compound Name (CAS Number)	Prop. 65 Chemical	ARB TAC	1/2 CREL (ug/m^3)	Olfactory Threshold (ug/m^3)	Emission Factors ($ug/(m^2*hr)$) 24-Hr	48-Hr	96-Hr	96-Hr. Air Conc. (ug/m^3) Class-room	Office
Analysis Name: VOCs-Thermal Desorption - GC/MS									
2-(2-Butoxyethoxy) Ethanol (112-34-5) *		Yes			45	53	55	1.1	3.3
2-Ethyl Hexanoic Acid (149-57-5) *					180	230	240	4.9	15
2-Ethyl-1-hexanol (104-76-7) *				1,300	43	47	44	0.90	2.7
Butyl Cyclohexane (1678-93-9)					19	20	18	0.37	1.1
Cyclohexanone (108-94-1)				2,900			34	0.69	2.1
Decane (124-18-5)				4,400	20	22	20	0.41	1.2
Ethyl Benzene (100-41-4)		Yes	1000	13			7.6	0.15	0.46
m/p-Xylene (108-38-3/106-42-3)		Yes	350	2,100			8.5	0.17	0.52
Naphthalene (91-20-3)		Yes	4.5	79	38	42	41	0.84	2.5
n-Butanol (71-36-3) *				1,500	210	260	200	4.2	12
o-Xylene (95-47-6)		Yes	350	3,800			9.0	0.18	0.54
Phenol (108-95-2)		Yes	100	430	610	690	680	14	41
Propylene Glycol (57-55-6) *					320	210	250	5.1	15
Toluene (108-88-3)		Yes	150			10	8.5	0.17	0.52
Undecane (1120-21-4)				7,800	260	280	270	5.4	16

* Results for chemicals marked with an asterisk were calculated based on internal standard (chlorobenzene-d5).
In addition to the compounds listed above, many branched and cyclic hydrocarbons were emitted, mostly in the 9-carbon to 14-carbon range. Several of these compounds have been tentatively identified, including 2,6-dimethyl nonane, 2-methyl decane, 3-methyl decane, 4-methyl decane, 5-methyl decane, pentyl-cyclohexane and 2,6-dimethyl undecane.

Analysis Name: Aldehyde-DNPH									
Acetaldehyde (75-07-0)	Yes	Yes	4.5			17	20	0.40	1.2
Acetone (67-64-1)						37	30	0.61	1.8
Formaldehyde (50-00-0) **	Yes	Yes	16.5	1,100		0.38	3.6	0.073	0.22

**CREL Note: Based on 1/2 of a total maximum of 27 ppb from all sources. The 27 ppb guideline is based on OEHHA's current acute 1-hour Reference Exposure Level (REL) of 76 ppb (94 µg/m^3), extrapolated to an 8-hour exposure period.

Analysis Name: TVOC								
TVOC				12,000	14,000	13,000	270	800

Appendix N
Summary of Manufacturing and Testing Dates

Sample ID	Sample Code	Date Manufactured	Date Received	Conditioning Start Date	Test Start Date	Age At Start of Conditioning
Acoustical Ceiling Panels						
25	AACP25M14	03/01/2002	03/13/2002	03/15/2002	03/25/2002	14 Days
26	AACP26M10	03/12/2002	03/13/2002	03/15/2002	03/25/2002	3 Days
27	AACP27M10	03/12/2002	03/13/2002	04/05/2002	04/15/2002	24 Days
28	AACP28M14	03/01/2002	03/13/2002	04/05/2002	04/15/2002	35 Days
29	SACP29M5	Not Known	03/12/2002	04/12/2002	04/22/2002	Not Known
30	AACP30M14	03/06/2002	03/13/2002	04/12/2002	04/22/2002	37 Days
31	SACP31M5	Not Known	04/11/2002	04/19/2002	04/29/2002	Not Known
32	SACP32M10	Not Known	04/26/2002	04/26/2002	05/06/2002	Not Known
33	SACP33M5	Not Known	04/25/2002	04/26/2002	05/06/2002	Not Known
Carpet						
2	SC2M1	Not Known	10/19/2001	10/26/2001	11/05/2001	Not Known
4	SC4M4	Not Known	11/01/2001	11/02/2001	11/12/2001	Not Known
5	SC5M4	Not Known	11/01/2001	11/02/2001	11/12/2001	Not Known
6	SC6M2	10/18/2001	11/21/2001	11/21/2001	12/03/2001	34 Days
7	ACT7M3	11/13/2001	11/21/2001	11/30/2001	12/11/2001	17 Days
8	SCT8M3	11/13/2001	11/21/2001	11/30/2001	12/11/2001	17 Days
9	AC9M1	03/13/2000	11/08/2001	12/07/2001	12/17/2001	634 Days
18	SC18M4	Not Known	11/01/2001	11/18/2001	11/28/2001	Not Known
19	SC19M4	Not Known	11/01/2001	11/18/2001	11/28/2001	Not Known
34	SC34M15	05/03/2002	05/10/2002	05/10/2002	05/20/2002	7 Days
35	SCT35M16	05/06/2002	05/07/2002	05/10/2002	05/20/2002	4 Days
36	ACT36M16	05/06/2002	05/07/2002	05/24/2002	06/03/2002	18 Days
37	ACT37M17	Not Known	05/20/2002	05/31/2002	06/10/2002	Not Known
38	ACT38M17	Not Known	05/20/2002	05/31/2002	06/10/2002	Not Known
39	SC39M15	05/07/2002	05/24/2002	07/24/2002	08/03/2002	78 Days
40	SCT40M17	Not Known	05/24/2002	07/24/2002	08/03/2002	Not Known
Fiberboard						
20	AMDF20M11	Not Known	11/14/2001	01/22/2002	02/01/2002	Not Known
21	AMDF21M12	Not Known	11/13/2001	01/22/2002	02/01/2002	Not Known
24	AMDF24M11	Not Known	01/18/2002	02/01/2002	02/11/2002	Not Known
51	SMDF51M11	07/14/2002	07/24/2002	07/31/2002	08/09/2002	17 Days
52	SMDF52M11	07/18/2002	07/26/2002	07/31/2002	08/09/2002	13 Days

