Rosenblum Environmental

California Proposition 65 Exposure Assessment for PanTim Wood Products ½" x 6"/ Valaire Plank/18604, Novelle

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Date:

December 11th, 2019

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EXECUTIVE SUMMARY

This report reviews the exposure assessment that conservatively estimated the average daily dose and the lifetime average daily consumer exposure to the identified Proposition 65 listed chemicals of concern —volatile organic compounds (VOCs) N-methylpyrrolidone and acetaldehyde — that could occur during anticipated use of the PanTim Wood Products ½" x 6"/ Valaire Plank/18604, Novelle wood flooring within a private office, school classroom, and home residence. Exposures to Proposition 65 listed chemicals of concern from the product were based on inhalation exposures only. Exposure parameters and product usage assumptions included in this assessment are conservative, ensuring that calculated consumer exposures to Proposition 65 listed chemicals of concern overestimate what would occur during actual product use.

Using the conservative exposure assessment model presented herein, the ½" x 6"/ Valaire Plank/18604, Novelle wood flooring used within the private office, school classroom, and home residence scenarios resulted in calculated consumer exposures that were below the established safe harbor values to the Proposition 65 listed chemicals of concern.

NOTE: THIS REPORT IS PROVIDED FOR INFORMATION PURPOSES ONLY AND IS NOT INTENDED TO CONVEY LEGAL ADVICE REGARDING COMPLIANCE WITH CALIFORNIA'S SAFE DRINKING WATER AND TOXIC ENFORCEMENT ACT OF 1986 (PROPOSITION 65) OR OTHERWISE. IT IS THE SOLE RESPONSIBILITY OF PANTIM WOOD PRODUCTS TO DETERMINE IF A LABEL OR OTHER WARNING IS REQUIRED UNDER PROPOSITION 65 FOR THE ½" X 6"/ VALAIRE PLANK/18604, NOVELLE.

1 OVERVIEW AND INTRODUCTION

California's Safe Drinking Water and Toxic Enforcement Act of 1986 (Proposition 65) is intended to protect California citizens and the State's drinking water sources from chemicals known to cause cancer, birth defects or other reproductive harm, and to inform citizens about exposures to such chemicals. Proposition 65 requires businesses to provide a warning before they knowingly expose anyone to a chemical that is identified by the state as causing such harm. For consumer products, the warning often comes in the form of a label on the product or its packaging. The warning, however, is not required if the exposure is low enough to pose no significant risk of cancer or is significantly below levels observed to cause birth defects or other reproductive harm. The California Office of Environmental Health Hazard Assessment (OEHHA) is the agency responsible for the implementation of Proposition 65 and maintaining the list of chemicals "known to the state to cause cancer or reproductive toxicity" (OEHHA 2019a).

The PanTim Wood Products ½" x 6"/ Valaire Plank/18604, Novelle flooring is the subject of this report. The goal of this assessment is to conservatively quantify a consumer's average daily dose of the reproductive toxicant N-methylpyrrolidone and the lifetime average daily dose (LADD) of the carcinogen acetaldehyde associated with the use of this product within the private office, school classroom and home residence environments. The calculated doses, which are based on the measured acetaldehyde and N-methylpyrrolidone emission rates, are compared to the Proposition 65 established safe exposure thresholds for these substances. Results from this exposure assessment are intended to help PanTim Wood Products determine if use of the ½" x 6"/ Valaire Plank/18604, Novelle flooring product, when used within the private office, school classroom and home residence environments, could result in exposures to acetaldehyde or N-methylpyrrolidone that exceed the established Proposition 65 safe harbor levels for either compound.

