APPENDIX F

VENTILATION RATE AND AIR MIXING STUDIES OF THE LARGE-SCALE CHAMBER FACILITY

OBJECTIVES

The objectives of these experiments were to: 1) establish and measure the three fixed air change rates for each of the two large-scale chamber compartments; 2) establish and measure the air velocities in the compartments using small fans; 3) measure the quality of air mixing within each compartment at the two lower fixed air change rates; and 4) measure the air leakage between each compartment and the building and between the two compartments.

DESCRIPTION OF CHAMBER FACILITY

The chamber facility is housed in a small building. This building is equipped with thermostatic controls and a heat-pump system for heating and cooling. This system is capable of maintaining the building temperature within approximately ± 3° C of the set point under most climatic conditions.

Chamber compartments A and B were designed and constructed to simulate conditions for a small room in a typical residence. The interior dimensions of each compartment are 2.26 m wide by 4.62 m long with a 2.44-m high ceiling, yielding a volume of 25.5 m³. The walls and ceiling are finished with gypsum board. The seams between boards were taped and topped with joint compound. The finished gypsum board was painted with a "no VOC" primer and flat latex paint combination. The plywood floor was covered with thin aluminum plates with overlapping joints. The plates were screwed down to the floor and the joints were sealed with aluminized tape. Each compartment has a single, unfinished, composite-wood slab door 0.91 m wide by 2.13 m high. The door is weather-stripped on all edges to reduce air leakage. During an experiment, the gaps around the door are sealed with duct tape. There are no windows.

Ventilation air for the chamber compartments is supplied from the exterior of the building through a 15-cm diameter aluminum duct. This air is filtered for gaseous contaminants by passing through a sheet metal box containing a 5-cm thick horizontal bed of activated charcoal with surface dimensions of 0.61 by 0.61 m. The filter box has two exits, each leading to one compartment. The components for each of these systems are identical. An in-line centrifugal blower is attached to the filter box. Downstream of the blower is a manifold leading to three different sized ducts. The internal duct diameters are 3.0 cm, 5.1 cm and 7.6 cm. They are used to provide chamber compartment air change rates of 0.5, 2 and 5 h⁻¹, respectively. Manual valves on the manifold are used to select the desired duct. The ducts are 1.83 m long. A pitot tube (Dwyer Instruments, Inc.) is installed 0.46 m from the outlet end of each duct to monitor the air velocity pressure in the pipe. A manual gate valve is installed downstream of the pitot tube for the 3.0-cm and 5.1-cm diameter ducts. This valve is used to set the desired air flow rate. The air then directly enters the compartment 20 cm above the floor at a long end of the compartment. A cap is placed on the outlet of the 7.6-cm duct in the compartment and drilled with holes which sets the desired air flow rate. All the components of the duct system downstream of the blower are ABS and PVC plastic. They were washed with methanol prior to assembly. All joints are pressed tight and held with screws. No adhesives or sealants were used to assemble the system.

The chamber facility is equipped with a system to add water vapor to the ventilation supply air upstream of the filter box. This system is used to increase the humidity of the supply air when it falls below a minimum value of 40% relative humidity at room temperature. The components consist of: a humidity probe positioned in the filter box; a water reservoir; a variable speed peristaltic metering pump with electronic controls; a specially-fabricated aluminum duct.
section heated with a laboratory hot plate; and a water overflow drain. The data system measures the humidity in the filter box and uses a proportional-control algorithm to set the speed of the water-metering pump.

Air exits each compartment on the same wall that air enters the compartment. The center of the outlet is located 38 cm from the ceiling, about 2.2 m diagonally across from the air inlet. The dimensions of the outlet are 15 cm by 25 cm. Exterior to the compartment, the exhaust is fitted with a damper, which is manually adjusted according to the set air change rate. The exhaust duct is a 6-m section of 15-cm diameter flexible tubing leading to a vent on the roof of the building.

Each compartment is fitted with six 7.6-cm diameter axial fans to provide adequate air mixing. These fans are attached to vertically aligned removable metal poles. There are two fans spaced equally along each long wall and one fan located in the middle of each short wall. The fan heights alternate between 0.81 and 1.62 m from the floor. The fans are positioned 30 - 38 cm from a wall and are aligned so that they move air parallel to the wall. They all move air in the same direction. The fan speeds are controlled with a variable transformer to achieve the desired air velocity near the floor of the compartment.

Air is sampled from the mid-point of each compartment. The inlet of a 0.4-cm i.D. stainless-steel tube is positioned 1.5 m above the floor at the mid point. This tube runs directly to the exterior of the chamber and is connected to a stainless-steel sampling manifold with three ports to allow for the simultaneous collection of duplicate samples for volatile organic compounds and a single sample for aldehydes. Air is continuously pulled through the sampling tube at a rate of 1 L min⁻¹ throughout an entire experiment. Sampling flow rates are regulated with electronic mass flow controllers (Model FC 280, Tylan General) connected to vacuum pumps. These devices operate continuously at the established flow rates. The inlets of the sampling lines leading to the mass flow controllers are connected to electronically actuated three-way solenoid valves. The sampling lines are connected to the sampling manifold and to the valves. For sampling, each valve is switched by the data system from the open position to the position connected to the sampling device. At the end of a set time period, the data system switches the valve back to the open position and sampling is terminated. In some cases, the samples are manually collected during the period in which the valves are held in the in-line position.

The instrumentation for each compartment consists of: 1) a pressure transducer (Model 239, Setra Systems, Inc.) to measure the velocity pressure for the selected pitot tube; 2) a combined RTD temperature and relative humidity probe (Model HMD30YB, Vaisala) positioned at the mid-point of the compartment 1.5 m above the floor; 3) four Type T thermocouples to measure floor temperature and air temperature stratification; and 4) an air velocity transducer (Model 8470-5AM-V-STD-NC, TSI, Inc.) with a range of 0 to 50 cm sec⁻¹ to monitor air velocity 5 cm above the floor. The voltage outputs from these devices are measured at one-minute intervals and averaged and recorded at five-minute intervals with a PC-based data system (Series 500, Keithly/Metrabyte) and data acquisition software (Labtech Notebook, Version 7; Laboratory Technologies, Corp.).

METHODS

The tracer gas employed for these experiments was sulfur hexafluoride (SF₆). A gas cylinder containing a one-percent mixture of SF₆ in air was used as the supply. The flow rate of the SF₆ mixture into the chamber system was regulated with a calibrated electronic mass flow controller. Four peristaltic pumps were used to draw air for the analysis of SF₆ from the chamber system and the building into a computer-controlled multi-port valve. This allowed four separate locations to be sequentially analyzed with a one-minute interval between successive samples. A gas chromatograph equipped with an automated gas sample valve and an electron capture detector was used for the analysis. This system was calibrated on each day of analysis using dilutions of certified gas mixtures of SF₆ and air.
To set and measure the flow rate of air entering a compartment through a supply duct, the one-percent SF₆ gas mixture was metered at a constant rate into the inlet of the selected duct just downstream of the compartment supply manifold. The SF₆ concentration was measured in the air in the duct just as it entered the compartment. For the 3.0-cm and 5.1-cm diameter ducts, the gate valve was adjusted until the supply SF₆ concentration matched the concentration for the desired air flow rate found using,

\[
C_A^0 = \frac{C_{SF6} \cdot Q_{SF6}}{\lambda_A V_A}
\]

(1)

Where \( C_A^0 \) is the expected concentration in the supply of compartment A with a volume, \( V_A \), and an air exchange rate of \( \lambda_A \). The SF₆ from the tank has a concentration, \( C_{SF6} \), and is supplied with a mass flow controller at a volumetric flowrate \( Q_{SF6} \). For the 7.6-cm diameter duct, holes were drilled in the cap on the duct outlet until the calculated concentration was reached. When the desired flow rate was established, the velocity pressure drop for the corresponding pitot tube was recorded in volts with the system pressure transducer and in inches of water with a portable electronic pressure meter.

A residence time distribution experiment was performed for each compartment at each fixed air change rate as described in ASTM D 5116-90 (1990). The objectives of this procedure were to identify any bypassing of air between the air inlet and exhaust or any significant air leakage and to quantify the quality of air mixing in the compartment. First, the compartment was ventilated at the maximum rate until the SF₆ concentration in the compartment was near the limit of detection. Then, an experiment was initiated starting with the lowest air change rate. The tracer gas was introduced as described above. The time that the SF₆ was first introduced into the supply duct established the initial time for the experiment. The SF₆ concentration was measured at four locations: 1) clean supply air at the filter box; 2) the inlet air in the duct just as it entered the compartment; 3) the mid point of the compartment; and 4) the exhaust. Since there was a one-minute interval between successive samples, the SF₆ concentration at each location was measured every four minutes. The experiment was continued until steady state SF₆ concentrations were achieved in the compartment and the exhaust. This experiment was repeated for the other two fixed air change rates. For each experiment, the effective volume, \( V_{eff} \), was found using,

\[
V_{eff} = \frac{V_A \cdot \lambda_A}{\lambda_A^{RTD}}
\]

(2)

Where, the air exchange rate based on the residence time distribution, \( \lambda_A^{RTD} \), was found by fitting the tracer concentration data to,

\[
\frac{C_A}{C_A^0} = 1 - \exp(-\lambda_A^{RTD} \cdot t)
\]

(3)

Where, \( C_A \) is the tracer concentration in compartment A, \( C_A^0 \) is the tracer concentration in the supply, and the initial concentration of the tracer is zero. The effective volume was then compared to the actual volume.

In order to measure the rate of air leakage from a compartment to the building, the pressure drop between the compartment and the building was first measured at the 0.5 and 2 h⁻¹ air change rates with the compartment operating normally. Then, the exhaust was sealed by taping a flat plate over the opening in the compartment. Inlet air flow was established in the smallest diameter duct, and the control valve was adjusted to achieve a pressure drop between the compartment and the building that matched the measured pressure drop for normal operation.
at either the low or intermediate air change rates. This inlet air flow rate was, thus, a measure of the leakage rate since the exhaust was sealed. A 0.5-L volume of the one-percent air mixture of SF$_6$ was quickly introduced into the compartment at the mid point, and the concentration of SF$_6$ in the compartment over time was fit to the following equation to quantify the decay or leakage rate.

\[
\frac{C_A}{C_A^0} = \exp(-\lambda_L^A \cdot t)
\]

(4)

Where, $C_A^0$ is the initial tracer concentration, $\lambda_L^A$ is the air leakage rate from compartment A to the building, and $t$ is time.

A separate experiment was conducted to determine the air leakage rate between the two compartments. One compartment was operated at the 2 h$^{-1}$ air change rate while the second compartment was operated at 0.5 h$^{-1}$. Thus, there was a pressure differential established between the two compartments. Tracer gas was supplied to the first compartment and measured in both compartments over time. The experiment was run until near steady-state SF$_6$ concentrations were achieved in the second compartment. The data were applied to a simple two-chamber mass-balance model. The first chamber was modeled as having one air supply and two exhausts, the standard exhaust outlet and the leakage to the second compartment operating at lower pressure. The leakage rate was found using the following equation.

\[
\lambda_L^{A \rightarrow B} = \frac{\lambda_B (C_B - C_B^0)}{(C_A^0 - C_B)}
\]

(5)

Where, $C_B$ is the tracer concentration in chamber B, $C_A^0$ and $C_B^0$ are the supply SF$_6$ concentrations for compartments A and B, and $\lambda_B$ is the air exchange rate for compartment B. $\lambda_L^{A \rightarrow B}$ is the inter-compartment leakage rate defined as $Q_L/V_A$, where $Q_L$ is the inter-compartment volumetric flowrate. Equation (5) is valid at steady state when $C_A \approx C_A^0$.

Air velocities near the floor of each compartment were mapped with the compartment operating at 0.5 h$^{-1}$ and with the mixing fans operating. The floor of each compartment was marked off into a three by five equal-area grid. The sensor tip of the air velocity transducer was successively placed 5 cm above the floor at each of the eight grid intersections. The air velocity at each point was recorded with the data system. Air velocities were also measured at the center point of each of the four compartment walls (5 cm away from the wall) under the same conditions.

