



## REPORT OF INDUSTRIAL HYGIENE CONSULTATION

### SAFETY AND HEALTH SERVICES

**INSURED**

Uyen Nguyen, Owner  
Isabella Nail Bar  
1962 Mountain Blvd.  
Oakland, CA 94611

**DATE OF REPORT**

July 9, 2010

**POLICY NUMBER**

1942036

Dear Ms. Nguyen,

Thank you for your participation in our Nail Salon Chemical Hazard Assessment Project. Included in this report are the results of the air sampling done at your facility on April 7, 2010.

### EXECUTIVE SUMMARY

The purpose of the survey was to evaluate exposures to a variety of chemicals commonly used in nail care products. Industrial hygiene air monitoring was conducted for the following organic vapors: acetone, butyl acetate, dibutyl phthalate, ethyl methacrylate, methyl methacrylate and toluene. Monitoring was also conducted for total hydrocarbons, total volatile organic chemicals (TVOCs) and very small particulates (PM<sub>2.5</sub>).

The sampling results for organic vapors were well below regulated limits. The air sampling results for total hydrocarbons were very low. The 8-hour time-weighted average Total Volatile Organic Compounds (TVOC) was about thirty times higher than outdoor levels. TVOC levels are not regulated by Cal/OSHA; however, the US Environmental Protection Agency (EPA) has established an indoor exposure guideline (see Table 7). Ambient temperature, carbon monoxide, relative humidity and carbon dioxide (CO<sub>2</sub>) measurements were within normal ranges.

## BACKGROUND

Isabella Nail Bar is housed on the ground level in a group of street level stores on Mountain Blvd. in the Montclair section of Oakland. It has seven nail stations at the nail bar and eight pedicure stations. There is an exhaust outlet located in the middle of the ceiling that is on all the time. There are three supply air grilles spaced evenly across the ceiling. These provide air when heating or cooling is required. Fresh outdoor air is brought in through open jalousie windows in the front of the salon. There is another exhaust outlet at the very back of the salon. At the time of the survey, the chemical odor inside the salon was barely noticeable.

## METHODS

Ambient temperature, carbon monoxide, relative humidity and carbon dioxide (CO<sub>2</sub>) were measured using a direct reading instrument (TSI IAQ CALC Model 8762 Monitor). Personal breathing zone and area samples for the organic vapors acetone, butyl acetate, methyl methacrylate and toluene were collected using 3M organic vapor monitors. Dibutyl phthalate was collected using sampling pumps and Tenax tubes. Total hydrocarbons were collected on charcoal tubes and analyzed by OSHA Method 07. Short term (fifteen minute) and 8-hour samples were collected using SUMMA<sup>®</sup> canisters. These were analyzed per EPA Method TO-15. Analysis included total volatile organic chemicals (TVOCs). The TSI Sidepak AM510 Aerosol Monitor was used to monitor for particulates (PM<sub>2.5</sub>).

Information regarding the details of the sampling methods is included in Appendix 1 and 2. All samples were submitted to an American Industrial Hygiene Association accredited laboratory for analysis. Further details are kept on file with the Safety and Health Services Department of State Compensation Insurance Fund, and are available upon request.

## RESULTS

A TSI IAQ-Calc Indoor Air Quality Meter was used to measure temperature, humidity, carbon dioxide, and carbon monoxide. Table 1 lists the results of that monitoring. The TSI was set to record readings every 30 seconds.

**Table 1**  
**TSI IAQ-Calc Ranges of Measurements for**  
**Temperature, Relative Humidity, Carbon Dioxide and Carbon Monoxide**  
**Isabella Nail Bar 4/7/10**  
**Compared to ASHRAE Recommended Ranges or Limits**

	<b>Temperature (Degrees F)</b>	<b>Relative Humidity %</b>	<b>Carbon Dioxide (ppm)</b>	<b>Carbon Monoxide (ppm)</b>
<b>Range of Measurements</b>	64.8 to 74.1	32.2 to 62.0	350 to 810	0 to 3.4
<b>Limits / Guidelines</b>	<b>ASHRAE 55<sup>a</sup>: For Summer Clothing: 73° -79° F</b>	<b>ASHRAE 62<sup>b</sup>: Less than 65 % RH</b>	<b>ASHRAE 62: Less than 700 ppm above outdoor levels<sup>c</sup></b>	<b>ASHRAE 62: 9 ppm or less</b>
<b>Results Compared</b>	Cool for summer clothing at times.	OK	OK	OK
<b>Margin of Error of the Analytical Instrument</b>	± 1° F	2% of the RH at 77° F	± 3% of the reading at 77° F or 50 ppm, which ever is greater	± 3% or 3 ppm, which ever is greater