2 PROPOSITION 65 LISTING AND "NO SIGNIFICANT RISK LEVEL" DOSE FOR ACETALDEHYDE AND N-METHYLPYRROLIDONE

OEHHA has established daily dose rates, known as "safe harbor levels" for many Proposition 65 listed chemicals. The safe harbor value represents an exposure threshold below which exposures are deemed to pose no significant risk. These safe harbor levels are referred to as No Significant Risk Levels (NSRLs) for carcinogens and Maximum Allowable Dose Levels (MADLs) for chemicals causing reproductive toxicity. The latest available list of NSRLs and MADLs and associated criteria doses is dated March 2019 (OEHHA, 2019b). An NSRL for Proposition 65 is defined as the intake by a 70-kg adult associated with a lifetime cancer risk of 10^{-5}, or lower (OEHHA, 1992). In assessing exposures to carcinogens such as acetaldehyde for comparison to the established NSRLs, the relevant time frame for exposure is the long-term average, which typically is taken to be a 70-year lifetime. Exposures resulting in a given level of cancer risk can be derived from cancer potency values following OEHHA guidance described in Title 27, California Code of Regulations, Section 25703. For reproductive/developmental toxicity exposure assessments, it is assumed that a single exposure may result in toxicity if it occurs at the wrong time. Therefore, in assessing MADLs, the exposure assessment is made directly from a single average daily exposure level. An MADL value is developed by OEHHA using 1/1,000 of the concentration at which a chemical listed for reproductive or developmental toxicity would have no observable effect.

Acetaldehyde (CAS# 75-07-0) has been classified by the U.S. EPA as a Group B2 probable human carcinogen, using the guidelines for Carcinogen Risk Assessment, based on sufficient evidence of carcinogenicity in animals and inadequate evidence in humans. Acetaldehyde tumors occurred in the nasal area for rats and in the larynx for hamsters. While it is assumed that the respiratory tract is the only organ affected by acetaldehyde, tumors in the nose of rats and in the upper larynx of hamsters do not directly mean that only tumors in the nose or larynx would occur in humans. Unlike the rodents, humans are not obligate nose breathers. Thus, the entire human respiratory tract, including the lung, may be at risk for cancer induction by acetaldehyde (OEHHA 2011). OEHHA staff concurred that acetaldehyde is a potential human carcinogen and listed acetaldehyde on April 1, 1988 and established an NSRL value of 90 µg/day specific to inhalation exposures (OEHHA 2019b).

N-methylpyrrolidone (CAS# 872-50-4) was listed under Proposition 65 on June 15, 2001 based on the formal identification by the U.S. Environmental Protection Agency (U.S. EPA 1994) of N-methylpyrrolidone as causing developmental toxicity. U.S. EPA is an authoritative body under Proposition 65 for identification of chemicals causing reproductive toxicity (Title 22, California Code of Regulations, Section 12306 (22 CCR 12306)). Inhalation exposures to N-methylpyrrolidone have been shown to result in decreased birth weights and minor developmental effects on exposed animals (OEHHA 2003). Based on the inhalation studies, OEHHA has published an inhalation-specific MADL of 3,200 µg/day (OEHHA 2019b).

3 ROUTES OF EXPOSURE TO ACETALDEHYDE AND N-METHYLPYRROLIDONE

Acetaldehyde is classified as a VOC and is anticipated to volatilize into indoor air (CERI 2007). Because of its volatility, inhalation is the principal route of exposure for the general population to this substance. In addition, it is assumed that the respiratory tract is the only organ affected by acetaldehyde (OEHHA 2011). Therefore, this assessment focuses on inhalation exposures associated with the post-production volatilization of residual levels of acetaldehyde from the product. N-methylpyrrolidone has a low vapor pressure and, while not highly volatile, the compound can volatilize from products and enter the indoor air. Exposures to N-methylpyrrolidone can occur through inhalation and can be absorbed into the body through the skin and by ingestion. Extensive direct dermal contact of long duration with the wood flooring is not anticipated; therefore, this assessment focuses only on inhalational exposures to N-methylpyrrolidone.