RESULTS AND DISCUSSION

The results of the measurements of the three fixed air change rates for the two chamber compartments are presented in Table F-1. The established air change rates were within plus or minus four percent of the desired values.

The results of the residence time distribution experiments are presented in Table F-2. For the low and intermediate air change rates in each compartment, the deviation of the effective compartment volume from the actual volume was close to ten percent. At the 5.0 h$^{-1}$ air change rate, the deviation was close to 20 percent. ASTM D 5116-90 (1990) suggests that a deviation of about ten percent or less is acceptable; however, precise quantitative guidance on how complete the mixing must be is not yet available. In all cases but one, the effective volume was greater than the actual volume. This implies that some of the supply air was escaping through a leak before it became well mixed with the air in the compartment. For one experiment (Compartment A at the 2.0 h$^{-1}$ air change rate), the effective volume was smaller indicating that a small amount of supply air was bypassing to the exhaust.

The results of the leakage rate experiments are presented in Table F-3. Six to 13 percent of the air in a compartment leaked out of the compartment to the building at the 0.5 and 2 h$^{-1}$ air change rates. The inter-compartment leakage experiment indicated that the air leakage between compartments operating at 0.5 and 2 h$^{-1}$ rates was less than one percent of 0.5 h$^{-1}$.
The air velocities measured in the two compartments operating at 0.5 h⁻¹ are presented in Table F-4. The average air velocity (±1 standard deviation) 5 cm above the floor in compartment A was 11 ± 4 cm sec⁻¹. The average air velocity 5 cm above the floor in compartment B was 9 ± 4 cm sec⁻¹. The air velocities measured at the walls averaged 20 cm sec⁻¹ for each compartment.

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**Table F.1.** Measured fixed air change rates for chamber compartments A and B. The volume of each compartment is 25.5 m³.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Values, Compartment A</th>
<th>Values, Compartment B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Expected air change rate (h⁻¹)</td>
<td>2.0</td>
<td>5.0</td>
</tr>
<tr>
<td>Expected inlet air flow rate (L min⁻¹)</td>
<td>212</td>
<td>2,120</td>
</tr>
<tr>
<td>Expected SF₆ flow rate (mL min⁻¹)</td>
<td>850</td>
<td>850</td>
</tr>
<tr>
<td>1% SF₆ flow rate (VPPs)</td>
<td>3.35</td>
<td>3.35</td>
</tr>
<tr>
<td>Velocity pressure (VPP)</td>
<td>1.34</td>
<td>1.34</td>
</tr>
<tr>
<td>SF₆ compartment conc. (ppb) ± 1 std. dev.</td>
<td>0.72 ± 0.01</td>
<td>0.72 ± 0.01</td>
</tr>
<tr>
<td>Measured air change rate (h⁻¹)</td>
<td>0.50 ± 0.01</td>
<td>0.50 ± 0.01</td>
</tr>
</tbody>
</table>

**Table F.2.** Air residence time distributions for chamber compartments A and B. The volume of each compartment is 25.5 m³.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Values, Compartment A</th>
<th>Values, Compartment B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Expected air change rate (h⁻¹)</td>
<td>2.0</td>
<td>2.0</td>
</tr>
<tr>
<td>Average SF₆ conc. (ppb)</td>
<td>157</td>
<td>177</td>
</tr>
<tr>
<td>Measured air change rate (h⁻¹)</td>
<td>0.46</td>
<td>0.46</td>
</tr>
<tr>
<td>Measured air change rate (h⁻¹)</td>
<td>0.46</td>
<td>0.46</td>
</tr>
<tr>
<td>Effective volume (m³)</td>
<td>28.1</td>
<td>28.1</td>
</tr>
<tr>
<td>Deviation from actual volume (%)</td>
<td>+10</td>
<td>+21</td>
</tr>
</tbody>
</table>
Table F-3. Air leakage from chamber compartments A and B to the building at the 0.5 and 2.0 h\(^{-1}\) air change rates.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Values, Compartment A</th>
<th>Values, Compartment B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air change rate (h(^{-1}))</td>
<td>0.5</td>
<td>2.0</td>
</tr>
<tr>
<td>Pressure differential (Pa)</td>
<td>1.0</td>
<td>3.0</td>
</tr>
<tr>
<td>Leakage rate (h(^{-1}))</td>
<td>0.05</td>
<td>0.11</td>
</tr>
<tr>
<td>Leakage rate (%)</td>
<td>10</td>
<td>6</td>
</tr>
</tbody>
</table>

Table F-4. Summary of the floor and wall air velocities measured in chamber compartments A and B at the 0.5 h\(^{-1}\) air change rate. Velocities were measured 5 cm from surfaces.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Air Velocity, cm sec(^{-1})</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Compartment A</td>
</tr>
<tr>
<td>Floor</td>
<td></td>
</tr>
<tr>
<td>Number of points</td>
<td>8</td>
</tr>
<tr>
<td>Range</td>
<td>6 - 18</td>
</tr>
<tr>
<td>Average (±1 std. dev.)</td>
<td>11 ± 4</td>
</tr>
<tr>
<td>Walls (mid point)</td>
<td></td>
</tr>
<tr>
<td>Number of points</td>
<td>4</td>
</tr>
<tr>
<td>Range</td>
<td>11 - 32</td>
</tr>
<tr>
<td>Average (±1 std. dev.)</td>
<td>20 ± 11</td>
</tr>
</tbody>
</table>
APPENDIX G

PROCEDURES USED FOR EXPOSURE REDUCTION EXPERIMENTS CONDUCTED IN THE LARGE-SCALE CHAMBER FACILITY

GENERAL PROCEDURES

These experiments were designed to measure the concentrations and emission rates of the target compounds under simulated residential indoor environmental conditions. The chamber facility is described in detail in Appendix F. The walls and ceilings of the two chamber compartments were gypsum board painted with flat latex paint, which is the most typical residential wall treatment. The floors were covered with carpet or sheet vinyl flooring. Furnishings were also included as these may act as additional sinks for the deposition and re-emission for compounds that are emitted by the source assemblies. A set of eight identical chairs was purchased for this purpose. These chairs were fully upholstered, medium-sized, arm chairs. They had previously been used in a hotel. The fabric was a fleecy synthetic material. Drapery from the same source was also purchased. The fabric appeared to be cotton or a cotton blend. The material was cut down into panels with dimensions of 1.5 by 2.1 m. Two chairs and one drapery panel were used for each experiment. The chairs and drapery panels were alternated among the experiments and were aired out between uses.

The chamber compartments were thoroughly ventilated between experiments in order to reduce the background concentrations of volatile organic compounds (VOCs) and aldehydes. Typically, this was done for more than two weeks. Background concentrations of VOCs and aldehydes were monitored occasionally during the airing-out periods between experiments. Just prior to initiating an experiment, the compartment was operated at a ventilation rate of 0.5 h⁻¹ for two or more days. For this background measurement period, the compartment was furnished with two chairs and a single drapery panel hung on a wire at the short wall of the compartment opposite the supply air inlet and the exhaust. Each compartment was fitted with six, speed-controlled, 7.6-cm diameter axial fans to provide adequate air mixing within the compartment. The placement of these fans is described in Appendix F. For experiments with the latex paint combination, painting substrates consisting of textured gypsum wall board and plywood panels and wall-to-wall carpeting were installed prior to the background measurement period. At the end of this period, air samples for VOCs and aldehydes were collected from the compartment and from the supply air downstream of the charcoal filter.

In preparation for the installation of the source assembly for each experiment, the supply air flow rate was set to provide a ventilation rate of 2.0 or 5.0 h⁻¹ as required. The compartment exhaust damper was adjusted accordingly, and the tubing connections for the pressure transducer were manually moved to the selected pilot tube. The technicians then entered the compartment and removed the chairs, the drapery panel, and the sampling line. For experiments with floor coverings, they also removed the air mixing fans. The technicians installed the source assemblies following the protocols described below. They re-install the fans, the temperature and humidity probe, the thermocouples, and the sampling line and exited the compartment. The data acquisition and sample valve control program was then terminated and re-started. This established the initial time for the experiment.

The first set of air samples was collected from the compartment and the supply air at an average elapsed time of one hour. At 2-h elapsed time, the technicians re-entered the compartment and installed the two chairs, the drapery panel and an air velocity transducer. They exited the compartment, and the door was taped closed. The door was not opened and the compartment was not re-entered after this time. The compartment ventilation rate was reduced to either 0.5 or 2.0 h⁻¹; the exhaust damper was adjusted; and the tubing connections for the pressure transducer were moved.
Additional air samples were collected from the compartment and the supply air at average elapsed times of three and six hours on the first day of the experiment. Subsequently, samples were collected daily for the next nine days at 24-h intervals from the time the experiment was initiated. The final set of air samples was collected on day fourteen of the experiment at 336-h elapsed time. Replicate samples for VOCs were collected on at least two sampling events during an experiment.

For experiments with elevated ventilation, the compartment was operated at a ventilation rate of 2.0 h⁻¹ for the first 72 hours following the installation of the source assembly. Then, the ventilation rate was reduced to 0.5 h⁻¹; the exhaust damper was adjusted; and the tubing connections for the pressure transducer were moved.

Prior to each experiment, the calibrations of the mass-flow controllers used to regulate the air sampling rates were checked with a flow calibrator.

The environmental and other data were recorded throughout an experimental period and the sampling values were controlled using a computer-based data acquisition and control system. The sensors and the data acquisition and control system are described in more detail in Appendix F. The experimental data consisted of: probe RTD temperature 1.5 m from floor at the midpoint of the compartment; probe relative humidity from the same location; four thermocouple temperatures in the compartment (one on the floor, one 30 cm from the ceiling at the end of the compartment nearest the supply air inlet, one 30 cm from floor at the opposite end of the compartment, and one 1.2 m above the floor near the midpoint of interior wall); air velocity 5-cm above the floor; flow velocity pressure; supply air relative humidity; several thermocouple temperatures in the building; mass-flow controller flow rates; sampling valve positions; elapsed time and clock time. The data were recorded at 5-minute intervals.

LATEX PAINT COMBINATION

The substrate used for the application of the flat latex paint consisted of five panels of 1-cm thick, unfinished, gypsum wall board each with surface dimensions of 1.22 by 2.44 m yielding a total painting surface area of 14.9 m². More than one month prior to the experiments with paint, the exposed surfaces of all of the panels were textured using a professional texturing gun and commercial texturing compound. The textured surface that was applied was typical of many residential wall board installations.

The substrate used for the application of the semi-gloss latex paint consisted of two 1.3-cm thick panels of smooth-surface plywood each with surface dimensions of 0.61 by 0.91 m yielding a total painting surface area of 1.1 m².

The gypsum board and plywood panels were installed in the compartment two or more days prior to initiating an experiment. The gypsum board panels were installed over the painted walls of the compartment and held in place with screws. The panels extended from the floor to the ceiling. Three panels were installed along the long interior wall of the compartment. The edges of these panels were butted against each other. The remaining panels were installed on each side of the door on the opposite long wall of the compartment. The plywood panels were hung on the short walls with one panel at each end of the compartment. The floor of the chamber was swept clean after installing the panels.

Next, the floor of the compartment was completely carpeted. The carpet used for all of these experiments with paints was an action back, tufted level loop, 100 percent olefin fiber material. The carpet was obtained from a local retailer and had been in the retailer's warehouse stock for an extended period prior to the purchase. The carpet was installed directly over the aluminum-clad floor without a carpet cushion. It was held in place with tack strips positioned around the inside perimeter of the compartment. No seam tape or adhesives were used in the installation.
Following the installation of substrate panels and the carpet, the two chairs, the drapery panel, the air mixing fans, the temperature and humidity probe, and the sampling line were installed. Then the 48-h background measurement period was initiated.

The paints used in the experiments were purchased from a local retailer. They were all obtained in 3.78-L containers. The semi-gloss latex paint was mixed and split into new 0.95-L paint containers following purchase since a relatively small amount of this paint was used in each experiment. Immediately prior to use, each paint container was thoroughly mixed by shaking and stirring.