*ppm = parts of contaminant per million parts of air.*

*ASHRAE = American Society of Heating, Refrigerating and Air-Conditioning Engineers*

*ASHRAE 62.1-2004 - Ventilation for Acceptable Indoor Air Quality*

All indoor air quality measurements taken with the TSI IAQ Calc were within recommended limits except possibly for temperature, which was a little cool for summer clothing for part of the day, and carbon monoxide, which ranged up to 3.4 ppm. This was likely due to instrument baseline drift.

<sup>a</sup> ASHRAE 55-1992 *Thermal Environmental Conditions for Human Occupancy*

<sup>b</sup> ASHRAE 62-2007 - *Ventilation for Acceptable Indoor Air Quality*

<sup>c</sup> Outdoor levels of CO<sub>2</sub> are between 350 ppm and 400 ppm. Per ASHRAE “maintaining a steady-state CO<sub>2</sub> concentration in a space no greater than about 700 ppm above outdoor air levels will indicate that a substantial majority of visitors entering a space will be satisfied . . .”

Table 2 lists the air sampling results for suspended particulate matter PM<sub>2.5</sub> dust concentration levels. The California Environmental Protection Agency 2006 proposal for the 24-hour fine particle standard is 35 micrograms per cubic meter (µg/m<sup>3</sup>). The California /EPA ambient air quality standard<sup>d</sup> value is listed for informational purposes only, since it is difficult to compare this 24 hour non-occupational to the 8-hour occupational standard.

**TABLE 2**  
**Results of Dust PM<sub>2.5</sub>**  
**Isabella Nail Bar 4/7/10**

<b>Parameter</b>	<b>Particulate Matter PM<sub>2.5</sub></b> <b>Exposure range concentrations in microgram/m<sup>3</sup></b>
Isabella Nail Bar Max	59 - 60 µg/m <sup>3</sup>
Isabella Nail Bar Min	3 - 4 µg/m <sup>3</sup>
Isabella Nail Bar Average	11 - 12 µg/m <sup>3</sup>
Isabella Nail Bar 8 hr-TWA	10 - 11 µg/m <sup>3</sup>
<b>NAAQS*/EPA 24 hour non-occupational exposure standard</b>	<b>35 µg/m<sup>3</sup></b>

TWA = Time-Weighted Average for a normal 8-hour workday  
 µg/m<sup>3</sup> = Micrograms of contaminant per cubic meter of air.

\* NAAQS = National Ambient Air Quality Standards. In 1997, Environmental Protection Agency (EPA) established annual and 24-hour NAAQS for PM<sub>2.5</sub> for the first time. In 2006, EPA revised the 24-hour NAAQS for PM<sub>2.5</sub> to 35 µg/m<sup>3</sup>.

As shown above, the time-weighted average of the particulate matter PM<sub>2.5</sub> level was between 11 and 12 µg/m<sup>3</sup>. Currently, there is no OSHA - PEL for PM<sub>2.5</sub>, however, measured levels compare favorably with the NAAQS EPA non-occupational exposure level for 24 hours.

Tables 3 through 7 include results of air sampling results for organic vapors (solvents).

**TABLE 3**  
**Air Sampling Results For Organic Vapors on 3M Badges**

<sup>d</sup> Table of Standards in Section 70200 of Title 17 of the California Code of Regulations

**Isabella Nail Bar 4/7/10  
 Parts Per Million (ppm)**

Sample Number	Sample Location	Acetone	Methyl Methacrylate	Toluene	n-Butyl Acetate	Ethyl Acetate
HG7335	Phuc	3.6	LT 0.16	LT 0.16	0.21	1.6
HG4531	Han	7.0	LT 0.16	LT 0.16	0.39	2.7
HG7328	Phuong	3.8	LT 0.16	LT 0.16	0.15	1.6
<b>Cal/OSHA PEL</b>		500	50	50	150	400

**TABLE 4  
 Air Sampling Results For Organic Vapors on Charcoal Tubes  
 Isabella Nail Bar 4/7/10  
 Parts Per Million (ppm)**

Sample Number	Sample Location	Ethyl Methacrylate	Toluene	Total Hydrocarbons, as n-hexane
INB-C1	On manicurist's table (Phuc)	LT 0.51	LT 0.58	0.96
INB-C2	On manicurist's table (Han)	LT 0.54	LT 0.60	0.95
INB-C3	On manicurist's table (Phuong)	LT 0.52	LT 0.59	1.1
<b>Cal/OSHA PEL</b>		NE	50	NE

LT = Less than (indicates less than the limit of quantification. The contaminant may or may not be present at levels below this concentration).