A consumer's daily inhalation exposure to acetaldehyde and N-methylpyrrolidone released from the ½" x 6"/ Valaire Plank/18604, Novelle Flooring into the inhaled air is based on 1) the emission rate of the substances from the product, 2) the resulting estimated indoor air concentration, and 3) the daily breathing rate within the affected environment. The acetaldehyde and N-methylpyrrolidone emission rates associated with the ½" x 6"/ Valaire Plank/18604, Novelle are based on product-specific air chamber emission tests (867-008-01A-Nov2219). Indoor air concentrations, breathing rates and occupancy patterns are specific to private office, school classroom and home residence scenarios and are based on conservative assumptions.

The values selected for the model parameters are discussed in detail below.

3.1 Estimating VOC Air Concentrations

Inhaled air concentrations within this report are estimated using a simplified steady-state mass balance model described in ASTM Standard Guide D5116, "Standard Guide for Small-Scale Environmental Chamber Determinations of Organic Emissions from Indoor Materials/Products" (ASTM, 2010). This model is commonly used to estimate indoor air concentrations associated with product emissions of VOCs. For example, this model is incorporated into the California Department of Public Health, "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers Version 1.2" (CDPH, 2017). Steady-state conditions with respect to emission rates and building ventilation are assumed in making the estimation. Additional model assumptions include zero outdoor air concentrations, perfect mixing within the building and zero net losses of VOC gas from air due to other effects such as irreversible or net sorption on surfaces (i.e., net sink effects) and chemical reactions. Indoor air concentrations are estimated as follows:

$$Ca = EFA \times AQ \qquad \text{(Equation 1)}$$

Where:

C_a =	Estimated indoor air concentration (µg/m^3)
EF_A =	Unit specific emission rate or emission factor (µg/m^2 h^{-1})
A =	Surface area of emitting source (m^2)
Q =	Ventilation airflow rate (m^3 h^{-1})

Equation 1 estimates the acetaldehyde and N-methylpyrrolidone concentrations in specific indoor environments based on measured emission rates (EF_A), the emitting surface area (A) that is within the indoor environment, and the clean, outdoor, ventilation airflow rate (Q). From Equation 1, it is evident that more emitting surface area (A) will result in a higher VOC concentration, while more outdoor airflow (Q) will result in a lower VOC concentration. This assessment uses "worst-case" conditions for the outdoor airflow rate to conservatively estimate indoor air VOC concentrations associated with use of the ½" x 6"/ Valaire Plank/18604, Novelle within private office, school classroom and home residence environments.

3.2 VOC Emission Rates

The decrease in VOC emission rates from consumer products is an important factor in reducing the indoor air concentrations of VOCs. VOC emission decay has been reported by several investigators in laboratory studies of wood products, carpet products and thermoset composite materials (Crawford, 2011; Schaeffer, 1996; Hodgson, 1993 and 1999). It is well established that the release of the VOC formaldehyde from wood products decreases with time under normal use conditions (Kazakevis, 1984; Sundin and Roffael, 1989; Zinn, 1990; Baummann, 2000; Riedlinger, 2012). For example, Kazakevis (1984) reported that formaldehyde emissions from newly manufactured particle board were as great as 12 mg h^{-1} m^{-2} and decreased, after five years of storage in ventilated conditions, to between 0.1 and 1.1 mg h^{-1} m^{-2}. Short-term studies of small samples have also shown a rapid formaldehyde decay. Specifically, Riedlinger (2012) monitored emissions over 50 days from particle board panels which used four different resin chemistries and reported half-lives of less than 30 days. Baumann (2000) tested six particleboards and six medium density fiberboard (MDF) products that were stored continuously in small chambers for 22 days to 43 days. This study reported formaldehyde half-lives of less than six weeks for 10 of the 12 tests. Similar observations have been made for emissions of the VOC styrene. For example, in one study, Crawford (2011) reported that styrene concentrations emitted from newly manufactured thermoset composite material decreased from 0.127 mg/m^3 to 0.014 mg/m^3 between 48 and 162 hours. Likewise, styrene emissions from new carpet assemblies were reported to decrease rapidly over the initial two to three days of chamber measurements (Hodgson, 1999). While no studies specific to emissions decay of acetaldehyde or N-methylpyrrolidone were located, it is anticipated that emissions of these chemicals from the ½” x 6”/ Valaire Plank/18604, Novelle flooring material would also decline over time.