The paints were applied using typical painting tools. The latex primer sealer was applied to the gypsum board panels by roller using a new 23-cm wide roller cover with a 0.9-cm nap. A brush was used to apply the primer to the upper and lower borders of the gypsum panels and to the two plywood panels. The flat latex paint was applied to the primered gypsum panels using a new roller cover of the same type. Another brush was used to apply the flat latex paint to the upper and lower borders of the gypsum panels. A third brush was used to apply the semi-gloss paint to the primered plywood panels. New plastic liners were used to contain the paints in the roller trays. Plastic drop cloths were used to collect any paint spilled during the painting process. All paint containers, tools and drop cloths were weighed immediately prior to and following an experiment. These weights were used to calculate the masses of the three paints that were applied to the panels.

The latex primer sealer and the flat latex paint were applied to the gypsum board panels by roller using a standardized procedure that followed recommended industry practice. The roller was loaded with paint, and the paint was applied to an approximately 0.6 by 0.1.2 m area following an "N" pattern. The pattern was filled in by running the roller horizontally over the area and was then smoothed out with vertical strokes. This procedure was repeated until the entire surface area was painted.

For each of these experiments, the latex primer sealer was applied first. Two technicians entered the compartment with the primer, painting tools and a work light. The door was closed and remained closed during the painting operation. It took approximately 25 minutes to apply the primer. At the end of this period, the technicians exited the compartment with the remaining paint and the painting tools. The primer was allowed to dry for one hour as recommended by the manufacturer. Exactly one hour after initially entering the compartment, the technicians re-entered with the flat and semi-gloss latex paints and painting materials. They applied these paints following the same sequence as used for the primer. It took approximately another 20 - 25 minutes to apply the finish paints. The remaining paint and painting tools were passed out of the compartment. The temperature and humidity probe, the thermocouples, and the sampling line were installed and positioned. The technicians then exited the chamber with the work light. This established the beginning of the 336-h experimental period. At 2-h elapsed time, the technicians re-entered the compartment and installed the two chairs, the drapery panel, and the air velocity transducer.

For the paint experiment with added air mixing and additional ventilation, two oscillating room fans, 30 cm in diameter, were installed in the compartment at 2-h elapsed time when the two chairs and the drapery panel were also installed. The fans were placed on a metal hospital cart in the approximate middle of the compartment. The axial centers of the fans were 1.1 m above the floor. The fans were positioned and operated so that they oscillated along the long walls of the compartment and moved air approximately perpendicular to these walls. The fans were continuously operated at their maximum speed setting until 72-h elapsed time when they were switched off externally to the compartment. The fans remained in the compartment for the duration of the experiment.
At the end of each experiment, the painted gypsum board, the plywood panels and the carpet were removed from the compartment, and the compartment was ventilated at a high air change rate.

CARPET ASSEMBLY

The carpet used for these experiments was an action back, tufted textured loop, 100 percent olefin fiber material. This carpet was purchased through a contract flooring dealer. The dealer was able to obtain material that had been manufactured approximately one week prior to its delivery to the dealer. Upon delivery, the large roll was cut into the approximate sizes required for the experiments. For each experiment, there were three sections of carpet. Two of these had dimensions of 1.2 by 2.4 m and the third had dimensions of 2.4 by 2.4 m. The three sections were tightly rolled together and stored in a sealed Tedlar bag until they were used in an experiment.

A 1.1-cm thick bonded urethane carpet cushion was used for the experiments. This material was manufactured approximately one week prior to the time it was purchased from a local retailer. The 1.8 m wide roll was cut into approximately 2.4 m long sections. The material for each experiment, which consisted of three sections, was rolled together and stored in a sealed Tedlar bag until it was used.

Following the 48-h background measurement period, the two chairs, the drapery panel, the air mixing fans, and the sampling line were removed from the compartment. The carpet and carpet cushion materials for the experiment were unpacked from their storage bags outside of the compartment. The rolled materials, the installation tools and a work light were taken into the compartment by two technicians. The compartment door was closed and remained closed during most the installation period. Previously, a carpet tack strip had been attached to the floor around the inside perimeter of the compartment. The sections of carpet cushion were laid out on the floor with the smooth webbing side facing up. The sections were trimmed with a knife so that they fit inside of the tack strip. Next, the sections of carpet were laid out over the cushion. These were aligned so that the two seams ran across the short length of the compartment and were not directly over the seams in the cushion. The two seams were bonded with thermal seam tape applied with a professional seaming iron. The edges of the carpet were then trimmed with a knife so that the carpet fit closely against the walls of the compartment. The carpet was attached to the tack strip by pounding the edges down with a metal block and hammer. The carpet was not stretched, as is typical practice. The air mixing fans, the temperature and humidity probe, the thermocouples, and the sampling line were installed. The technicians exited the compartment with the work light. This established the beginning of the 336-h experimental period. The entire installation and setup procedure required approximately 50 minutes to complete. At 2-h elapsed time, the technicians re-entered the compartment and installed the two chairs, the drapery panel, and the air velocity transducer.

For one experiment, the carpet and carpet cushion materials were aired out prior to their installation in the compartment. Two days before the start of the experiment, the materials were laid out on the floor of a room that was ventilated at over ten air changes per hour. The carpet was positioned with the backing facing up and the cushion was positioned with the webbing side facing up. Four oscillating room fans were used to increase the air velocity over the surfaces of the materials. The fans were placed on the floor at the edges of the materials and were operated in the oscillating mode on their highest speed setting. At the end of the 48-h airing out period, the materials were rolled up and taken to the nearby chamber facility. Installation of the materials, as described above, began within one hour.

At the end of each experiment, the carpet and carpet cushion were removed from the compartment, and the compartment was ventilated at a high air change rate.
VINYL FLOORING ASSEMBLY

The primary materials used for the experiments with the vinyl flooring assembly were particle board underlayment, residential sheet vinyl flooring, rubber cove base and associated adhesives.

The particle board underlayment was purchased from a local building supply retailer several months prior to the initiation of these experiments. The 1.22 by 2.44 m, 1-cm thick, panels were stored in the chamber facility building. They were leaned up against several walls of the building to maximize the exposure of their surfaces to air. This was intended to reduce the emissions of VOCs from the panels; however, the reduction was not quantified. Prior to an experiment, four panels of underlayment were cut to completely cover the floor of the compartment. They were carefully cut so that the seams fit closely together and no nailing or filling would be required. The panels were then removed from the compartment, and the compartment was set up for the background measurement period as described above.

The sheet vinyl flooring was purchased through the contract flooring dealer. The roll of material was received within one week of its production by the manufacturer. Upon receipt, the roll was cut into the approximate sizes required for the experiments. There were three pieces for each experiment. Two pieces were 1.8 by 2.4 m, and the other piece was 0.9 by 2.4 m. Pieces for two experiments were tightly rolled together and stored in a sealed Tedlar bag.

The sheet flooring adhesive was packaged by the manufacturer in a 19-L container. Sufficient adhesive needed to complete the installation was transferred into a separate container for each experiment. The cove base adhesive was packaged in 0.32-L tubes with applicator spouts designed for use in a caulking gun. The seam sealer consisted of two separate liquids that are designed to be mixed together in equal portions just prior to application. The secondary container of sheet vinyl adhesive, two containers of cove base adhesive, and the installation tools consisting of two notched trowel applicators and a spatula were weighed immediately prior to and following an experiment. These weights were used to calculate the applied masses of the two adhesives.

Following the background measurement period, the two chairs, the drapery panel, the air mixing fans, and the sampling line were removed from the compartment. The technicians then installed the four panels of underlayment on top of the aluminum-clad floor. The compartment door was left open during this operation. Next, the sheet vinyl flooring material for the experiment was removed from its storage bag exterior to the compartment. The vinyl flooring, sections of cove base, adhesives, tools and a work light were taken into the compartment by the two technicians. The door was closed and remained closed during most of the installation. The vinyl flooring was laid out on the floor so that the two seams ran across the short length of the compartment. The material was trimmed to approximately the correct size with a knife. The sheet flooring adhesive was applied to the surface of the underlayment with the notched trowels. These trowels had 1.5- by 1.5-mm square teeth as recommended by the adhesive manufacturer. The adhesive was applied in stages with two stages for each piece of vinyl flooring. After the vinyl flooring was glued down, the edges were trimmed as required and any large air bubbles were worked out by rubbing the surface and applying pressure with a large towel. The cove base, which was manufactured in 1.1-m sections, was applied next. Three equally-spaced beads of adhesive running the length of a section of cove base were applied with a caulking gun. The beads were approximately 0.6 cm wide. The cove base with adhesive was then pressed against the base of the wall and down against the vinyl flooring. Finally, the seam sealer was applied to the two seams in the vinyl flooring. The sealer was prepared outside of the compartment by mixing together 7.5 mL of each of the two components in a glass vial. The mixture was applied using a 10-mL plastic disposable syringe.

The tools and the remaining and scrap materials were passed out of the compartment. The air mixing fans, the temperature and humidity probe, the thermocouples, and the sampling line were installed. The technicians exited the compartment with the work light. This established
the beginning of the 336-h experimental period. The entire installation and setup procedure required approximately 90 minutes to complete. At 2-h elapsed time, the technicians re-entered the compartment and installed the two chairs, the drapery panel, and the air velocity transducer.

For one experiment, the sheet vinyl flooring and cove base materials were aired out prior to their installation in the compartment. Two days before the start of the experiment, the materials were laid out on the floor of a room that was ventilated at over ten air changes per hour. The materials were positioned with their finished surfaces facing up. Two oscillating room fans were used to increase the air velocity over the surfaces of the materials. The fans were placed on the floor at the edges of the materials and were operated in the oscillating mode on their highest speed setting. At the end of the 48-h airing out period, the vinyl flooring was rolled up, and both materials were transported to the chamber facility. Installation of the materials began within one hour.

At the end of each experiment, the entire vinyl flooring assembly and the cove base were removed from the compartment, and the compartment was ventilated at a high air change rate.

COMBINED SOURCES

Two experiments were conducted in which all of the sources were installed in the compartment. The materials used for these installations were the same as those described above for the individual source experiments. The substrates used for the paint combination were also identical in kind and size to those described above. Two-thirds of the floor area of the compartment was covered with the carpet assembly, and the remaining one-third was covered with the vinyl flooring assembly.

The gypsum board and plywood panels, the two chairs, and the drapery panel were installed in the compartment. The aluminum-clad floor was left bare. Following the 48-h background measurement period, the furnishings were removed and the paints were applied following procedures that were identical to those described above. The ventilation rate during painting was 5.0 h⁻¹. Immediately after painting, the air mixing fans, the temperature and humidity probe, the thermocouples, and the sampling line were installed. There were no carpet and furnishings in the compartment. The technicians then exited the compartment with the work light. This established the initial time for the paint-drying period. Two hours later, the ventilation rate was reduced to 2.0 h⁻¹.

Since the magnitude of the VOC emissions from the latex paints was known to be significantly greater than the magnitude of the VOC emissions from the other two source assemblies, the flooring materials were installed three days (72 hours) after painting. This initial drying period allowed the VOC emissions from the paints to decay down to somewhat lower levels and made it more practical to collect and analyze VOC samples for compounds that were representative of all of the sources. Additionally, it is common in new construction and remodeling projects for painting to be completed prior to installation of the finish flooring materials.

Approximately 68 hours after painting, VOC and aldehyde samples were collected from the compartment and the supply air. Seventy-two hours after painting and with the chamber still operating at 2.0 h⁻¹, the installation of the carpet and vinyl flooring assemblies was initiated. The vinyl flooring assembly was installed first followed by the carpet assembly. The procedures were the same as those described above for the individual assemblies. The air mixing fans, the temperature and humidity probe, the thermocouples, the sampling line and the air velocity transducer were then installed, and the two technicians exited the compartment with the work light. This established the beginning of the experimental period. The entire installation and setup procedure required approximately 70 minutes to complete. At 2-h elapsed time, the technicians re-entered the compartment and installed the two chairs, the drapery panel, and the air velocity transducer.
One of these experiments was conducted using mild heating over approximately three days in combination with additional ventilation as a source treatment procedure. Prior to this experiment, the exterior walls, the ceiling and the floor of the compartment were insulated with fiberglass insulation in an attempt to improve the uniformity of the air and surface temperatures in the compartment. Fiberglass bats with R-11 insulation value were installed on the three exterior walls; R-19 fiberglass bats were installed on the roof deck and under the floor. Two hours after the beginning of the experimental period, two portable heaters were placed in the compartment concurrently with the installation of the furnishings. These were identical 1,500 watt, 120 VAC, fan-forced, radiant heaters. The fans were placed on the carpet on aluminum plates and positioned on either side of the door. The operation of one of the heaters was controlled by a digital laboratory temperature controller with 0.1°C resolution that was mounted on the exterior of the compartment. The temperature probe for the controller was positioned in the compartment about 60 cm above the floor. The other heater was manually controlled from the exterior of the compartment with an on/off switch.