Sample ID	Sample Code	Date Manufactured	Date Received	Conditioning Start Date	Test Start Date	Age At Start of Conditioning
Gypsum Board						
57	SGB57M31	Not Known	08/07/2002	02/28/2003	03/10/2003	Not Known
58	SGB58M10	Not Known	08/07/2002	02/28/2003	03/10/2003	Not Known
59	AGB59M32	Not Known	08/19/2002	03/07/2003	03/17/2003	Not Known
60	AGB60M33	Not Known	08/19/2002	03/07/2003	03/17/2003	Not Known
91	SGB91M51	Not Known	05/01/2002	05/03/2002	05/13/2002	Not Known
Paint						
41	SPNT41M18	04/01/2002	06/12/2002	06/15/2002	06/24/2002	75 Days
42	SPNT42M18	04/01/2002	06/12/2002	06/15/2002	06/25/2002	75 Days
43	APNT43M19	02/23/2001	06/17/2002	06/21/2002	07/01/2002	483 Days
44	APNT44M20	08/01/2001	06/14/2002	06/28/2002	07/08/2002	331 Days
45	SPNT45M22	04/01/2002	06/12/2002	06/28/2002	07/08/2002	88 Days
46	SPNT46M23	02/01/02	06/24/2002	07/05/2002	07/15/2002	154 Days
47	APNT47M23	02/01/02	06/24/2002	07/05/2002	07/15/2002	154 Days
48	APNT48M24	07/12/00	07/12/2002	07/12/2002	07/22/2002	730 Days
49	APNT49M25	08/17/01	07/12/2002	07/19/2002	07/29/2002	336 Days
50	APNT50M26	Not Known	07/18/2002	07/19/2002	07/29/2002	Not Known
Particleboard						
22	APB22M13	Not Known	12/11/2001	01/27/2002	02/07/2002	Not Known
23	SPB23M11	Not Known	01/18/2002	02/01/2002	02/11/2002	Not Known
Plastic Laminates and Assemblies						
55	SPLAM55M29	Not Known	08/05/2002	08/09/2002	08/19/2002	Not Known
56	SPLAM56M30	Not Known	08/05/2002	08/09/2002	08/19/2002	Not Known
61	SPASM61M30	Not Known	03/14/2003	03/14/2003	03/24/2003	Not Known
62	APASM62M30	Not Known	09/17/2002	09/07/2002	09/17/2002	Not Known

Sample ID	Sample Code	Date Manufactured	Date Received	Conditioning Start Date	Test Start Date	Age At Start of Conditioning
Resilient Flooring (non-rubber based)						
11	SRFT11M5	Not Known	11/05/2001	12/28/2001	01/07/2002	Not Known
12	ARF12M6	Not Known	01/09/2002	01/11/2002	01/22/2002	Not Known
13	SRF13M5	Not Known	11/30/2001	01/11/2002	01/22/2002	Not Known
14	ARFT14M7	Not Known	11/27/2001	01/04/2002	01/14/2002	Not Known
15	ARFT15M8	Not Known	12/11/2001	01/04/2002	01/14/2002	Not Known
79	SRFT79M44	06/15/2002	12/05/2002	12/06/2002	12/16/2002	174 Days
80	SRFT80M46	12/21/2000	11/25/2002	12/27/2002	01/06/2003	736 Days
81	ARF81TM45	10/15/2002	12/17/2002	12/27/2002	01/06/2003	73 Days
87	SRFT87M46	11/24/2002	01/15/2003	01/17/2003	01/27/2003	54 Days
90	ARF90M5	Not Known	12/06/2002	02/17/2003	03/03/2003	Not Known
Resilient Flooring (rubber-based)						
Non-Tire-Derived						
70	ARRF70M38	08/01/2002	09/17/2002	10/18/2002	10/28/2002	78 Days
75	ARRF75M41	09/10/2002	11/07/02	11/22/2002	12/02/2002	73 Days
84	ARRF84M42	Not Known	12/11/2002	01/03/2003	01/13/2003	Not Known
Tire-Derived						
64	ARRF64M36	08/01/2002	9/03/02	09/15/2002	09/30/2002	45 Days
65	ARRF65M36	08/01/2002	9/03/02	09/15/2002	09/30/2002	45 Days
66	ARRF66M36	06/01/2002	9/03/02	09/20/2002	10/07/2002	111 Days
67	ARRF67M36	08/01/2002	9/03/02	09/20/2002	10/07/2002	50 Days
71	ARRF71M37	08/20/2002	08/28/02	10/25/2002	11/04/2002	66 Days
72	ARRF72M35	08/27/2002	09/06/2002	10/25/2002	11/04/2002	59 Days
73	ARRFT73M34	08/19/2002	09/05/2002	11/08/2002	11/18/2002	81 Days
74	ARRFT74M43	Not Known	10/21/02	11/08/2002	11/18/2002	Not Known
76	ARRF76M41	10/01/2002	11/07/02	11/22/2002	12/02/2002	52 Days
77	ARRF77M49	Not Known	11/12/02	11/27/2002	12/09/2002	Not Known
85	ARRF85M42	Not Known	12/11/02	01/10/2003	01/20/2003	Not Known
86	ARRF86M42	Not Known	12/11/02	03/14/2003	03/24/2003	Not Known

Sample ID	Sample Code	Date Manufactured	Date Received	Conditioning Start Date	Test Start Date	Age At Start of Conditioning
Tackable Wall Panels						
16	SWP16M9	Not Known	11/26/2001	01/17/2002	01/27/2002	Not Known
17	AWP17M10	Not Known	12/21/2001	01/17/2002	01/27/2002	Not Known
Thermal Insulation						
53	AINS53M27	Not Known	08/02/2002	08/04/2002	08/14/2002	Not Known
54	SINS54M28	Not Known	08/02/2002	08/04/2002	08/14/2002	Not Known
68	SINS68M47	08/15/2002	08/19/2002	10/11/2002	10/21/2002	57 Days
69	AINS69M48	08/22/2002	10/09/2002	10/11/2002	10/21/2002	50 Days
Wall Base						
78	SWB78M39	Not Known	11/25/2002	11/27/2002	12/09/2002	Not Known
83	SWB83M50	Not Known	12/17/2002	01/17/2003	01/27/2003	Not Known

Appendix O
Health Effects of Selected Chemicals

Health Effects of Selected Chemicals

As was discussed in Section 2.3.5, we identified and quantified chemicals on the Chronic Reference Exposure Levels list, Proposition 65 list, Toxic Air Contaminants list, and Human Olfactory Thresholds list as published by Devos, et al. (1990).