To calculate indoor acetaldehyde and N-methylpyrrolidone air concentrations associated with an emission source using Equation 1, a discrete emission rate must be selected. Therefore, it was conservatively assumed herein that a consumer is exposed over the entire 25-year product life to the measured acetaldehyde and N-methylpyrrolidone emission rates of 4.9 µg/m^2 hr^{-1} and 4.4 µg/m^2 hr^{-1}, respectively (Berkeley Analytical report # 867-008-01A-Nov2219). This conservative emission rate does not consider the decrease of acetaldehyde and N-methylpyrrolidone that will likely occur over a 25-year product life. Based on other VOC emission rates measured in similar building products over longer periods of time (discussed above), it is anticipated that the emission rates of acetaldehyde and N-methylpyrrolidone would decrease over a 25-year product usage.

3.3 Flow Rates of Outdoor Ventilation Air

Ventilation, as defined here, is the flow rate of clean outdoor air into an occupied indoor space or a building. Ventilation is the primary means of reducing the concentrations of air contaminants that are generated indoors. Each of the three exposure scenarios that were evaluated herein has a characteristic ventilation airflow rate that is independently selected for use in the model.

The American Society of Heating, Refrigerating, and Air Conditioning Engineers (ASHRAE) publishes standards that provide professional guidance on minimum ventilation rates for most building types and occupancies. These guidelines are based largely on human perceptions of air quality and comfort. ASHRAE Standard 62.1, “Ventilation for Acceptable Indoor Air Quality”

(ASHRAE, 2016a), which covers offices, schools, and other building types except residential, either forms the basis for most mechanical building codes or is directly referenced by the codes themselves. For example, the 2013 California Mechanical Code in California Code of Regulations, Title 24, Part 4 (CBSC 2013) directly reproduces ASHRAE 62.1 Table 6.2 "Minimum Ventilation Rates in Breathing Zone." The ventilation requirements in ASHRAE Standard 62.2, "Ventilation and Acceptable Indoor Air Quality in Residential Buildings" (ASHRAE, 2016b) are replicated in the California Building Code for residential construction. These codes are enforceable by law in all state jurisdictions not covered by local building codes. Additionally, state codes are the foundation of all local building codes in California.

Private office scenario

Carter and Zhang (2007) plotted the frequency distribution of the floor areas of 430 single occupancy private office workstations in randomly selected floor plans. The 50th percentile workstation floor area was 13.47 m^2 (145 ft^2). With apportioned general office common space, the total, 50th percentile open-plan workstation floor was 23.78 m^2 (256 ft^2). The minimum ventilation requirements for an office environment as defined in the 2007 version of ASHRAE 62.1, Table 6-1, are 2.5 L/s person (5 cfm/person) and 0.3 L/s-m^2 floor area (0.06 cfm/ft^2). The objective is to provide sufficient ventilation to dilute pollutants both associated with an occupant and emanating from the space. Applying these requirements to the 23.78-m^2 single-occupant, private office, the calculated minimum ventilation airflow rate is 34.7 m^3/h (9.63 L/s or 20.4 cfm).

The standard private office scenario defined in CDPH Standard Method V1.2 (Table 4-4) is commonly used for assessing VOC emissions from building products and office furniture. While the origin for this private office scenario is not identified in the standard, it is claimed to be representative of an enclosed office in a public/commercial building. The floor dimensions are 3.66 m (12 ft.) by 3.05 m (10 ft.) yielding a floor area of 11.15 m^2. Application of the minimum ventilation requirements from ASHRAE 62.1 results in a minimum total flow rate of outdoor air during occupied hours of 20.7 m^3/h (5.76 L/s or 12.2 cfm). Although the CDPH standard private office may not be fully representative due to its omission of common area, it nevertheless is selected to represent the private office scenario in the model (Table 1) because of its lower airflow rate.