Immediately following the collection of the 6-h air samples, the two heaters were turned on. After several hours when the air and surface temperatures had approached the 33°C set-point temperature, the manually controlled heater was switched off. The single temperature-controlled heater was used for the duration of the heating period. The compartment was continuously heated until the collection of the 72-h air samples was completed. At this time, the heater was switched off, and the ventilation rate was reduced to 0.5 h⁻¹. Additional sets of air samples were collected during this experiment at 12- and 80-h elapsed time.

The other experiment with combined source assemblies was conducted with additional ventilation of 2.0 h⁻¹, but without heating, throughout the first 72 hours following installation of the flooring assemblies. After collection of the 72-h air samples, the ventilation rate was reduced to 0.5 h⁻¹. This experiment was conducted over a period of 12 weeks (2,016 hours) in order to measure the longer-term emissions of the target VOCs. Air samples were collected weekly following the initial two-week period.
APPENDIX H

EXPOSURE REDUCTION EXPERIMENTS WITH THE LATEX PAINT COMBINATION

Appendix H presents the analytical data for the four large-scale exposure reduction experiments with the latex paint combination. The experiments were conducted in 25.5 m³ chamber compartments over a period of 336 hours. Paints LPS2, FLP3 and SGLP3 were applied to gypsum board and plywood panels with a total surface area of 16 m². The concentrations of selected compounds and SigmaVOC were measured throughout the experiments. Specific emission rates of these components were calculated. Cumulative mass emissions and cumulative exposures were estimated.

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### Table H-01. Summary of environmental parameters for large-scale Experiments P-1 through P-4 with latex paints.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>P-1</th>
<th>Experiment</th>
<th>P-2</th>
<th>P-3</th>
<th>P-4*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>P-2</td>
<td>P-3</td>
<td>P-4*</td>
<td></td>
</tr>
<tr>
<td>Starting date</td>
<td>10/10/96</td>
<td>10/22/96</td>
<td>11/13/96</td>
<td>12/09/96</td>
<td></td>
</tr>
<tr>
<td>Treatment</td>
<td>Base case</td>
<td>Base case</td>
<td>Add ventilation</td>
<td>Add ventilation &amp; mixing</td>
<td></td>
</tr>
<tr>
<td>Ventilation rate, 2 - 72 h (h⁻¹)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average ± 1 std. dev.</td>
<td>0.50 ± 0.01†</td>
<td>0.50 ± 0.01†</td>
<td>1.95 ± 0.01‡</td>
<td>1.88 ± 0.01‡</td>
<td></td>
</tr>
<tr>
<td>Range</td>
<td>0.50 - 0.51</td>
<td>0.49 - 0.50</td>
<td>1.91 - 1.98</td>
<td>1.85 - 1.91</td>
<td></td>
</tr>
<tr>
<td>Ventilation rate, 72 - 336 h (h⁻¹)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average ± 1 std. dev.</td>
<td>0.50 ± 0.01</td>
<td>0.50 ± 0.01</td>
<td>0.50 ± 0.01</td>
<td>0.50 ± 0.01</td>
<td></td>
</tr>
<tr>
<td>Range</td>
<td>0.49 - 0.51</td>
<td>0.49 - 0.50</td>
<td>0.49 - 0.51</td>
<td>0.49 - 0.52</td>
<td></td>
</tr>
<tr>
<td>Temperature, 2 - 336 h (°C)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average ± 1 std. dev.</td>
<td>23.1 ± 1.1</td>
<td>23.1 ± 0.6</td>
<td>23.8 ± 0.3</td>
<td>23.1 ± 0.6</td>
<td></td>
</tr>
<tr>
<td>Range</td>
<td>20.7 - 25.7</td>
<td>21.7 - 25.4</td>
<td>23.0 - 25.2</td>
<td>22.1 - 24.5</td>
<td></td>
</tr>
<tr>
<td>Relative Humidity, 2 - 336 h (%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average ± 1 std. dev.</td>
<td>43 ± 10</td>
<td>38 ± 5</td>
<td>44 ± 6</td>
<td>48 ± 5</td>
<td></td>
</tr>
<tr>
<td>Range</td>
<td>24 - 61</td>
<td>24 - 48</td>
<td>33 - 53</td>
<td>37 - 56</td>
<td></td>
</tr>
</tbody>
</table>

*Experiment P-4 was terminated at 240-h elapsed time.
†Ventilation rate for 0 - 2 hours was 2 h⁻¹.
‡Ventilation rate for 0 - 2 hours was 5 h⁻¹.
Table H-02. Paint application data for large-scale Experiments P-1 through P-4. See Appendix C, Table C-01 for paint descriptions.

<table>
<thead>
<tr>
<th>Experiment/ Paint</th>
<th>Area (m²)</th>
<th>Mass (g)</th>
<th>Coverage (g m⁻²)</th>
</tr>
</thead>
<tbody>
<tr>
<td>P-1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LPS2</td>
<td>16.0</td>
<td>1,610</td>
<td>101</td>
</tr>
<tr>
<td>FLP3</td>
<td>14.9</td>
<td>1,590</td>
<td>107</td>
</tr>
<tr>
<td>SGLP3</td>
<td>1.1</td>
<td>110</td>
<td>100</td>
</tr>
<tr>
<td>Total*</td>
<td>16.0</td>
<td>3,310</td>
<td>207</td>
</tr>
<tr>
<td>P-2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LPS2</td>
<td>16.0</td>
<td>2,000</td>
<td>125</td>
</tr>
<tr>
<td>FLP3</td>
<td>14.9</td>
<td>1,570</td>
<td>105</td>
</tr>
<tr>
<td>SGLP3</td>
<td>1.1</td>
<td>114</td>
<td>104</td>
</tr>
<tr>
<td>Total*</td>
<td>16.0</td>
<td>3,680</td>
<td>230</td>
</tr>
<tr>
<td>P-3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LPS2</td>
<td>16.0</td>
<td>1,880</td>
<td>118</td>
</tr>
<tr>
<td>FLP3</td>
<td>14.9</td>
<td>1,610</td>
<td>108</td>
</tr>
<tr>
<td>SGLP3</td>
<td>1.1</td>
<td>115</td>
<td>105</td>
</tr>
<tr>
<td>Total*</td>
<td>16.0</td>
<td>3,600</td>
<td>225</td>
</tr>
<tr>
<td>P-4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LPS2</td>
<td>16.0</td>
<td>2,030</td>
<td>127</td>
</tr>
<tr>
<td>FLP3</td>
<td>14.9</td>
<td>1,570</td>
<td>106</td>
</tr>
<tr>
<td>SGLP3</td>
<td>1.1</td>
<td>115</td>
<td>103</td>
</tr>
<tr>
<td>Total*</td>
<td>16.0</td>
<td>3,720</td>
<td>232</td>
</tr>
</tbody>
</table>

*Total area was used in specific emission rate calculations.
Table H-03. VOCs emitted by Paints LPS2, FLP3 and SGLP3 in large-scale Experiment P-2 at 24- and 240-hours elapsed times.

<table>
<thead>
<tr>
<th>COMPOUND</th>
<th>Code*</th>
<th>24-h ET</th>
<th>240-h ET</th>
<th>Match Quality</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aromatic Hydrocarbons</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>m-,p-Xylene</td>
<td>T,B</td>
<td>+</td>
<td></td>
<td>Confirmed</td>
</tr>
<tr>
<td>4-Phenylcyclohexene</td>
<td>B</td>
<td>+</td>
<td></td>
<td>Confirmed</td>
</tr>
<tr>
<td>Other Hydrocarbons</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>alpha-Pinene</td>
<td>B</td>
<td>+</td>
<td>+</td>
<td>Confirmed</td>
</tr>
<tr>
<td>3-Carene</td>
<td>B</td>
<td>+</td>
<td></td>
<td>Confirmed</td>
</tr>
<tr>
<td>Carbonyl Compounds</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hexanal</td>
<td>B</td>
<td>+</td>
<td>+</td>
<td>Confirmed</td>
</tr>
<tr>
<td>Octanal</td>
<td>B</td>
<td>+</td>
<td></td>
<td>Confirmed</td>
</tr>
<tr>
<td>Nonanal</td>
<td>B</td>
<td>+</td>
<td>+</td>
<td>Confirmed</td>
</tr>
<tr>
<td>Decanal</td>
<td>B</td>
<td>+</td>
<td>+</td>
<td>Confirmed</td>
</tr>
<tr>
<td>Other Oxidized Compounds</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Acetic acid</td>
<td>B</td>
<td>+</td>
<td>+</td>
<td>Confirmed</td>
</tr>
<tr>
<td>Ethylene glycol</td>
<td>T,A,Q</td>
<td>+</td>
<td>+</td>
<td>Confirmed</td>
</tr>
<tr>
<td>n-Butyl ether</td>
<td>Q</td>
<td>+</td>
<td></td>
<td>Confirmed</td>
</tr>
<tr>
<td>Propylene glycol</td>
<td>A,Q</td>
<td>+</td>
<td>+</td>
<td>Confirmed</td>
</tr>
<tr>
<td>Ethylene glycol monoacetate</td>
<td></td>
<td>+</td>
<td></td>
<td>Probable</td>
</tr>
<tr>
<td>Hexylene glycol</td>
<td></td>
<td>+</td>
<td></td>
<td>Confirmed</td>
</tr>
<tr>
<td>2-Ethyl-1-hexanol</td>
<td>Q</td>
<td>+</td>
<td></td>
<td>Confirmed</td>
</tr>
<tr>
<td>2-(2-Butoxyethoxy)ethanol</td>
<td>T,Q</td>
<td>+</td>
<td>+</td>
<td>Confirmed</td>
</tr>
<tr>
<td>Unidentified oxidized compound</td>
<td></td>
<td>+</td>
<td>+</td>
<td>Unident.</td>
</tr>
<tr>
<td>2,2,4-Trimethyl-1,3-pentanediol monosobutrate isomers (Texanol)</td>
<td>A,Q</td>
<td>+</td>
<td>+</td>
<td>Confirmed</td>
</tr>
</tbody>
</table>

*T = Toxic air contaminant; A = Abundant compound; B = Component of chamber background; Q = Quantified target compound.
Table H-04. Target compounds quantified in large-scale Experiments P-1 through P-4. Toxic Air Contaminant (TAC) Category for June 1996 is indicated where applicable.

<table>
<thead>
<tr>
<th>Compound</th>
<th>TAC Cat</th>
<th>Table Abbrev.</th>
<th>Sources</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Carbonyl Compounds</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Formaldehyde</td>
<td>I</td>
<td></td>
<td>FLP3,SGLP3</td>
</tr>
<tr>
<td>Acetaldehyde</td>
<td>I</td>
<td></td>
<td>FLP3,SGLP3</td>
</tr>
<tr>
<td><strong>Other Oxidized Cmpds.</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ethylene glycol</td>
<td>I</td>
<td>EG</td>
<td>LPS2,FLP3</td>
</tr>
<tr>
<td>Propylene glycol</td>
<td></td>
<td>PG</td>
<td>LPS2,SGLP3</td>
</tr>
<tr>
<td>n-Butyl ether</td>
<td></td>
<td></td>
<td>LPS2,FLP3,SGLP3</td>
</tr>
<tr>
<td>2-Ethyl-1-hexanol</td>
<td></td>
<td></td>
<td>LPS2</td>
</tr>
<tr>
<td>2-(2-Butoxyethoxy)ethanol</td>
<td>I</td>
<td>DEGBE</td>
<td>LPS2,SGLP3</td>
</tr>
<tr>
<td>2,2,4-Trimethyl-1,3-pentanediol monoisobutyrales (combined isomers)</td>
<td>Texanol</td>
<td>LPS2,FLP3,SGLP3</td>
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Table H-05. Concentrations of target VOCs for large-scale Experiment P-1.