In addition, we used the following criteria to identify and quantify compounds not shown in the above four lists:

1. Compounds with emission factors exceeding 1.5 $\mu g/m^2 \bullet hr$ for VOCs except aldehydes. For aldehydes the emissions factor cut off varied from 15 $\mu g/m^2 \bullet hr$ for formaldehyde to 36 $\mu g/m^2 \bullet hr$ for hexanal.

2. Compounds with chromatography peaks exceeding five percent of the TVOC area.

3. Ten most abundant compounds.

Below we are listing health effects of selected chemicals which: (a) we found in several materials and which are on one or more of the above four lists; or (b) meet one of the three criteria above and for which health effects are known.

1. **Acetaldehyde (75-07-0):**
   CREL: 9 $\mu g/m^3$. Prop. 65 lists this chemical as a carcinogen. Also listed in ARB's TAC list. This is a chemical with a fruity, pungent odor. Acute exposure results in eye, skin, and respiratory tract irritation. In rats, long-term exposure has been shown to result in damage to the respiratory tract. The U.S. EPA and the International Agency for Research on Cancer (IARC) have classified it as a probable/possible human carcinogen based on sufficient evidence in animals. More information about this chemical can be found at: www.arb.ca.gov/toxics/tac/factshts/acetalde.pdf.

2. **2-Butoxy Ethanol** [Ethylene glycol monobutyl ether] **(111-76-2):**
   CREL: 20 $\mu g/m^3$ as listed in ARB's TAC list. Odor threshold is 339 ppb. Has pleasant odor and it is used as a solvent. Acute exposure to low levels of glycol ethers in humans causes conjunctivitis, temporary corneal clouding, and upper respiratory tract irritation. Chronic exposure to glycol ethers in humans results in fatigue, lethargy, nausea, anorexia, tremor, and anemia. More information about this chemical can be found at: www.arb.ca.gov/toxics/tac/factshts/glycleth.pdf.

3. **2-(-2-butoxyethoxy)-ethanol** [diethylene glycol monobutyl ether] **(112-34-5):**
   This chemical is in the TAC list. It has a faint butyl odor SMF can react with oxidizing materials. It is used as solvent (plasticized intermediate). Acute exposure to low levels of glycol ethers in humans causes conjunctivitis, temporary corneal clouding, and upper respiratory tract irritation. Chronic exposure to glycol ethers in humans results in fatigue, lethargy, nausea, anorexia, tremor, and anemia. More information about this chemical can be found at: www.arb.ca.gov/toxics/tac/factshts/glycleth.pdf.

4. **Caprolactam (105-60-2): Interim Concentration Limit (OEHHA, 2002b)**
   This chemical is used in the manufacture of nylon materials such as Nylon 6. It has an unpleasant odor and it is listed in the TAC list as a Category V non-cancer substance. Although a CREL has not been established by OEHHA at this time, the following health effects are listed in the TAC list: (a) exposure by inhalation can cause severe eye and respiratory tract irritation; (b) acute inhalation has been observed to cause nervous system effects including headaches, malaise, and confusion; (c) chronic exposure has been observed to cause skin peeling of the hands, and eye, skin, and throat irritation; and (d) the U.S. EPA has set an oral Reference Dose at 0.5 mg/kg per day based on reduced offspring weight rates. The U.S. EPA has not established an inhalation Reference Concentration (RfC) for this chemical.

Since caprolactam has a vapor pressure of 1.9 mm x 10-3 mm Hg at 25ºC, it will exist solely in the vapor phase in the ambient environment. Vapor-phase caprolactam degrades in the atmosphere by reaction with photochemically produced hydroxyl radicals; the half-life for this reaction in air is estimated to be 21 hours. In indoor environments, the degradation of caprolactam is likely to take much longer due to the presence of lower concentration or even absence of the reactive hydroxyl radicals needed.

The National Institute for Occupational Safety and Health (NIOSH), responsible for establishing recommended exposure limits for chemicals found at industrial workplaces, has established a limit for vapor caprolactam at 0.22 ppm (1 mg/m^3). This is the time-weighted average recommended exposure limit for up to a ten-hour workday. Since the occupational exposure values are for healthy industrial workers, a ten-fold safety factor has been used in the past when applying these industrial exposure values to the general population. In the case of caprolactam, the extrapolated concentration for the general population is 22 ppb (100 μg/m^3). We are using this extrapolated concentration as an interim concentration limit. However, we note that at this time the State of California has not assessed whether or not this extrapolated concentration is low enough to protect children and other sensitive populations.

More information about this chemical can be found at:
www.arb.ca.gov/toxics/tac/factshts/caprolac.pdf
www.cdc.gov/niosh/npg/npgd0097.html
www.cdc.gov/niosh/pel88/105-60A.html

Although not related to health effects, the following text is provided to give the reader an understanding of how this chemical is used in the manufacturing of Nylon 6.

According to BASF, manufacturer of Nylon 6, the following steps are taken during the recycling of Nylon 6 fibers (www.basf.com/):

a. Used carpet is collected and verified for 100% BASF Nylon 6® fiber content.
b. The product is shredded into a form that allows the fiber and backing materials to be separated. Backing and other non-fiber components are diverted and either processed into useful recycled products, or properly disposed of by independent contractors authorized by BASF.
c. Pelletized face fiber is de-polymerized and chemically distilled, returning the nylon to a purified caprolactam monomer.
d. Caprolactam is re-polymerized into first quality BASF nylon polymer.
e. Nylon polymer is melt-spun into bcf nylon carpet yarn.
f. Finished carpet is manufactured from recycled Nylon 6 yarns.