School classroom scenario

The standard school classroom scenario defined in CDPH Standard Method V1.2 (Table 4-2) is commonly used for assessing VOC emissions from building products and classroom furniture. The CDPH standard classroom scenario is typical of re-locatable classrooms used widely in California and is generally representative of site-built classrooms for K-12 schools (Jenkins et al. 2004). It is a 12.2-m (24-ft) wide by 7.32-m (40-ft) long classroom with a 2.59-m (8.5-ft) ceiling height. The resulting floor area is 89.2 m^2, and the volume is 231 m^3. The assumed occupancy is 27 pupils and one teacher. The 2007 version of ASHRAE Standard 62.1, Table 6-1, for classrooms occupied by individuals, ages five and up, establishes the minimum ventilation requirement at 5 L/s-person (10 cfm/person) and 0.6 L/s-m^2 floor area (0.12 cfm/ft^2). Thus, the minimum total flow rate of outdoor air for the standard classroom is 654 m^3/h (182 L/s or 385 cfm). This produces a ventilation air change rate of 2.8 h^{-1} for occupied hours. As documented in various reports, classroom HVAC systems sometimes do not deliver the required amount of outdoor air for a variety of reasons including poorly designed or overridden controls and lack of maintenance. In addition, HVAC systems may not be turned on sufficiently early in the school day to achieve a fully ventilated condition prior to the start of class. Therefore, the CDPH standard uses an average ventilation rate over a 168-h week assuming 40 hours of operation at 654 m^3/h (2.8 h^{-1}) and 128 hours of operation with ventilation of only 0.2 h^{-1} due to infiltration. This yields an average flow rate of 191 m^3/h (53.1 L/s or 112 cfm).

Residential scenario

General housing characteristics in the U.S. and the ventilation rates for homes, mostly single family, have been the subject of numerous field studies and simulation ventilation studies (e.g., Persily 2010). The CDPH Standard Method V1.2, Appendix B, includes an indoor air exposure scenario for a new single-family detached (SFD) residence. New homes were selected as the basis for the scenario as they tend to have considerably tighter envelopes than older homes and can be expected to operate closer to minimum ventilation rate requirements. The size of the SFD home in the CDPH standard is taken from statistics on new U.S. homes published by the U.S. Census Bureau (2008). For 2008, the median size for new detached single-family homes was 206 m^2 (2,215 ft^2); however, a floor surface area of 211 m^2 was included in the residential model due to availability of data on a specific floor plan of this size. The minimum ventilation airflow rate requirement for this home and configuration was calculated using the 2007 version of ASHRAE Standard 62.2, Table 4-1a. From the table, the ventilation airflow rate requirement is 127 m^3/h (75 cfm). According to the National Association of Home Builders (NAHB) consumer preference survey conducted in 2007, the 2.44 m and 2.7 m ceiling height are most preferred by consumers (NAHB 2007). Therefore, the CDPH standard assumed a 2.59-m (8.5-ft) average height yielding a home volume of 534 m^3. The minimum airflow rate in this volume corresponds to a 0.23 h^{-1} outdoor air change rate (CDPH 2017). For modeling the impacts of VOC emissions from indoor building products, perfect mixing of indoor air throughout the home is assumed.