<table>
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<th>Sample ID</th>
<th>EG</th>
<th>PG</th>
<th>Butyl ether</th>
<th>Ethylhexanol</th>
<th>DEGBE</th>
<th>Texanol</th>
</tr>
</thead>
<tbody>
<tr>
<td>Avg. Inlet</td>
<td>&lt;33</td>
<td>&lt;12</td>
<td>&lt;1</td>
<td>&lt;1</td>
<td>&lt;1</td>
<td>&lt;2</td>
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<tr>
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<td>&lt;33</td>
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<td>&lt;1</td>
<td>&lt;1</td>
<td>&lt;1</td>
<td>&lt;2</td>
</tr>
<tr>
<td>1-h</td>
<td>3,640</td>
<td>840</td>
<td>530</td>
<td>160</td>
<td>60</td>
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<tr>
<td>3-h</td>
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<td>2,340</td>
<td>276</td>
<td>116</td>
<td>92</td>
<td>2,890</td>
</tr>
<tr>
<td>6-h</td>
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<td>1,070</td>
<td>214</td>
<td>99</td>
<td>63</td>
<td>3,550</td>
</tr>
<tr>
<td>24-h</td>
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<td>309</td>
<td>50</td>
<td>30</td>
<td>32</td>
<td>3,070</td>
</tr>
<tr>
<td>48-h</td>
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<td>190</td>
<td>27</td>
<td>15</td>
<td>28</td>
<td>2,640</td>
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<tr>
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<td>15</td>
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<td>96</td>
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<td>6</td>
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<td>2,410</td>
</tr>
<tr>
<td>120-h</td>
<td>500</td>
<td>36</td>
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<td>5</td>
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<td>1,930</td>
</tr>
<tr>
<td>144-h</td>
<td>245</td>
<td>40</td>
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<td>1,680</td>
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<tr>
<td>168-h</td>
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<td>27</td>
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<td>3</td>
<td>6</td>
<td>1,640</td>
</tr>
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<tr>
<td>216-h</td>
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<td>31</td>
<td>4</td>
<td>3</td>
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<tr>
<td>240a-h</td>
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<td>27</td>
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<td>2</td>
<td>4</td>
<td>980</td>
</tr>
<tr>
<td>240b-h</td>
<td>202</td>
<td>26</td>
<td>4</td>
<td>2</td>
<td>4</td>
<td>1,310</td>
</tr>
<tr>
<td>336-h</td>
<td>316</td>
<td>42</td>
<td>3</td>
<td>1</td>
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### Table H-06. Concentrations of target VOCs for large-scale Experiment P-2.

<table>
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<th>Sample ID</th>
<th>EG</th>
<th>PG</th>
<th>Butyl ether</th>
<th>Ethylhexanol</th>
<th>DEGEE</th>
<th>Texanol</th>
</tr>
</thead>
<tbody>
<tr>
<td>Avg. Inlet</td>
<td>&lt;33</td>
<td>&lt;12</td>
<td>&lt;1</td>
<td>&lt;1</td>
<td>&lt;1</td>
<td>&lt;2</td>
</tr>
<tr>
<td>Background</td>
<td>&lt;33</td>
<td>&lt;12</td>
<td>&lt;1</td>
<td>&lt;1</td>
<td>&lt;1</td>
<td>&lt;2</td>
</tr>
<tr>
<td>1-h</td>
<td>16,100</td>
<td>4,020</td>
<td>554</td>
<td>169</td>
<td>84</td>
<td>3,330</td>
</tr>
<tr>
<td>3-h</td>
<td>19,500</td>
<td>3,740</td>
<td>265</td>
<td>108</td>
<td>108</td>
<td>4,640</td>
</tr>
<tr>
<td>6-h</td>
<td>10,500</td>
<td>2,260</td>
<td>227</td>
<td>91</td>
<td>82</td>
<td>3,970</td>
</tr>
<tr>
<td>24-h</td>
<td>3,160</td>
<td>756</td>
<td>49</td>
<td>38</td>
<td>60</td>
<td>2,660</td>
</tr>
<tr>
<td>48-h</td>
<td>1,580</td>
<td>364</td>
<td>23</td>
<td>18</td>
<td>42</td>
<td>3,180</td>
</tr>
<tr>
<td>72-h</td>
<td>776</td>
<td>114</td>
<td>13</td>
<td>8</td>
<td>20</td>
<td>2,890</td>
</tr>
<tr>
<td>96-h</td>
<td>691</td>
<td>89</td>
<td>8</td>
<td>5</td>
<td>16</td>
<td>md*</td>
</tr>
<tr>
<td>120a-h</td>
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<td>44</td>
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<td>12</td>
<td>1,840</td>
</tr>
<tr>
<td>120b-h</td>
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<td>38</td>
<td>5</td>
<td>3</td>
<td>10</td>
<td>1,950</td>
</tr>
<tr>
<td>144-h</td>
<td>364</td>
<td>49</td>
<td>4</td>
<td>4</td>
<td>10</td>
<td>1,660</td>
</tr>
<tr>
<td>168a-h</td>
<td>715</td>
<td>89</td>
<td>5</td>
<td>2</td>
<td>14</td>
<td>1,920</td>
</tr>
<tr>
<td>168b-h</td>
<td>664</td>
<td>77</td>
<td>5</td>
<td>3</td>
<td>12</td>
<td>1,850</td>
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<tr>
<td>192-h</td>
<td>625</td>
<td>58</td>
<td>5</td>
<td>3</td>
<td>11</td>
<td>1,600</td>
</tr>
<tr>
<td>216-h</td>
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<td>53</td>
<td>6</td>
<td>4</td>
<td>10</td>
<td>1,490</td>
</tr>
<tr>
<td>240-h</td>
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<td>45</td>
<td>5</td>
<td>3</td>
<td>8</td>
<td>1,290</td>
</tr>
<tr>
<td>336a-h</td>
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<td>md</td>
<td>3</td>
<td>3</td>
<td>4</td>
<td>1,020</td>
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<tr>
<td>336b-h</td>
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<td>2</td>
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</table>

*md = missing or invalidated data.
### Table H-07. Concentrations of target VOCs for large-scale Experiment P-3.

<table>
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<tr>
<th>Sample ID</th>
<th>EG</th>
<th>PG</th>
<th>Butyl Ether</th>
<th>Ethyl-hexanol</th>
<th>DEGBE</th>
<th>Texanol</th>
</tr>
</thead>
<tbody>
<tr>
<td>Avg. Inlet</td>
<td>&lt;33</td>
<td>&lt;12</td>
<td>&lt;1</td>
<td>&lt;1</td>
<td>&lt;1</td>
<td>&lt;2</td>
</tr>
<tr>
<td>Background</td>
<td>&lt;33</td>
<td>&lt;12</td>
<td>&lt;1</td>
<td>&lt;1</td>
<td>&lt;1</td>
<td>27</td>
</tr>
<tr>
<td>1-h</td>
<td>16,400</td>
<td>4,640</td>
<td>110</td>
<td>76</td>
<td>119</td>
<td>5,590</td>
</tr>
<tr>
<td>3a-h</td>
<td>13,800</td>
<td>2,920</td>
<td>96</td>
<td>53</td>
<td>96</td>
<td>4,600</td>
</tr>
<tr>
<td>3b-h</td>
<td>13,800</td>
<td>2,960</td>
<td>85</td>
<td>51</td>
<td>96</td>
<td>4,100</td>
</tr>
<tr>
<td>6-h</td>
<td>7,920</td>
<td>1,910</td>
<td>59</td>
<td>38</td>
<td>85</td>
<td>3,630</td>
</tr>
<tr>
<td>24-h</td>
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<td>284</td>
<td>8</td>
<td>13</td>
<td>34</td>
<td>2,710</td>
</tr>
<tr>
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<td>123</td>
<td>3</td>
<td>4</td>
<td>17</td>
<td>1,390</td>
</tr>
<tr>
<td>72-h</td>
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<td>83</td>
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<td>2</td>
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<tr>
<td>96-h</td>
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<td>166</td>
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<td>16</td>
<td>1,860</td>
</tr>
<tr>
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<td>133</td>
<td>10</td>
<td>3</td>
<td>17</td>
<td>1,820</td>
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<tr>
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<td>5</td>
<td>17</td>
<td>2,050</td>
</tr>
<tr>
<td>144-h</td>
<td>627</td>
<td>102</td>
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</tr>
<tr>
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<td>91</td>
<td>9</td>
<td>3</td>
<td>14</td>
<td>1,930</td>
</tr>
<tr>
<td>168b-h</td>
<td>597</td>
<td>88</td>
<td>8</td>
<td>3</td>
<td>12</td>
<td>md*</td>
</tr>
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<tr>
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<td>73</td>
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<tr>
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<td>42</td>
<td>5</td>
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*md* = Missing or invalidated data.
Table H-08. Concentrations of target VOCs for large-scale Experiment P-4. Experiment was terminated at 240-h elapsed time (see Report).

<table>
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<tr>
<th>Sample ID</th>
<th>EG</th>
<th>PG</th>
<th>Butyl ether</th>
<th>Ethyl-hexanol</th>
<th>DEGBE</th>
<th>Texanol</th>
</tr>
</thead>
<tbody>
<tr>
<td>Avg. Inlet</td>
<td>&lt;33</td>
<td>&lt;12</td>
<td>&lt;1</td>
<td>&lt;1</td>
<td>&lt;1</td>
<td>&lt;2</td>
</tr>
<tr>
<td>Background</td>
<td>&lt;33</td>
<td>&lt;12</td>
<td>&lt;1</td>
<td>1</td>
<td>&lt;1</td>
<td>10</td>
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<tr>
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<td>2,970</td>
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<td>58</td>
<td>87</td>
<td>4,370</td>
</tr>
<tr>
<td>3-h</td>
<td>10,100</td>
<td>2,640</td>
<td>82</td>
<td>43</td>
<td>106</td>
<td>3,430</td>
</tr>
<tr>
<td>6-h</td>
<td>5,190</td>
<td>1,490</td>
<td>53</td>
<td>34</td>
<td>77</td>
<td>3,560</td>
</tr>
<tr>
<td>24-h</td>
<td>1,750</td>
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<td>11</td>
<td>11</td>
<td>45</td>
<td>2,090</td>
</tr>
<tr>
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<td>5</td>
<td>23</td>
<td>1,530</td>
</tr>
<tr>
<td>72-h</td>
<td>590</td>
<td>94</td>
<td>3</td>
<td>2</td>
<td>14</td>
<td>1,740</td>
</tr>
<tr>
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<td>90</td>
<td>8</td>
<td>4</td>
<td>15</td>
<td>1,410</td>
</tr>
<tr>
<td>120-h</td>
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<td>6</td>
<td>3</td>
<td>11</td>
<td>1,440</td>
</tr>
<tr>
<td>144-h</td>
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<td>4</td>
<td>2</td>
<td>8</td>
<td>1,160</td>
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<tr>
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<td>3</td>
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<tr>
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<td>54</td>
<td>4</td>
<td>3</td>
<td>9</td>
<td>1,430</td>
</tr>
<tr>
<td>216a-h</td>
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<td>2</td>
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<td>3</td>
<td>2</td>
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<td>1,480</td>
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<td>40</td>
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<td>2</td>
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</table>
Table H-09. Concentrations of SigmaVOC (i.e., sum of six target VOCs) for large-scale Experiments P-1 through P-4.