5. 2-Ethyl hexanoic acid (149-57-5):
This chemical is not on the Prop. 65 or the TAC lists. This chemical is in HSDB (Hazardous Substances Data Bank), CHRIS (Chemical Hazard Response Information System) and RTECS (Registry of Toxic Effects of Chemical Substances). Since it has a measured vapor pressure of 0.03 mm Hg @ 20ºC, it is expected to exist solely as a vapor in the ambient or indoor environment. Outside, vapor-phase 2-ethylhexanoic is degraded in the atmosphere by reaction with photochemically produced hydroxyl radicals; the half-life for this reaction in air is estimated to be about two days. Indoors, this chemical will most likely be degraded at a much slower rate. The vapor can cause severe irritation of the eyes and throat and can cause eye and lung injury. The liquid is a moderate to severe skin irritant. Animal oral studies showed that the chemical can cause liver damage and is a developmental toxicant (embryo- and fetotoxicity). Although the chemical is not a carcinogen, it is important to note that 2-ethylhexanoic acid is a metabolite of the widely used plasticizer, di-(2-ethylhexyl)phthalate (DEHP), a known human carcinogen.

6. **Formaldehyde: Interim Indoor Reference Exposure Level (IREL)** (OEHHA. 2002a)
The acute 1-hour REL of 76 ppb (94 µg/m³) was derived from a human study (Kulle, et al., 1987) with eye irritation as the adverse health effect. The 8-hour IREL of 27 ppb (33µg/m³) was derived directly from this human study using a modification of Haber's Law, C^n *T = K, where n=2. An uncertainty factor of 10 was used to account for intraindividual variability in the human population.

The chronic REL of 2 ppb (3 µg/m³) was derived from a study of chemical plant workers (Wilhelmsson and Holmstrom, 1992) based on assumed exposure of 8 hours/day, 5 days/week for an average of 10 years. Critical effects were nasal and eye irritation, nasal obstruction, and nasal lesions including rhinitis, squamous metaplasia, and dysplasia. A no observed adverse effect level (NOAEL) of 0.032 mg/m³ (26 ppb) was derived and the chronic REL was calculated using an intraindividual variability uncertainty factor of 10.

The Department of Health Services (DHS) has been using the chronic RELs as guidance levels in controlling the release of emission pollutants from indoor products. In 2000, DHS approached the Office of Environmental Health Hazard Assessment (OEHHA) about the chronic REL of formaldehyde because it is found at a level that is often above that measured in ambient air. DHS, in its effort to reduce exposure to formaldehyde indoors from furniture and other building materials, requested OEHHA to provide an indoor "lowest reasonable achievable level" for formaldehyde, taking into account the following:

- At the present time it is impossible to completely eliminate formaldehyde emission from wood products.
- Manufacturers of particleboard could not change to non-formaldehyde resin systems, as they are not of the strength and non-deterioration quality of formaldehyde-based adhesives. Board products made from non-formaldehyde resins do not meet the standards required in construction.
- OEHHA recommends an interim IREL of 27 ppb for formaldehyde based on the following:
  a. No effects were seen in healthy workers exposed to 26 ppb of formaldehyde for 8 hours/day, 5 days/week for an average of 10 years (see above). Due to the rapid off-gassing of formaldehyde-containing products/materials indoors, it is unlikely that occupants will be exposed to this level daily for this length of time.
  b. ACGIH has a TLV-Ceiling of 0.3 ppm (300 ppb) for healthy adult workers. If this number is given an uncertainty factor of 10 to protect sensitive workers in the workforce, this number is lowered to 0.03 ppm or 30 ppb.
  c. The World Health Organization (WHO) (2000) concluded that in order to prevent irritation in the general population, an air quality value of 0.1 mg/m³ (80 ppb) is recommended.

The interim IREL for formaldehyde represents the current best scientific judgment, but there may be a need for periodic revision of the number when new scientific data become available. It is believed that inhalation of formaldehyde at 27 ppb or below will not have adverse health effects on most people. However, highly sensitive groups, especially those that respond immunologically to the chemical, may be affected at levels below this concentration. Health effects at or below this level can also result from combined exposures to various chemicals or from exposure to the same chemical by multiple routes.

7. **Naphthalene (91-20-3):**
CREL: 9 µg/m^3. Naphthalene is listed as a Category II non-cancer contaminant in the TAC list. It can cause nasal inflammation, olfactory epithelial metaplasia, and respiratory epithelial hyperplasia. Odor threshold is 14.8 ppb. More information about this chemical can be found at: www.oehha.org/air/chronic_rels/pdf/91203.pdf and www.arb.ca.gov/toxics/tac/factshts/naphthal.pdf.

8. **Phenol (108-95-2):**
CREL: 200 µg/m^3. Listed in ARB's TAC list. This is an intermediate chemical for the manufacture of Nylon 6 and other man-made fibers. Exposure to this chemical has systemic effects including liver

and nervous system. More information about this chemical can be found at: www.oehha.org/air/chronic_rels/pdf/108952.pdf.

9. **Propionaldehyde (123-38-6):**
This is a chemical on the IVa TAC list. It has an unpleasant, suffocating, fruity odor, similar to acetaldehyde. Some of its uses include disinfectants and preservatives. Exposure may cause eye and respiratory tract irritation. No carcinogenic information is available on this chemical from animal or human studies. More information about this chemical can be found at: www.arb.ca.gov/toxics/tac/factshts/propalde.pdf.

Appendix P

Gypsum Board Analysis Via Scanning Electron Microscopy and Energy-Dispersive Spectroscopy

EHLB Analytical Report - Microscopy Unit

Submitted by:	Robert Miller Cal. Dept. of Health Services/EHLB/Indoor Air Section (for CIWMB Materials Emissions Testing Project)
Date Received:	9/20/02
Received By:	Jeff Wagner
Samples Analyzed:	SGB57M31 SGB58M10 AGB59M32 AGB60M33
Sampling Location:	n/a
Sample Description:	1.5 in x 6 in sections cut from wallboard panels possessing varying degrees of recycled content
Analysis Requested:	Determine presence of any metals or mold spores in recycled wallboard materials, considering both core and endpaper materials
Methods:	Gross composition using low-power stereomicroscope Scanning electron microscopy using back-scattered electron detector Energy-dispersive X-ray spectroscopy
Instruments:	Bausch & Lomb Stereo Microscope Philips XL30 Environmental Scanning Electron Microscope ThermoNoran VANTAGE X-ray Analysis System

Analyst:	Jeff Wagner, Ph.D. Research Scientist (510) 540-2390	California Department of Health Services Environmental Health Laboratory Branch 2151 Berkeley Way, Berkeley, CA 94704

Analytical Results

Introduction:

Four wallboard samples with differing degrees of recycled content were analyzed using scanning electron microscopy and energy-dispersive spectroscopy. This analysis is driven by the hypothesis that the recycled content may contain metal and/or mold spore contamination if the original materials were collected, for example, from a dirty construction site.