PEL-TWA = Permissible Exposure limit - Time-Weighted Average is the allowable level to which the majority of employees can be exposed 8 hours per day, forty hours per week, for a working lifetime without experiencing adverse health effects<sup>3</sup>.

NE = Not Established

**TABLE 5  
 Air Sampling Results For Dibutyl Phthalate  
 Isabella Nail Bar 4/7/10**

Sample Number	Sample Location	Dibutyl Phthalate
INB-TA	On manicurist's table (Phúc)	LT 0.094
INB-TB	On manicurist's table (Hận)	LT 0.096
INB-TC	On manicurist's table (Phuong)	LT 0.095
<b>Cal/OSHA PEL</b>		5

mg/m<sup>3</sup> = Milligrams of contaminant per cubic meter of air.

LT = Less than (indicates less than the limit of quantification. The contaminant may or may not be present at levels below this concentration).

In addition to the tentatively identified compounds, over 75 compounds were analyzed per TO-15 method. Tables 6 and 7 list the results of that analysis. Only relevant and selected compounds found to be above the lab reporting limit are listed in these tables.

**TABLE 6**  
**Air Sampling Results For Organic Vapors**  
**(concentration in micrograms per cubic meter)**  
**Isabella Nail Bar 4/7/10**

Compound	INB-1 Outdoor	INB-2 Indoor	INB-3 STEL	INB4 STEL	Cal/OSHA PEL µg/m <sup>3</sup>
	µg/m <sup>3</sup>	µg/m <sup>3</sup>	µg/m <sup>3</sup>	µg/m <sup>3</sup>	
Propene	5.1	180	140	560	NE
Dichlorodifluoromethane	3.0	ND	ND	ND	42,000
Ethanol	ND	1500	250	610	1,900,000
Acetone	35	6900	1100	2200	1,200,000
2-Propanol (Isopropyl Alcohol)	7.9	3300	950	3800	980,000
2-Butanone (MEK)	ND	ND	ND	ND	590,000
Ethyl Acetate	6.4	3600	630	1700	1,400,000
Tetrahydrofuran	ND	12	ND	ND	590,000
Methyl Methacrylate	ND	ND	ND	ND	205,000
n-Heptane	ND	24	4.7	16	1,600,000
Toluene	4.9	27	11	28	188,000
2-Hexanone	ND	ND	15	ND	4000 SKIN
n-Butyl Acetate	ND	560	150	620	710,000
n-Octane	ND	ND	18	ND	1,450,000
d-Limonene	ND	14	ND	ND	--
TVOC as Toluene	320	9400	2700	6000	--

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.  
SKIN = can be readily absorbed through the skin and cause exposure.

**TABLE 7**  
**Measured Total Volatile Organic Compounds (TVOC)**  
**Isabella Nail Bar 4/7/10**

Compound	Outdoor Level 8-hour TWA	Indoor Level 8-hour TWA	Indoor Level Minus Outdoor Level*	Short Term Samples 15 Minutes
TVOC*	0.320 mg/m <sup>3</sup>	9.4 mg/m <sup>3</sup>	9.08 mg/m <sup>3</sup>	2.7 and 6.0 mg/m <sup>3</sup>

\*Indoor Minus Outdoor for comparison with the EPA guideline, below.

TVOC = Total Volatile Organic Compounds (as Toluene)

mg/m<sup>3</sup> = Milligrams of contaminant per cubic meter of air.

TVOC Guidelines from US EPA <sup>e</sup>	
Less than 0.20 mg/m <sup>3</sup>	No irritation or discomfort expected

There is insufficient evidence that TVOC measurements can be used to predict health or comfort effects per ASHRAE 62.1 – 2007 *Ventilation for Acceptable Indoor Air Quality*.

Please note that these guidelines are not designed to protect "hypersusceptible" persons, or those with pre-existing diseases. The results should not be taken as absolute, but should be used as a means to predict the employees' potential exposure. It should be stressed that the evaluations are based on the work conditions observed on the day of the survey and may not be representative of other workdays. Exposure levels can vary from day to day based on various factors, such as climate, work practices and material composition.