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<th>Chamber Concentration, µg m⁻³</th>
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</tr>
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</tr>
<tr>
<td>3a-h</td>
<td>20,000</td>
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<tr>
<td>3b-h</td>
<td>---</td>
</tr>
<tr>
<td>6-h</td>
<td>13,100</td>
</tr>
<tr>
<td>24-h</td>
<td>4,890</td>
</tr>
<tr>
<td>48-h</td>
<td>4,040</td>
</tr>
<tr>
<td>72-h</td>
<td>4,340</td>
</tr>
<tr>
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</tr>
<tr>
<td>120a-h</td>
<td>2,490</td>
</tr>
<tr>
<td>120b-h</td>
<td>---</td>
</tr>
<tr>
<td>144-h</td>
<td>1,980</td>
</tr>
<tr>
<td>168a-h</td>
<td>1,980</td>
</tr>
<tr>
<td>168b-h</td>
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</tr>
<tr>
<td>192-h</td>
<td>1,970</td>
</tr>
<tr>
<td>216a-h</td>
<td>1,700</td>
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<td>216b-h</td>
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<tr>
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<tr>
<td>240b-h</td>
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</tr>
<tr>
<td>336b-h</td>
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*Concentration of Texanol for this sample was estimated as the average of the concentrations for the immediately preceding and subsequent samples.

**md = Missing data; Experiment P-4 was terminated at 240-h elapsed time.
Table H-10. Concentrations of formaldehyde for large-scale Experiments P-1 through P-4.

<table>
<thead>
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<th>Sample ID</th>
<th>Exp P-1</th>
<th>Exp P-2</th>
<th>Exp P-3</th>
<th>Exp P-4</th>
</tr>
</thead>
<tbody>
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<td>1.3 ± 1.2</td>
<td>&lt;1.0</td>
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<td>1.1</td>
<td>7.0</td>
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<td>25.6</td>
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</tr>
<tr>
<td>3-h</td>
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<td>14.0</td>
<td>10.4</td>
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<td>23.0</td>
<td>9.7</td>
<td>9.5</td>
</tr>
<tr>
<td>24-h</td>
<td>11.0</td>
<td>md**</td>
<td>2.9</td>
<td>7.6</td>
</tr>
<tr>
<td>48-h</td>
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<td>11.2</td>
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<tr>
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<tr>
<td>96-h</td>
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<td>11.4</td>
<td>7.6</td>
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<td>3.1</td>
<td>10.9</td>
<td>6.2</td>
</tr>
<tr>
<td>144-h</td>
<td>5.4</td>
<td>3.2</td>
<td>10.9</td>
<td>5.5</td>
</tr>
<tr>
<td>168-h</td>
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<td>7.9</td>
<td>10.3</td>
<td>7.7</td>
</tr>
<tr>
<td>192-h</td>
<td>6.6</td>
<td>5.1</td>
<td>10.0</td>
<td>5.8</td>
</tr>
<tr>
<td>216-h</td>
<td>7.0</td>
<td>7.5</td>
<td>10.0</td>
<td>7.5</td>
</tr>
<tr>
<td>240-h</td>
<td>4.6</td>
<td>8.4</td>
<td>9.4</td>
<td>6.0</td>
</tr>
<tr>
<td>336-h</td>
<td>8.1</td>
<td>7.0</td>
<td>4.4</td>
<td>md</td>
</tr>
</tbody>
</table>

*Average ± 1 standard deviation.  
**md = Missing data or invalid data; Experiment P-4 was terminated at 240-h elapsed time.
Table H-11. Concentrations of acetaldehyde for large-scale Experiments P-1 through P-4.

<table>
<thead>
<tr>
<th>Sample ID</th>
<th>Exp P-1</th>
<th>Exp P-2</th>
<th>Exp P-3</th>
<th>Exp P-4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Avg. Inlet*</td>
<td>6.8 ± 5.3</td>
<td>3.0 ± 4.5</td>
<td>&lt;1.0</td>
<td>1.0 ± 0.7</td>
</tr>
<tr>
<td>Background</td>
<td>6.8</td>
<td>2.3</td>
<td>8.3</td>
<td>8.3</td>
</tr>
<tr>
<td>1-h</td>
<td>1,250</td>
<td>1,440</td>
<td>133</td>
<td>110</td>
</tr>
<tr>
<td>3-h</td>
<td>141</td>
<td>147</td>
<td>21.1</td>
<td>17.6</td>
</tr>
<tr>
<td>6-h</td>
<td>73.4</td>
<td>69.9</td>
<td>13.6</td>
<td>12.4</td>
</tr>
<tr>
<td>24-h</td>
<td>26.6</td>
<td>md**</td>
<td>3.3</td>
<td>6.0</td>
</tr>
<tr>
<td>48-h</td>
<td>27.2</td>
<td>15.8</td>
<td>2.3</td>
<td>4.7</td>
</tr>
<tr>
<td>72-h</td>
<td>26.0</td>
<td>12.9</td>
<td>2.1</td>
<td>4.7</td>
</tr>
<tr>
<td>96-h</td>
<td>18.2</td>
<td>12.0</td>
<td>12.8</td>
<td>11.5</td>
</tr>
<tr>
<td>120-h</td>
<td>20.2</td>
<td>11.9</td>
<td>13.4</td>
<td>8.3</td>
</tr>
<tr>
<td>144-h</td>
<td>15.6</td>
<td>9.9</td>
<td>11.6</td>
<td>8.5</td>
</tr>
<tr>
<td>168-h</td>
<td>15.7</td>
<td>12.8</td>
<td>12.3</td>
<td>10.2</td>
</tr>
<tr>
<td>192-h</td>
<td>12.8</td>
<td>16.6</td>
<td>11.5</td>
<td>9.0</td>
</tr>
<tr>
<td>216-h</td>
<td>9.0</td>
<td>12.6</td>
<td>11.5</td>
<td>7.9</td>
</tr>
<tr>
<td>240-h</td>
<td>6.7</td>
<td>12.1</td>
<td>9.3</td>
<td>8.3</td>
</tr>
<tr>
<td>336-h</td>
<td>16.3</td>
<td>10.6</td>
<td>7.3</td>
<td>md</td>
</tr>
</tbody>
</table>

*Average ± 1 standard deviation.
**md = Missing data or invalid data; Experiment P-4 was terminated at 240-h elapsed time.
**Table H-12.** Quasi steady-state specific emission rates (mg m\(^{-2}\) h\(^{-1}\)) of target VOCs for large-scale Experiment P-1.

<table>
<thead>
<tr>
<th>Sample ID</th>
<th>EG</th>
<th>PG</th>
<th>Butyl ether</th>
<th>Ethylhexanol</th>
<th>DEGBE</th>
<th>Texanol</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-h</td>
<td>11.6</td>
<td>2.68</td>
<td>1.69</td>
<td>0.510</td>
<td>0.191</td>
<td>12.3</td>
</tr>
<tr>
<td>3-h</td>
<td>11.4</td>
<td>1.86</td>
<td>0.220</td>
<td>0.092</td>
<td>0.073</td>
<td>2.30</td>
</tr>
<tr>
<td>6-h</td>
<td>6.42</td>
<td>0.851</td>
<td>0.171</td>
<td>0.079</td>
<td>0.051</td>
<td>2.83</td>
</tr>
<tr>
<td>24-h</td>
<td>1.12</td>
<td>0.246</td>
<td>0.039</td>
<td>0.024</td>
<td>0.0256</td>
<td>2.45</td>
</tr>
<tr>
<td>48-h</td>
<td>0.907</td>
<td>0.151</td>
<td>0.021</td>
<td>0.012</td>
<td>0.022</td>
<td>2.11</td>
</tr>
<tr>
<td>72-h</td>
<td>0.915</td>
<td>0.118</td>
<td>0.013</td>
<td>0.007</td>
<td>0.012</td>
<td>2.39</td>
</tr>
<tr>
<td>96-h</td>
<td>0.563</td>
<td>0.077</td>
<td>0.009</td>
<td>0.005</td>
<td>0.012</td>
<td>1.92</td>
</tr>
<tr>
<td>120-h</td>
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<td>0.029</td>
<td>0.007</td>
<td>0.004</td>
<td>0.008</td>
<td>1.54</td>
</tr>
<tr>
<td>144-h</td>
<td>0.195</td>
<td>0.032</td>
<td>0.005</td>
<td>0.002</td>
<td>0.005</td>
<td>1.34</td>
</tr>
<tr>
<td>168-h</td>
<td>0.238</td>
<td>0.021</td>
<td>0.004</td>
<td>0.002</td>
<td>0.005</td>
<td>1.31</td>
</tr>
<tr>
<td>192-h</td>
<td>0.298</td>
<td>0.022</td>
<td>0.003</td>
<td>0.002</td>
<td>0.004</td>
<td>1.24</td>
</tr>
<tr>
<td>216-h</td>
<td>0.234</td>
<td>0.025</td>
<td>0.003</td>
<td>0.002</td>
<td>0.004</td>
<td>1.08</td>
</tr>
<tr>
<td>240-h</td>
<td>0.168</td>
<td>0.021</td>
<td>0.003</td>
<td>0.002</td>
<td>0.003</td>
<td>0.911</td>
</tr>
<tr>
<td>336-h</td>
<td>0.252</td>
<td>0.034</td>
<td>0.002</td>
<td>0.001</td>
<td>0.004</td>
<td>1.22</td>
</tr>
</tbody>
</table>
Table H-13. Quasi steady-state specific emission rates (mg m\(^{-2}\) h\(^{-1}\)) of target VOCs for large-scale Experiment P-2.

<table>
<thead>
<tr>
<th>Sample ID</th>
<th>EG</th>
<th>PG</th>
<th>Butyl ether</th>
<th>Ethylhexanol</th>
<th>DEGBE</th>
<th>Texanol</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-h</td>
<td>51.5</td>
<td>12.8</td>
<td>1.77</td>
<td>0.538</td>
<td>0.269</td>
<td>10.6</td>
</tr>
<tr>
<td>3-h</td>
<td>15.6</td>
<td>2.98</td>
<td>0.211</td>
<td>0.086</td>
<td>0.086</td>
<td>3.70</td>
</tr>
<tr>
<td>6-h</td>
<td>8.40</td>
<td>1.80</td>
<td>0.181</td>
<td>0.072</td>
<td>0.065</td>
<td>3.17</td>
</tr>
<tr>
<td>24-h</td>
<td>2.52</td>
<td>0.603</td>
<td>0.039</td>
<td>0.030</td>
<td>0.048</td>
<td>2.12</td>
</tr>
<tr>
<td>48-h</td>
<td>1.26</td>
<td>0.290</td>
<td>0.019</td>
<td>0.014</td>
<td>0.033</td>
<td>2.53</td>
</tr>
<tr>
<td>72-h</td>
<td>0.618</td>
<td>0.091</td>
<td>0.011</td>
<td>0.006</td>
<td>0.016</td>
<td>2.30</td>
</tr>
<tr>
<td>96-h</td>
<td>0.551</td>
<td>0.071</td>
<td>0.006</td>
<td>0.004</td>
<td>0.013</td>
<td>1.88*</td>
</tr>
<tr>
<td>120-h</td>
<td>0.272</td>
<td>0.033</td>
<td>0.004</td>
<td>0.003</td>
<td>0.008</td>
<td>1.51</td>
</tr>
<tr>
<td>144-h</td>
<td>0.290</td>
<td>0.039</td>
<td>0.003</td>
<td>0.003</td>
<td>0.008</td>
<td>1.33</td>
</tr>
<tr>
<td>168-h</td>
<td>0.550</td>
<td>0.066</td>
<td>0.004</td>
<td>0.002</td>
<td>0.010</td>
<td>1.50</td>
</tr>
<tr>
<td>192-h</td>
<td>0.498</td>
<td>0.046</td>
<td>0.004</td>
<td>0.002</td>
<td>0.008</td>
<td>1.27</td>
</tr>
<tr>
<td>216-h</td>
<td>0.459</td>
<td>0.042</td>
<td>0.005</td>
<td>0.003</td>
<td>0.008</td>
<td>1.18</td>
</tr>
<tr>
<td>240-h</td>
<td>0.428</td>
<td>0.036</td>
<td>0.004</td>
<td>0.002</td>
<td>0.006</td>
<td>1.03</td>
</tr>
<tr>
<td>336-h</td>
<td>0.230</td>
<td>0.022</td>
<td>0.002</td>
<td>0.002</td>
<td>0.003</td>
<td>0.928</td>
</tr>
</tbody>
</table>

*Concentration of Texanol used in the calculation for this sample was estimated as the average of the concentrations for the immediately preceding and subsequent samples.
Table H-14. Quasi steady-state specific emission rates (mg m\(^{-2}\) h\(^{-1}\)) of target VOCs for large-scale Experiment P-3.