Summary:

EHLB Lab ID	Sample ID	Region	Nominal recycled content	Single metals detected***	Internally-mixed metals detected***
E0211002-1	SGB57M31	core	none	Fe, Sr	Fe/Cu/Co
		paper	100% RC*	Fe, Sr, Ba	Fe/Cu/Co
E0211002-2	SGB58M10	core	none	Fe, Sr, Ba, Mn, Zr, U	Fe/Cu, Fe/Mn, Fe/Zn
		paper	100% RC	Fe, Ba	
E0211002-3	AGB59M32	core	5% TRC**	Fe, Sr	Fe/Mn
		paper	100% RC	Fe, Sr, Mn, Zr, Cr	Fe/Cr/Ni, Fe/Cr
E0211002-4	AGB60M33	core	5% TRC**	Fe, Sr, Ba	Fe/Cr/Ni
		paper	100% RC	Fe, Sr, Ba	Pb/Sn

*RC = recycled content **TRC = total recycled content ***atomic number > 22

Methods/Results:

1. Samples were in the form of 1.5 in x 6 in sections that had been scored and broken off of larger wallboard pieces.
2. All samples were first examined under the low-power stereomicroscope to determine overall gross composition:
    a. Generally, all samples consisted of a thick white layer with clear straight fibers and a gray or tan paper layer on each face.
    b. Specifically, the bulk composition ranged between 85-90% gypsum ($CaSO_4$), 5-10% cellulose fibers (predominantly in the paper layers), and 3-5% fiberglass.
    c. Trace levels of cellulose fibers were found in all sample cores. Samples SGB57M31 and SGB58M10 have nominally virgin cores, so the presence of these fibers may indicate contamination. Alternatively, the cellulose may have been added intentionally along with the fiberglass to strengthen the core. The recycled status of these fibers is not known.
3. Small portions were then scraped from the core and paper regions of each sample. Scrapings were transferred onto aluminum stubs with carbon substrates and examined using an FEI XL30 Environmental Scanning Electron Microscope (SEM) with back-scattered electron (BSE) detector and a Noran VANTAGE X-Ray Analysis System. The surface of each SEM stub was then scanned for metal-containing particles.
    a. Metals with atomic numbers > 22 could be clearly distinguished from the other constituents, as they yielded much brighter BSE signals. With the exception of iron, this group represents the least-prevalent metals in environmental samples.
        i. The most commonly found metals in these samples were iron, strontium, and barium, though all were found at levels <1%. Iron was found in all paper and core samples; the source is undefined as it is found in both natural and manmade materials. Strontium was found to some degree in all samples, ranging from consistently (SGB57M31) to rarely (SGB58M10). Barium was found in the paper and/or core of all samples except AGB59M32. Strontium and

barium were both found consistently in the same particles as sulfur. Strontium sulfate and barium sulfate are found in sedimentary rocks along with gypsum and so may have arisen as impurities in the gypsum mining process. Barium sulfate is also used commercially as a white pigment.

ii. Copper, zirconium, manganese, and uranium were found in the cores and endpapers of samples SGB58M10 and AGB59M32. The core of SGB58M10 is nominally virgin, so the detected metals may have arisen as impurities in the gypsum mining process. These were present at trace levels only. These metals are found both in manmade materials and in rocks, soils, and groundwater.

iii. Combinations of other metals were found mixed together in single particles, which suggests that they arose from man-made alloys rather than naturally occurring deposits. These internally mixed particles were present at trace levels:

1. Particles containing copper, cobalt, and iron were found in SGB57M31 (both in core and attached to paper fibers). An additional particle in the SGB58M10 core exhibited only copper and iron.
2. Particles containing iron and manganese were found in the cores of SGB58M10 and AGB59M32.
3. A particle containing iron and zinc was found in the core of SGB58M10.
4. Particles containing chromium, nickel, and iron were found in AGB59M32 (attached to paper fibers) and AGB60M33 (in core). An additional particle in the AGB59M32 paper exhibited only chromium and iron. Both samples had recycled content.
5. A particle containing lead and tin was found on the paper from AGB60M33. This sample had recycled content.

b. Metals with atomic numbers of 22 or less were often found associated with the above-described particles. These metals included aluminum, sodium, magnesium, titanium, and potassium. All are fairly common in the natural environment.

c. No spores were detected during these analyses, which were typically conducted at 1200x. Spores would have been distinguished by the following characteristics:

i. Morphology (possessing distinct shape, segmentation, and surface texture, as described in references such as *The Particle Atlas* by McCrone and Delly (Ann Arbor Science, 1973) and the Airborne Allergens CD-ROM [Institute of Respiratory Medicine Ltd., 1999]).

ii. Size (generally 1-15 μm).

iii. Elemental composition (predominantly carbon-based).

Conclusion

All samples showed trace levels of metals, including strontium, copper, zirconium, zinc, manganese, uranium, chromium, lead, tin, nickel, and cobalt. Some of these metals were present in combinations suggesting man-made alloys, while others are likely trace impurities from the gypsum mining process. No significant difference in metal levels was found between nominally virgin cores and those made with recycled content. Cellulose fibers found in the virgin cores may be an indicator or source of contamination. No spores were detected at the scanning magnifications.