3.4 Emitting Surface Area

The estimated emitting surface area for wood flooring materials within the private office, school classroom and home residence are based on room sizes provided within the CDPH Standard Method V1.2. Within the private office and school classroom it is assumed that the surface area of wood flooring material is equal to the room floor area. Therefore, wood flooring surface areas of 11.5 m^2 and 89.3 m^2 have been selected for the private office and school classroom (CDPH 2017). Representative residential floorings covering rates have been published by NAHB (NAHB 2008 Builder Practices Report). Specifically, the material quantities used in the construction of new homes in 2008 (as a percentage of total finished floor areas) are given for carpets (52%), hardwood (20%), ceramic tile (16%), vinyl (9%) and other flooring types (CDPH 2017). Therefore, it is assumed herein that ½" x 6"/ Valaire Plank/18604, Novelle will be used on 20% of the 211m^2 residential floor surface area, resulting in an emitting surface area of 42.2 m^2 within the home residence scenario.

Table 1. Emitting surface areas and ventilation airflow rates

Exposure Scenario	Emitting Surface Area (m^2)	Ventilation Airflow Rate (m^3/h)	Reference
Private Office	11.5	20.7	CDPH Standard Method V1.2
School Classroom	89.3	191	CDPH Standard Method V1.2
Home Residence[1]	42.2 [2]	127	CDPH Standard Method V1.2

[1]Assumes air in home is perfectly mixed
[2]Based on 20% of home residential flooring covered with wood (CDPH 2017)

4 INHALATION DAILY DOSES FOR N-METHYLPYRROLIDONE

In assessing MADLs for developmental/reproductive toxicants, the relevant period for exposure is a single daily exposure concentration. The average daily doses for N-methylpyrrolidone calculated herein were based on the maximum exposure concentration that would occur on any single day of exposure. The daily inhalation exposure concentration was estimated by multiplying the indoor air concentration by the approximate volume of air that an exposed consumer would breathe per day (Equation 2). The inhalation average daily dose was calculated as follows:

$$DDinhal=Ca \times Br \quad \text{(Equation 2)}$$

Where:

DD_{inhal} = Daily inhalation dose (µg/day)
Ca = Estimated indoor air concentration (µg/m^3)
Br = Volume of inhaled air during a typical day (m^3/day)

Following OEHHA guidance, the office and school classroom scenarios estimated that an exposed consumer inhales indoor air during a typical eight-hour work day and that the volume of inhaled air is 10 m^3 (OEHHA, 2009, Table 2). Within the residential scenario, it is assumed that indoor air is mixed throughout the house and exposure is not limited to an 8-hour work day. Daily exposure within the residential office scenario is therefore based on a 24-hour inhalation volume of 20 m^3 (OEHHA, 2000). The American Industrial Hygiene Council's Exposure Factors Sourcebook (AIHC, 1994) recommends age-specific breathing rates, as well as a distribution of breathing rates based on the information developed by the U.S. EPA (2011). Specifically, the AIHC recommends point-estimate default daily breathing rates of 18.9 m^3/day for individuals six to 70-years old and 17.3 m^3/day for children under six. The AIHC also recommends a point-estimate default value of 12 m^3/day for children one to four years old by adjusting the ventilation rate for six-year-old children by 0.75 (OEHHA, 2000). Therefore, the use of a 20 m^3 inhalation volume conservatively overestimates a child's daily exposure (Table 2).

5 INHALATION LIFETIME AVERAGE DAILY DOSES FOR ACETALDEHYDE

In assessing NSRLs for carcinogens, the relevant period for exposure is not based on a single daily exposure concentration, but rather on the average of the daily exposure concentrations that occur over a consumer's lifetime (Equation 3). A daily inhalation exposure concentration is estimated by multiplying the indoor air concentration by the approximate volume of air that an exposed consumer breathes during the exposure duration. This daily dose is then converted to an LADD based on the number of days a year a consumer is exposed averaged over the consumer's expected lifetime. Therefore, a consumer's LADDs are calculated as follows:

$$Ca \times Br \times EF \times EDAT \times CF \qquad \text{(Equation 3)}$$

Where:

LADD =	Lifetime average daily dose (µg/day)
C_a =	Estimated inhaled air concentration (µg/m^3)
Br =	Volume of air inhaled within the affected environment (m^3/day)
EF =	Exposure frequency (d/yr)
ED =	Exposure duration (yr)
AT =	Averaging time (yr)
CF =	Conversion factor (365 d/yr)

The expected frequency of exposure within the private office and school classroom scenarios is estimated as 250 work days per year (OEHHA, 2005). The employment duration is estimated to be 25 years as this value has been suggested as a reasonable estimate of the 95th percentile within the OEHAA Hot Spots program (OEHHA, 2012). The home residence scenario assumes an exposure frequency of 350 days per year and an exposure duration of 30 years following OEHHA guidance (OEHHA, 2012).

Table 2. Exposure parameters used in the LADD and ADD calculations

Parameter	Private Office	School Classroom	Home Residence	Reference
Breathing Rate (m^3/day)	10	10	20	OEHHA, 2000
Exposure Frequency (days/year)	250	250	350	OEHHA, 2005
Exposure Duration (years)	25	25	30	OEHHA, 2012

The consumer's daily dose and LADD values (Table 3) are calculated for the private office, school classroom, and home residence scenarios using the exposure parameters summarized in Table 2, the product-specific emission rate, and the upper bound surface area estimates summarized in Table 1. The modeled exposures to Proposition 65 listed chemicals of concern summarized in Table 3 indicate that estimated VOC emissions from the ½" x 6"/ Valaire Plank/18604, Novelle flooring will result in consumer N-methylpyrrolidone daily doses within the three exposure scenarios that are less than the N-methylpyrrolidone inhalation MADL of 3,200 µg/day. Likewise, the LADDs within the three exposure scenarios are less than the acetaldehyde NSRL of 90 µg/day.

Table 3. LADDs and Daily Doses for Proposition 65 listed chemicals of concern

Exposure Scenario	**Acetaldehyde LADD** (µg/day)	**n-Methylpyrrolidone Daily Dose** (µg/day)
Private Office	6.0	27.2
School Classroom	5.0	22.9
Home Residence	12.0	32.6
OEHHA Safe Harbor Value	*90* [1]	*3,200* [2]

LADDs in bold exceed the NSRL
[1] OEHHA established NSRL
[2] OEHHA established inhalation MADL

6 CONCLUSIONS

There always is uncertainty regarding the estimates in an exposure assessment. By necessity, assumptions and extrapolations are required to fill areas of missing and limited data. The use of conservative product assumptions and exposure parameters, however, ensures that exposure estimates overestimate actual exposures that occur during product usage. As shown in Table 3, conservative exposure assessment of the ½" x 6"/ Valaire

Plank/18604, Novelle flooring used within a private office, school classroom, and home residence scenarios resulted in calculated LADDs for the listed carcinogen acetaldehyde that are less than the Proposition 65 established NSRL of 90 µg/day; also, the calculated average daily dose for the listed developmental toxicant N-methylpyrrolidone is less than the Proposition 65 established inhalation MADL of 3,200 µg/day.

Actual exposure to these Proposition 65 listed chemicals of concern associated with the ½" x 6"/ Valaire Plank/18604, Novelle flooring within an indoor environment will likely be lower than the LADD or average daily dose values calculated within this assessment. For example, it is well documented that VOC emissions from consumer materials decrease over the lifetime of the product. The VOC emission rates used herein are based on an emission rate which occurs early in the product's lifetime and is then assumed to remain constant over the product lifetime. This does not reflect VOC decay that has been observed in consumer materials. In addition, the minimum air exchange rates used within the private office, school classroom and home residence are all based on the ASHRAE minimum ventilation requirements. Higher ventilation rates are likely within each of these environments which would result in lower indoor air VOC concentrations. An exposure assessment taking into account factors including larger indoor air volumes, smaller surface area installations, increased VOC decay rates and higher ventilation rates would result in lower LADD and average daily dose calculations.

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December 11th , 2019

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