<table>
<thead>
<tr>
<th>Sample ID</th>
<th>EG</th>
<th>PG</th>
<th>Butyl ether</th>
<th>Ethyl-hexanol</th>
<th>DEGBE</th>
<th>Texanol</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-h</td>
<td>126.1</td>
<td>35.5</td>
<td>0.843</td>
<td>0.583</td>
<td>0.908</td>
<td>42.6</td>
</tr>
<tr>
<td>3-h</td>
<td>43.0</td>
<td>9.12</td>
<td>0.280</td>
<td>0.162</td>
<td>0.298</td>
<td>13.4</td>
</tr>
<tr>
<td>6-h</td>
<td>24.6</td>
<td>5.93</td>
<td>0.184</td>
<td>0.119</td>
<td>0.263</td>
<td>11.2</td>
</tr>
<tr>
<td>24-h</td>
<td>4.32</td>
<td>0.882</td>
<td>0.026</td>
<td>0.040</td>
<td>0.105</td>
<td>8.34</td>
</tr>
<tr>
<td>48-h</td>
<td>1.98</td>
<td>0.381</td>
<td>0.010</td>
<td>0.012</td>
<td>0.054</td>
<td>4.22</td>
</tr>
<tr>
<td>72-h</td>
<td>1.62</td>
<td>0.259</td>
<td>0.008</td>
<td>0.008</td>
<td>0.038</td>
<td>3.79</td>
</tr>
<tr>
<td>96-h</td>
<td>0.596</td>
<td>0.132</td>
<td>0.007</td>
<td>0.004</td>
<td>0.013</td>
<td>1.46</td>
</tr>
<tr>
<td>120-h</td>
<td>0.607</td>
<td>0.105</td>
<td>0.008</td>
<td>0.003</td>
<td>0.014</td>
<td>1.52</td>
</tr>
<tr>
<td>144-h</td>
<td>0.500</td>
<td>0.081</td>
<td>0.007</td>
<td>0.002</td>
<td>0.011</td>
<td>1.50</td>
</tr>
<tr>
<td>168-h</td>
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<td>0.007</td>
<td>0.002</td>
<td>0.010</td>
<td>1.52</td>
</tr>
<tr>
<td>192-h</td>
<td>0.414</td>
<td>0.057</td>
<td>0.006</td>
<td>0.002</td>
<td>0.007</td>
<td>1.33</td>
</tr>
<tr>
<td>216-h</td>
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<td>0.008</td>
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</tr>
<tr>
<td>240-h</td>
<td>0.261</td>
<td>0.033</td>
<td>0.004</td>
<td>&lt;0.001</td>
<td>0.006</td>
<td>1.24</td>
</tr>
<tr>
<td>336-h</td>
<td>0.159</td>
<td>&lt;0.008</td>
<td>0.002</td>
<td>&lt;0.001</td>
<td>0.003</td>
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</table>
Table H-15. Quasi steady-state specific emission rates (mg m\(^{-2}\) h\(^{-1}\)) of target VOCs for large-scale Experiment P-4. Experiment was terminated at 240-h elapsed time.

<table>
<thead>
<tr>
<th>Sample ID</th>
<th>EG</th>
<th>PG</th>
<th>Butyl ether</th>
<th>Ethylhexanol</th>
<th>DEGBE</th>
<th>Texanol</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-h</td>
<td>62.4</td>
<td>24.1</td>
<td>0.703</td>
<td>0.461</td>
<td>0.703</td>
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</tr>
<tr>
<td>3-h</td>
<td>30.2</td>
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<td>0.127</td>
<td>0.317</td>
<td>10.2</td>
</tr>
<tr>
<td>6-h</td>
<td>15.6</td>
<td>4.47</td>
<td>0.158</td>
<td>0.098</td>
<td>0.230</td>
<td>10.6</td>
</tr>
<tr>
<td>24-h</td>
<td>5.24</td>
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<td>0.029</td>
<td>0.134</td>
<td>6.22</td>
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<td>0.011</td>
<td>0.069</td>
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<tr>
<td>72-h</td>
<td>1.76</td>
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<td>0.004</td>
<td>0.041</td>
<td>5.17</td>
</tr>
<tr>
<td>96-h</td>
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<td>0.006</td>
<td>0.002</td>
<td>0.012</td>
<td>1.12</td>
</tr>
<tr>
<td>120-h</td>
<td>0.329</td>
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<td>0.005</td>
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<td>1.14</td>
</tr>
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<td>0.001</td>
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<td>0.919</td>
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<td>192-h</td>
<td>0.272</td>
<td>0.043</td>
<td>0.003</td>
<td>0.001</td>
<td>0.007</td>
<td>1.13</td>
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<td>0.001</td>
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<td>0.002</td>
<td>0.001</td>
<td>0.005</td>
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<td>Exp P-4</td>
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<td>---------</td>
<td>---------</td>
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<td>---------</td>
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<td></td>
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<td>1.83</td>
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<td>1.54</td>
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<td></td>
</tr>
<tr>
<td>144-h</td>
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<td>1.67</td>
<td>2.10</td>
<td>1.23</td>
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<td></td>
</tr>
<tr>
<td>168-h</td>
<td>1.58</td>
<td>2.13</td>
<td>2.10</td>
<td>1.52</td>
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<tr>
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<td>1.83</td>
<td>1.82</td>
<td>1.46</td>
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<td></td>
</tr>
<tr>
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<td>1.70</td>
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<td>1.31</td>
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</tr>
<tr>
<td>240-h</td>
<td>1.11</td>
<td>1.51</td>
<td>1.55</td>
<td>1.43</td>
<td></td>
<td></td>
</tr>
<tr>
<td>336-h</td>
<td>1.51</td>
<td>1.18</td>
<td>1.27</td>
<td>md*</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*md = Missing data; Experiment P-4 was terminated at 240-h elapsed time.
Table H-17. Quasi steady-state specific emission rates of formaldehyde for large-scale Experiments P-1 through P-4.

<table>
<thead>
<tr>
<th>Sample ID</th>
<th>Exp P-1</th>
<th>Exp P-2</th>
<th>Exp P-3</th>
<th>Exp P-4</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-h</td>
<td>121</td>
<td>328</td>
<td>148</td>
<td>103</td>
</tr>
<tr>
<td>3-h</td>
<td>12.9</td>
<td>49.1</td>
<td>22.4</td>
<td>13.6</td>
</tr>
<tr>
<td>6-h</td>
<td>10.1</td>
<td>17.4</td>
<td>8.6</td>
<td>11.0</td>
</tr>
<tr>
<td>24-h</td>
<td>5.0</td>
<td>12.7*</td>
<td>&lt;6.4</td>
<td>&lt;6.4</td>
</tr>
<tr>
<td>48-h</td>
<td>3.6</td>
<td>8.0</td>
<td>&lt;6.4</td>
<td>&lt;6.4</td>
</tr>
<tr>
<td>72-h</td>
<td>3.3</td>
<td>7.3</td>
<td>&lt;6.4</td>
<td>&lt;6.4</td>
</tr>
<tr>
<td>96-h</td>
<td>&lt;1.6</td>
<td>5.0</td>
<td>3.6</td>
<td>&lt;1.6</td>
</tr>
<tr>
<td>120-h</td>
<td>1.6</td>
<td>1.6</td>
<td>3.1</td>
<td>&lt;1.6</td>
</tr>
<tr>
<td>144-h</td>
<td>&lt;1.6</td>
<td>1.6</td>
<td>3.1</td>
<td>&lt;1.6</td>
</tr>
<tr>
<td>168-h</td>
<td>&lt;1.6</td>
<td>5.4</td>
<td>2.7</td>
<td>&lt;1.6</td>
</tr>
<tr>
<td>192-h</td>
<td>&lt;1.6</td>
<td>3.2</td>
<td>2.4</td>
<td>&lt;1.6</td>
</tr>
<tr>
<td>216-h</td>
<td>1.7</td>
<td>5.1</td>
<td>2.4</td>
<td>&lt;1.6</td>
</tr>
<tr>
<td>240-h</td>
<td>&lt;1.6</td>
<td>5.8</td>
<td>1.9</td>
<td>&lt;1.6</td>
</tr>
<tr>
<td>336-h</td>
<td>2.6</td>
<td>4.6</td>
<td>&lt;1.6</td>
<td>md**</td>
</tr>
</tbody>
</table>

*Concentration of formaldehyde for this sample was estimated as the average of the concentrations for the immediately preceding and subsequent samples.

**md = Missing data; Experiment P-4 was terminated at 240-h elapsed time.
Table H-18. Quasi steady-state specific emission rates of acetaldehyde for large-scale Experiments P-1 through P-4.

<table>
<thead>
<tr>
<th>Sample ID</th>
<th>Exp P-1</th>
<th>Exp P-2</th>
<th>Exp P-3</th>
<th>Exp P-4</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-h</td>
<td>3,970</td>
<td>4,580</td>
<td>997</td>
<td>812</td>
</tr>
<tr>
<td>3-h</td>
<td>107</td>
<td>114</td>
<td>40.6</td>
<td>29.6</td>
</tr>
<tr>
<td>6-h</td>
<td>53.0</td>
<td>53.3</td>
<td>16.8</td>
<td>12.9</td>
</tr>
<tr>
<td>24-h</td>
<td>15.7</td>
<td>31.8*</td>
<td>&lt;6.4</td>
<td>&lt;6.4</td>
</tr>
<tr>
<td>48-h</td>
<td>16.3</td>
<td>10.2</td>
<td>&lt;6.4</td>
<td>&lt;6.4</td>
</tr>
<tr>
<td>72-h</td>
<td>15.3</td>
<td>7.9</td>
<td>&lt;6.4</td>
<td>&lt;6.4</td>
</tr>
<tr>
<td>96-h</td>
<td>9.1</td>
<td>7.2</td>
<td>3.6</td>
<td>2.5</td>
</tr>
<tr>
<td>120-h</td>
<td>10.6</td>
<td>7.1</td>
<td>4.0</td>
<td>&lt;1.6</td>
</tr>
<tr>
<td>144-h</td>
<td>7.0</td>
<td>5.5</td>
<td>2.6</td>
<td>&lt;1.6</td>
</tr>
<tr>
<td>168-h</td>
<td>7.1</td>
<td>7.8</td>
<td>3.1</td>
<td>&lt;1.6</td>
</tr>
<tr>
<td>192-h</td>
<td>4.8</td>
<td>10.8</td>
<td>2.5</td>
<td>&lt;1.6</td>
</tr>
<tr>
<td>216-h</td>
<td>1.8</td>
<td>7.7</td>
<td>2.5</td>
<td>&lt;1.6</td>
</tr>
<tr>
<td>240-h</td>
<td>&lt;1.6</td>
<td>7.2</td>
<td>&lt;1.6</td>
<td>&lt;1.6</td>
</tr>
<tr>
<td>336-h</td>
<td>7.6</td>
<td>6.0</td>
<td>&lt;1.6</td>
<td>md**</td>
</tr>
</tbody>
</table>

*Concentration of acetaldehyde for this sample was estimated as the average of the concentrations for the immediately preceding and subsequent samples.

**md = Missing data; Experiment P-4 was terminated at 240-h elapsed time.
Table H-19. Cumulative masses (milligrams) of target compounds and SigmaVOC emitted over 0 - 240 and 0 - 336 hours in large-scale Experiments P-1 through P-4.