Images/Spectra:

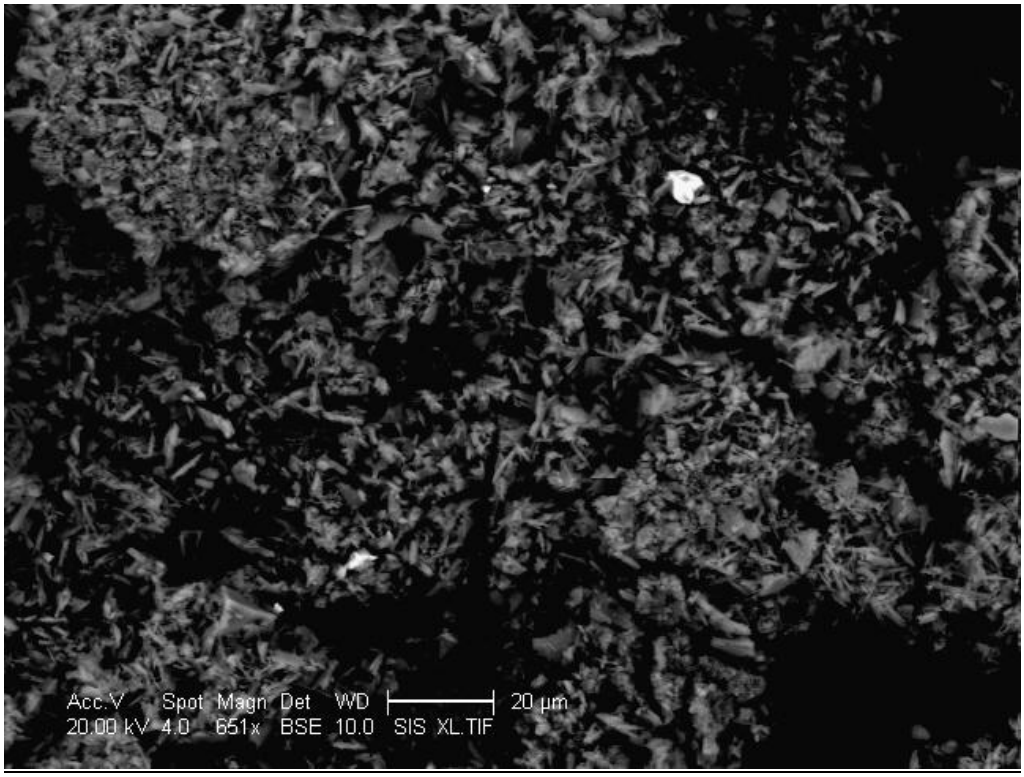


Figure 1. Strontium-containing particle (bright spot) surrounded by gypsum [AGB59M32].

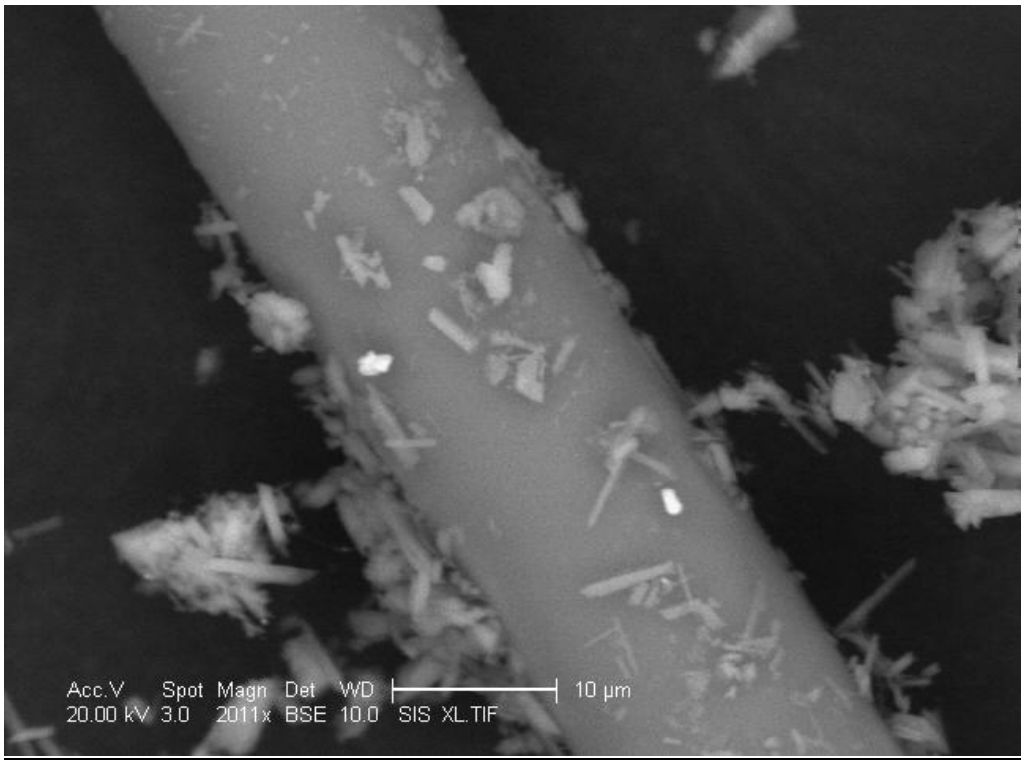


Figure 2. Particles containing copper, cobalt, and iron (bright spots) on fiberglass particle [SGB57M31].