## RECOMMENDATIONS

Based on the results of the survey, we suggest the following to address some of the chemical exposure issues and to further enhance your health and safety program.

- 1. Provide Hazard Communication training per Cal/OSHA Title 8 Section 5194<sup>g</sup> and compile the Material Safety Data Sheets (MSDSs) in a binder for easy access to safety information about the chemicals you use in your salon.**

<sup>e</sup> [http://www.epa.gov/rtirmd10/campus/environmental/s\\_01445.htm](http://www.epa.gov/rtirmd10/campus/environmental/s_01445.htm)

Also: "While data linking exposure to individual VOCs are available, the link between TVOC and health is more tenuous. Early studies by Molhave demonstrated a correlation between health/comfort and TVOC (Molhave, 1986). More recently, Molhave (2003) has indicated that the "TVOC concept is based on several assumptions and its usefulness for prediction of health effects of mixtures is undocumented." [www.epa.gov/iaq/pdfs/tichenor\\_report.pdf](http://www.epa.gov/iaq/pdfs/tichenor_report.pdf) -

<sup>g</sup> <http://www.dir.ca.gov/title8/5194.html>

Train your employees on the health hazards of chemicals that they use. The Hazard Communication regulation requires that employers obtain the MSDSs from the manufacturers or the distributors and have them readily available to employees. An MSDS lists the hazardous ingredients of a product, discusses any health and safety hazards, and suggests ways to use the product safely.

In addition to the compilation of MSDSs, employers are required to provide a Hazard Communication training program to explain to employees how to work safely with toxic mixtures, such as mixing of concentrated disinfectant solutions.

## 2. Develop a routine maintenance procedure for the water curtain.

Your water source should be treated to prevent microbial growth and odors. The products that can be used to treat the water include Eliminate™, Physan 20™, Evap100™ or Dias Aid Plus. Some of these products are designed for an evaporative cooler to control lime scale deposits, microbial growth and odors but they can be used for a decorative fountain or water curtain.

Physan 20™ is a broad range disinfectant, fungicide, virucide, bactericide and algaecide, which effectively controls a wide variety of potential pathogens on hard surfaces and plants.

BioSentry Evap100™ (Evaporative Cooler Biocide) is an algaecide, bactericide and slimicide for use in evaporative coolers. Evap100 contains two antibacterial and antifungal active ingredients -quaternary ammonium compounds and tributyltin oxide.

**Eliminate™ Eden Technologies, Inc.**  
223 East Madison St.,  
Phoenix, Arizona 85004-2824

**DIAS Inc.**  
P.O. Box 3188  
Kalamazoo, MI 49003  
616-344-1008 or 800-332-DIAS

**Maril Products Inc.**  
320 West 6th Street  
Tustin, CA 92780  
1-800-546-7711, 714-544-7711  
Fax: 714-544-4830

**BioSentry, Inc.**  
1481 Rock Mountain Blvd.  
Stone Mountain, Georgia 30083  
(770) 723-9211  
www.biosentry.com

**Disclaimer:** This is not a product endorsement by State Fund or its employees. It serves only as an example to assist you with your workplace design changes.



Please feel free to contact me at 415-215-4192 or Tuan Nguyen at 714-347-5414 if you have any questions about this report.

Sincerely,



Heather Borman, MS, CIH, CSP  
Industrial Hygiene Consultant  
State Compensation Insurance Fund



C: Tuan Nguyen, Industrial Hygiene Consultant, State Fund Safety & Health Services

## REFERENCES

1. ASHRAE Standard 62.1-2007: Ventilation for Acceptable Indoor Air Quality. American Society of Heating Refrigerating, and Air Conditioning Engineers (ASHRAE). Atlanta, GA, 2007.
2. National Institute of Occupational Safety and Health (NIOSH), Controlling Chemical Hazards During the Application of Artificial Fingernails, January 1999 DHHS (NIOSH) Publication No. 99-112.
3. California Code of Regulations, Title 8, General Industry Safety Orders, Section 5155. Airborne Contaminants