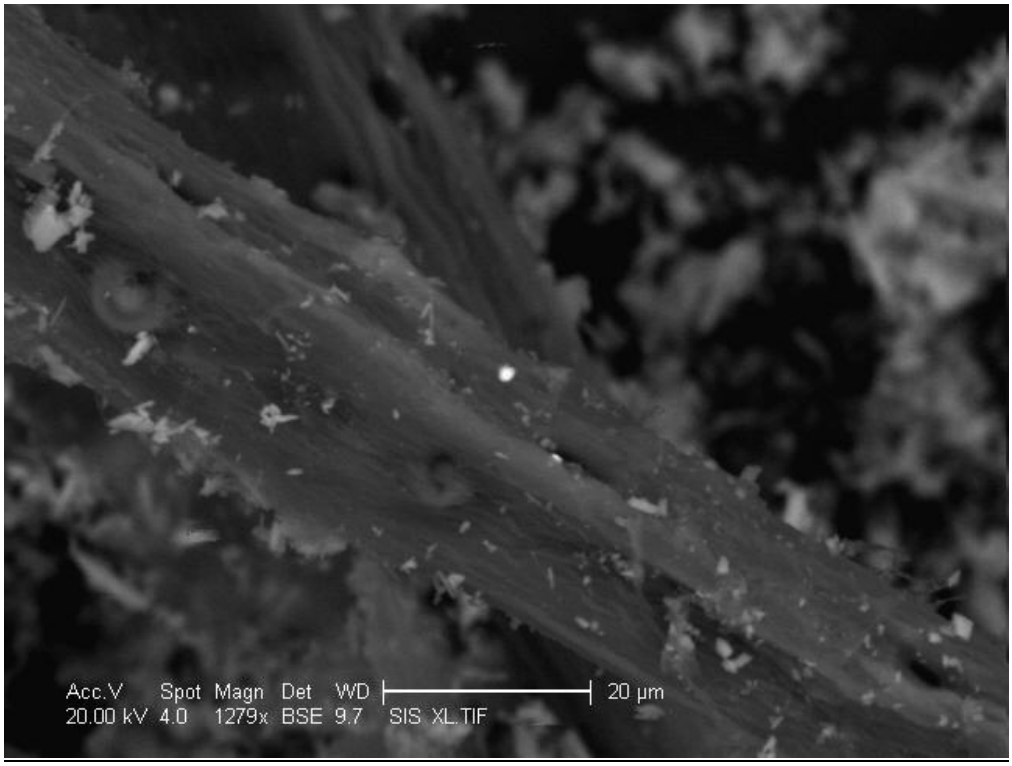


Figure 3. Zirconium -containing particle (bright spot) on cellulose fiber [AGB59M32].

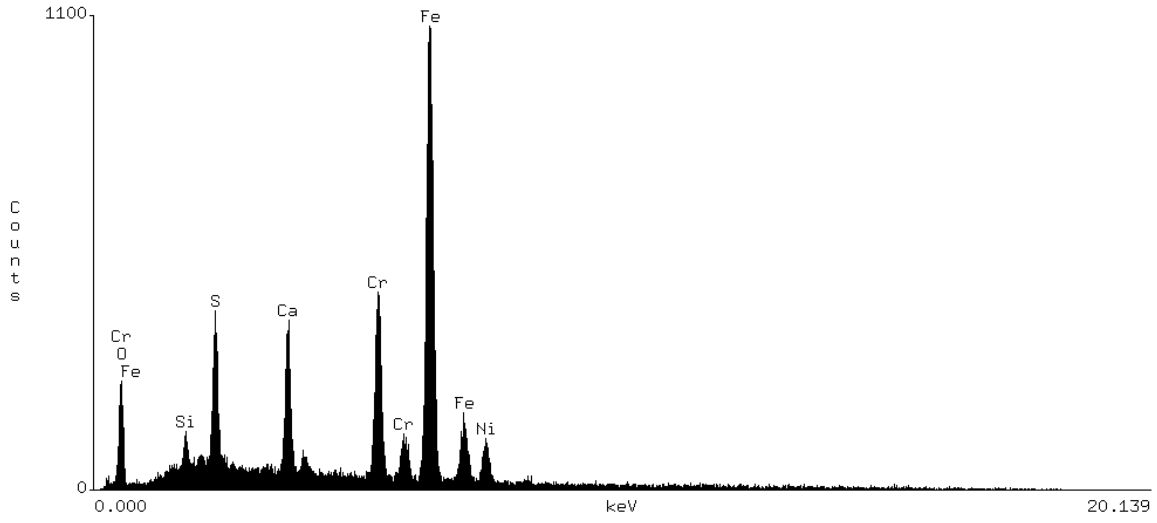


Figure 4. Energy-dispersive x-ray spectrum for particle containing chromium, nickel, and iron [AGB60M33].

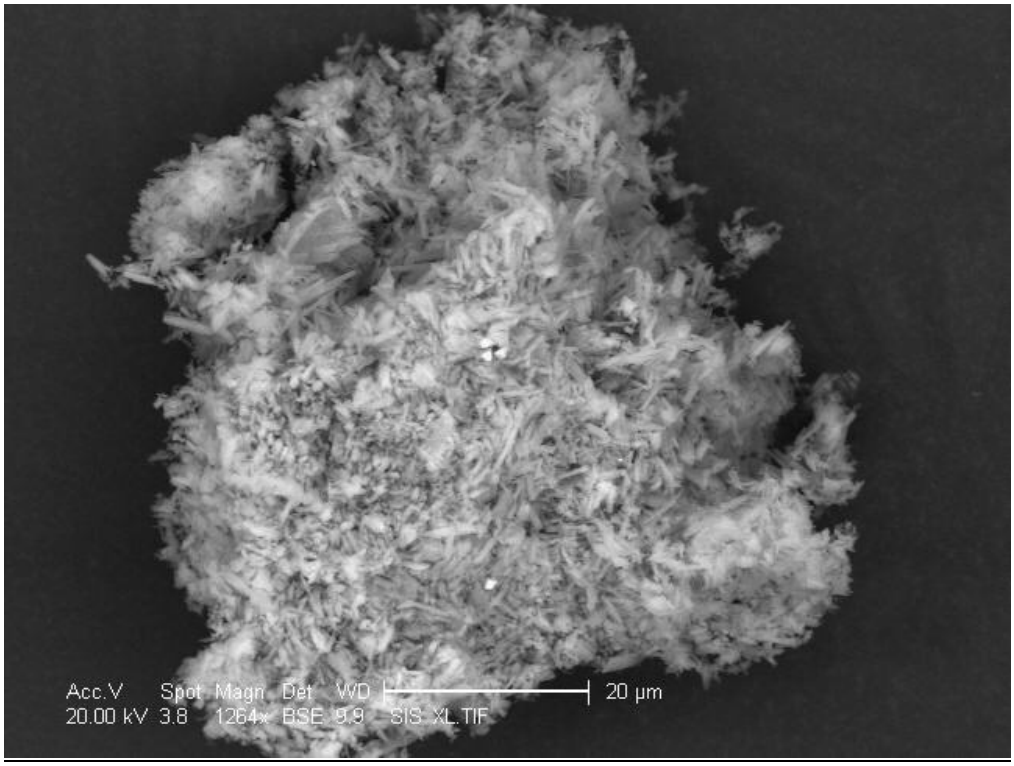


Figure 5. Large gypsum particle with smaller particles containing iron (bottom bright spot), strontium (top 3 bright spots), and uranium (tiny bright spot at right) [SGB58M10].

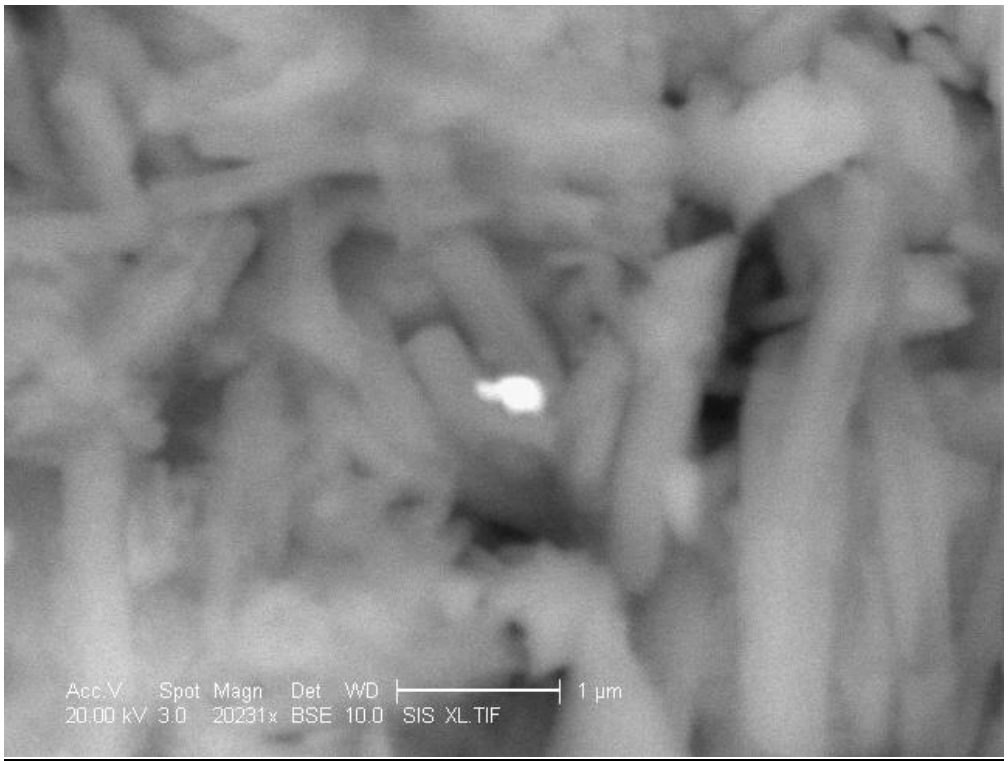
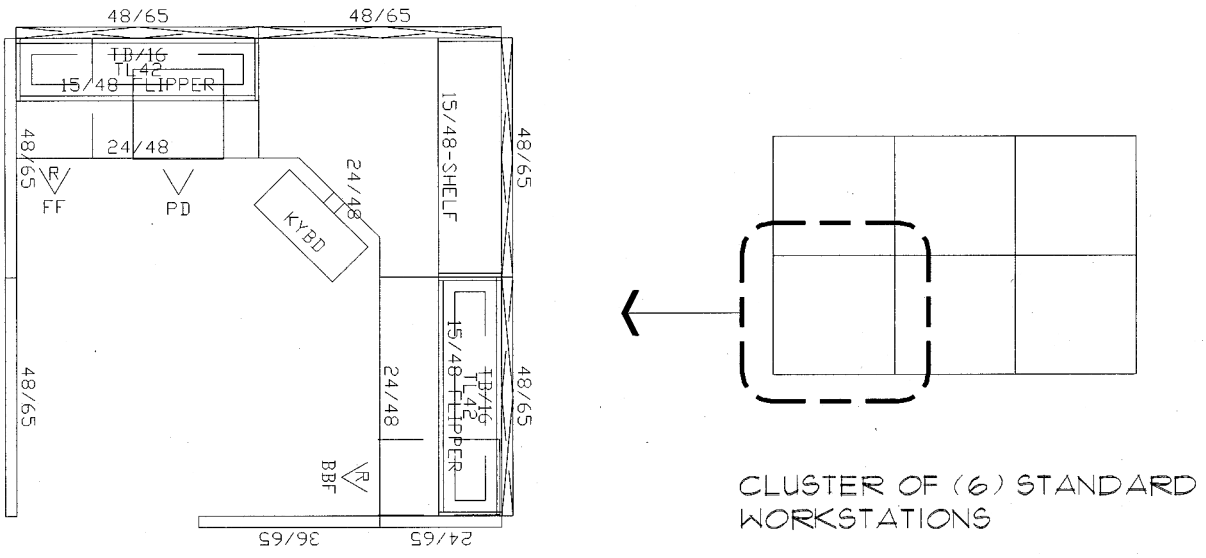


Figure 6. Close-up of uranium-containing particle from Figure 5.

Appendix Q

Standard Work Station
For the State of California



Adapted from Levin et al. (2000)

QTY	DESCRIPTION
4	48" X 65" POWERED PANEL (48/65)
2	48" X 65" NON-POWERED PANEL (48/65)
1	36" X 65" NON-POWERED PANEL (36/65)
1	24" X 65" NON-POWERED PANEL (24/65)
2	24" X 48" WORKSURFACE (24/48)
1	48" X 24" CORNER WORKSURFACE (24/48)
2	48" FLIPPER CABINET W/TASKLIGHT (15/48 Flipper)
1	48" SHELF (15/48 Shelf)
1	15" X 24" B/B/F PEDESTAL FILE (BBF)
1	15" X 24" F/F PEDESTAL FILE (FF)
2	16" X 48" TACKBOARD (TB/16)
1	PENCIL DRAWER (PD)
1	ARTICULATING KEYBOARD (KYBD)