*The current regulations require that employees be informed of any potential exposures to chemicals or physical agents, noise, etc. and that they have access to all the records of workplace monitoring. Airborne contaminant concentrations are reported to reflect the conditions during the monitoring day, and may or may not be reflective of airborne contaminant concentrations on other days. Results reported should be thought of as “snapshots” and estimates of actual airborne contaminant concentrations will vary inter-day and intra-day. Factors that can influence the airborne concentrations of contaminants on a particular day include ventilation rate and normal sampling and analytical error. This report is based on conditions observed during the survey. It does not include all potential health hazards that may exist. The regulations mentioned are those considered most critical for protecting safety and health. Consult the appropriate regulations to obtain complete compliance requirements. Specific products are not endorsed by State Fund.*

## APPENDIX 1

<b>SURVEY SAMPLING AND ANALYSIS DATA</b>		
<b>INSURED:</b> Isabella Nail Bar		<b>DATE:</b> April 7, 2010
<p><b>WORKPLACE SAMPLING:</b>                      Acetone, butyl acetate, dibutyl phthalate, ethyl acetate, ethyl methacrylate, methyl methacrylate, toluene and total hydrocarbons, as n-hexane</p> <p><b>INSTRUMENTS AND SAMPLE MEDIA:</b> 3M Organic Vapor Monitor (OVM), charcoal and Tenax tubes.</p> <p><b>SAMPLE AND CALIBRATION METHOD:</b> Passive Monitors. Flow rates per OSHA and NIOSH Methods</p> <p><b>SAMPLE DURATION:</b> 60 minutes for charcoal tubes; 430–442 minutes for Tenax tubes, 464 - 467 Minutes for 3M OVM.</p>		
<b>ANALYTICAL PROCEDURES:</b> Gas Chromatograph/Flame Ionization Detector		
Acetone (3M OVM)	GC/FID	Modified NIOSH 1300
Dibutyl phthalate	GC/FID	OSHA 104
Ethyl acetate (3M OVM)	GC/FID	Modified NIOSH 1457
Ethyl methacrylate	GC/FID	OSHA PV2100
Methyl methacrylate (3M OVM)	GC/FID	3M Method
n-Butyl acetate (3M OVM)	GC/FID	Modified NIOSH 1450
Toluene	GC/FID	NIOSH 1501
Toluene (3M OVM)	GC/FID	Modified NIOSH 1501
Total Hydrocarbons, as n-hexane	GC/FID	Modified OSHA 07
<p>Analyses were performed by the State Fund Industrial Hygiene Laboratory, or a consulting Lab accredited by the American Industrial Hygiene Association. Where pertinent, NIOSH analytical methods were used. Analytical results were corrected for blank samples.</p> <p style="text-align: center;"><b>Constitution State Services</b>                      Industrial Hygiene Laboratory                      90 Lambertson Road                      Windsor, CT 06095</p>		
<p>Workplace sampling, laboratory analysis, and calculation of exposures were all conducted in accordance with generally accepted industrial hygiene principles and practices. Further survey data and calculations are on file and available from the State Fund Industrial Hygiene staff.</p>		

## APPENDIX 2

<b>SURVEY SAMPLING AND ANALYSIS DATA</b>	
<b>INSURED:</b> Isabella Nail Bar	<b>DATE:</b> April 7, 2010
<b>WORKPLACE SAMPLING:</b> Organic vapors, ethyl methacrylate, total volatile organic chemicals (TVOCs) as toluene.	
<b>INSTRUMENTS AND SAMPLE MEDIA:</b> Samples Collected in Specially-Prepared Canisters <b>Sampling Media:</b> 1 Liter Summa <sup>®</sup> Canister	
<b>SAMPLE AND CALIBRATION METHOD:</b> EPA TO-15 Instruments were calibrated for sampling performance prior to and following the survey.	
<b>SAMPLE DURATION:</b> Range: 15 - 480 minutes	
<b>ANALYTICAL PROCEDURES:</b>  Analyzed by Gas Chromatography/Mass Spectrometry (GC/MS)	
Analyses were performed by the State Fund Industrial Hygiene Laboratory, or a consulting Lab accredited by the American Industrial Hygiene Association. Where pertinent, NIOSH analytical methods were used. Analytical results were corrected for blank samples.  <b>Columbia Analytical Services, Inc.</b> 2655 Park Center Drive, Suite A Simi Valley, CA 93065 www.CASAirLab.com	
Workplace sampling, laboratory analysis, and calculation of exposures were all conducted in accordance with generally accepted industrial hygiene principles and practices. Further survey data and calculations are on file and available from the State Fund Industrial Hygiene staff.	