<table>
<thead>
<tr>
<th>Compound</th>
<th>Exp P-1</th>
<th>Cumulative Mass, mg</th>
<th>Exp P-2</th>
<th>Exp P-3</th>
<th>Exp P-4*</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>0 - 240 Hour Period</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Formaldehyde</td>
<td>&lt;13</td>
<td>35</td>
<td>&lt;18</td>
<td>&lt;11</td>
<td></td>
</tr>
<tr>
<td>Acetaldehyde</td>
<td>173</td>
<td>197</td>
<td>&lt;47</td>
<td>&lt;35</td>
<td></td>
</tr>
<tr>
<td>Ethylene glycol</td>
<td>3,750</td>
<td>6,340</td>
<td>13,900</td>
<td>10,000</td>
<td></td>
</tr>
<tr>
<td>Propylene glycol</td>
<td>572</td>
<td>1,300</td>
<td>3,240</td>
<td>2,620</td>
<td></td>
</tr>
<tr>
<td>n-Butyl ether</td>
<td>131</td>
<td>130</td>
<td>102</td>
<td>88</td>
<td></td>
</tr>
<tr>
<td>2-Ethyl-1-hexanol</td>
<td>55</td>
<td>58</td>
<td>71</td>
<td>55</td>
<td></td>
</tr>
<tr>
<td>2-(2-Butoxyethoxy)ethanol</td>
<td>54</td>
<td>80</td>
<td>182</td>
<td>181</td>
<td></td>
</tr>
<tr>
<td>2,2,4-Trimethyl-1,3-pentanediol monoisobutyrate(Texanol)</td>
<td>6,930</td>
<td>7,130</td>
<td>13,200</td>
<td>11,800</td>
<td></td>
</tr>
<tr>
<td>SigmaVOC**</td>
<td>11,500</td>
<td>15,000</td>
<td>30,700</td>
<td>24,800</td>
<td></td>
</tr>
<tr>
<td><strong>0 - 336 Hour Period</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Formaldehyde</td>
<td>&lt;16</td>
<td>43</td>
<td>&lt;20</td>
<td>---</td>
<td></td>
</tr>
<tr>
<td>Acetaldehyde</td>
<td>180</td>
<td>207</td>
<td>&lt;48</td>
<td>---</td>
<td></td>
</tr>
<tr>
<td>Ethylene glycol</td>
<td>4,080</td>
<td>6,840</td>
<td>14,200</td>
<td>---</td>
<td></td>
</tr>
<tr>
<td>Propylene glycol</td>
<td>614</td>
<td>1,350</td>
<td>3,260</td>
<td>---</td>
<td></td>
</tr>
<tr>
<td>n-Butyl ether</td>
<td>134</td>
<td>136</td>
<td>107</td>
<td>---</td>
<td></td>
</tr>
<tr>
<td>2-Ethyl-1-hexanol</td>
<td>57</td>
<td>62</td>
<td>71</td>
<td>---</td>
<td></td>
</tr>
<tr>
<td>2-(2-Butoxyethoxy)ethanol</td>
<td>59</td>
<td>88</td>
<td>189</td>
<td>---</td>
<td></td>
</tr>
<tr>
<td>2,2,4-Trimethyl-1,3-pentanediol monoisobutyrate(Texanol)</td>
<td>8,570</td>
<td>8,630</td>
<td>15,000</td>
<td>---</td>
<td></td>
</tr>
<tr>
<td>SigmaVOC**</td>
<td>13,500</td>
<td>17,100</td>
<td>32,900</td>
<td>---</td>
<td></td>
</tr>
</tbody>
</table>

*Experiment P-4 was terminated at 240-h elapsed time.
**SigmaVOC includes all target compounds except formaldehyde and acetaldehyde.
### Table H-20. Maximum exposure concentrations (ppb) of target compounds during the first 48 hours of large-scale Experiments P-1 through P-4.

<table>
<thead>
<tr>
<th>Compound</th>
<th>Maximum Concentration, ppb</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Exp P-1</td>
</tr>
<tr>
<td>Formaldehyde</td>
<td>35</td>
</tr>
<tr>
<td>Acetaldehyde</td>
<td>696</td>
</tr>
<tr>
<td>Ethylene glycol</td>
<td>5,650</td>
</tr>
<tr>
<td>Propylene glycol</td>
<td>752</td>
</tr>
<tr>
<td>n-Butyl ether</td>
<td>100</td>
</tr>
<tr>
<td>2-Ethyl-1-hexanol</td>
<td>30</td>
</tr>
<tr>
<td>2-(2-Butoxyethoxy)ethanol</td>
<td>14</td>
</tr>
<tr>
<td>2,2,4-Trimethyl-1,3-pentanediol monisobutyrates (Texanol)</td>
<td>438</td>
</tr>
</tbody>
</table>

### Table H-21. Cumulative exposures (ppm-hour) to target compounds during the first 48 hours of large-scale Experiments P-1 through P-4. Estimates assume 20 hours of occupancy per day.

<table>
<thead>
<tr>
<th>Compound</th>
<th>Cumulative Exposure, ppm-hour</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Exp P-1</td>
</tr>
<tr>
<td>Formaldehyde</td>
<td>0.44</td>
</tr>
<tr>
<td>Acetaldehyde</td>
<td>1.80</td>
</tr>
<tr>
<td>Ethylene glycol</td>
<td>55.5</td>
</tr>
<tr>
<td>Propylene glycol</td>
<td>7.26</td>
</tr>
<tr>
<td>n-Butyl ether</td>
<td>0.80</td>
</tr>
<tr>
<td>2-Ethyl-1-hexanol</td>
<td>0.37</td>
</tr>
<tr>
<td>2-(2-Butoxyethoxy)ethanol</td>
<td>0.25</td>
</tr>
<tr>
<td>2,2,4-Trimethyl-1,3-pentanediol monisobutyrates (Texanol)</td>
<td>13.8</td>
</tr>
</tbody>
</table>

365
Table H-22. Cumulative exposures (ppm-hour) to target compounds over 48 - 240 and 48 - 336 hours in large-scale Experiments P-1 through P-4. Estimates assume 20 hours of occupancy per day.

<table>
<thead>
<tr>
<th>Compound</th>
<th>48 - 240 Hour Period</th>
<th>48 - 336 Hour Period</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Exp P-1</td>
<td>Exp P-2</td>
</tr>
<tr>
<td>Formaldehyde</td>
<td>&lt;0.31</td>
<td>0.73</td>
</tr>
<tr>
<td>Acetaldehyde</td>
<td>0.89</td>
<td>0.87</td>
</tr>
<tr>
<td>Ethylene glycol</td>
<td>33.5</td>
<td>40.4</td>
</tr>
<tr>
<td>Propylene glycol</td>
<td>3.31</td>
<td>4.45</td>
</tr>
<tr>
<td>n-Butyl ether</td>
<td>0.27</td>
<td>0.23</td>
</tr>
<tr>
<td>2-Ethyl-1-hexanol</td>
<td>0.14</td>
<td>0.15</td>
</tr>
<tr>
<td>2-(2-Butoxyethoxy)ethanol</td>
<td>0.24</td>
<td>0.35</td>
</tr>
<tr>
<td>2,2,4-Trimethyl-1,3-pentanediol monoisobutyrate (Texanol)</td>
<td>35.1</td>
<td>36.3</td>
</tr>
</tbody>
</table>

*Experiment P-4 was terminated at 240-h elapsed time.
APPENDIX I

EXPOSURE REDUCTION EXPERIMENTS WITH THE CARPET ASSEMBLY

Appendix I presents the analytical data for the three large-scale exposure reduction experiments with the carpet assembly. The experiments were conducted in 25.5 m$^3$ chamber compartments over a period of 336 hours. The 10.4-m$^2$ floor area was carpeted with Carpet Cushion CC4 and Carpet CP4. The concentrations of selected compounds and TVOC were measured throughout the experiments. Specific emission rates of these components were calculated. Cumulative mass emissions and cumulative exposures were estimated.

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Table I-01. Summary of environmental parameters for large-scale Experiments C-1 through C-3 with carpet materials.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>C-1</th>
<th>C-2</th>
<th>C-3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Starting date</td>
<td>3/17/97</td>
<td>4/29/97</td>
<td>6/02/97</td>
</tr>
<tr>
<td>Treatment</td>
<td>Base case</td>
<td>Add ventilation</td>
<td>Air out CP, CC</td>
</tr>
<tr>
<td>Ventilation rate, 2 - 72 h (h⁻¹)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average ± 1 std. dev.</td>
<td>0.50 ± 0.01*</td>
<td>1.91 ± 0.01†</td>
<td>0.50 ± 0.01*</td>
</tr>
<tr>
<td>Range</td>
<td>0.49 - 0.51</td>
<td>1.87 - 1.94</td>
<td>0.49 - 0.50</td>
</tr>
<tr>
<td>Ventilation rate, 72 - 336 h (h⁻¹)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average ± 1 std. dev.</td>
<td>0.50 ± 0.01</td>
<td>0.49 ± 0.01</td>
<td>0.50 ± 0.01</td>
</tr>
<tr>
<td>Range</td>
<td>0.49 - 0.50</td>
<td>0.48 - 0.49</td>
<td>0.49 - 0.50</td>
</tr>
<tr>
<td>Temperature (°C), 2 - 336 h (h⁻¹)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average ± 1 std. dev.</td>
<td>23.9 ± 1.1</td>
<td>23.3 ± 1.3</td>
<td>23.6 ± 1.1</td>
</tr>
<tr>
<td>Range</td>
<td>22.1 - 26.6</td>
<td>19.3 - 26.0</td>
<td>21.5 - 25.7</td>
</tr>
<tr>
<td>Relative Humidity (%), 2 - 336 h (h⁻¹)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average ± 1 std. dev.</td>
<td>50 ± 7</td>
<td>51 ± 4</td>
<td>53 ± 4</td>
</tr>
<tr>
<td>Range</td>
<td>34 - 61</td>
<td>38 - 59</td>
<td>47 - 61</td>
</tr>
</tbody>
</table>

*Ventilation rate for 0 - 2 hours was 2 h⁻¹.
†Ventilation rate for 0 - 2 hours was 5 h⁻¹.
Table I-02. Carpet materials and quantities used in large-scale Experiments C-1 through C-3. See Appendix D, Table D-01, for complete material descriptions.

<table>
<thead>
<tr>
<th>Material Description</th>
<th>Material ID</th>
<th>Unit of Measure</th>
<th>Exp C-1</th>
<th>Exp C-2</th>
<th>Exp C-3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Commercial olefin carpet*</td>
<td>CP4</td>
<td>m²</td>
<td>10.4</td>
<td>10.4</td>
<td>10.4</td>
</tr>
<tr>
<td>Bonded urethane carpet</td>
<td>CC4</td>
<td>m²</td>
<td>9.43</td>
<td>9.43</td>
<td>9.43</td>
</tr>
<tr>
<td>cushion</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Thermal seam tape</td>
<td>ST</td>
<td>m</td>
<td>4.57</td>
<td>4.57</td>
<td>4.57</td>
</tr>
</tbody>
</table>

*Area of carpet was used in specific emission rate calculations.
Table I-03. VOCs emitted by carpet assembly in large-scale Experiment C-1 at 24- and 240-hours elapsed times.

<table>
<thead>
<tr>
<th>COMPOUND</th>
<th>Code*</th>
<th>RT (min)</th>
<th>24-h ET</th>
<th>240-h ET</th>
<th>Match Quality</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Alkane Hydrocarbons</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>n-Octane</td>
<td></td>
<td>12.2</td>
<td>+</td>
<td></td>
<td>Confirmed</td>
</tr>
<tr>
<td>n-Nonane</td>
<td></td>
<td>14.0</td>
<td>+</td>
<td></td>
<td>Confirmed</td>
</tr>
<tr>
<td>Branched alkane HC</td>
<td></td>
<td>20.3</td>
<td>+</td>
<td></td>
<td>Probable</td>
</tr>
<tr>
<td>Branched alkane HC</td>
<td></td>
<td>21.0</td>
<td>+</td>
<td>+</td>
<td>Probable</td>
</tr>
<tr>
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<tr>
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<tr>
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<td>Probable</td>
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Table I-03, Continued. VOCs emitted by carpet assembly in large-scale Experiment C-1 at 24- and 240-hours elapsed times.

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<th>COMPOUND</th>
<th>Code*</th>
<th>RT (min)</th>
<th>24-h ET</th>
<th>240-h ET</th>
<th>Match Quality</th>
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<td>+</td>
<td>+</td>
<td>Probable</td>
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<td>1,2-Dichlorobenzene</td>
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<td>2-Furancarboxaldehyde</td>
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<td>Di(propylene glycol)methyl ether, isomer 1</td>
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<td>1-Decanol</td>
<td>Q</td>
<td>31.8</td>
<td>+</td>
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<td>B</td>
<td>35.4</td>
<td>+</td>
<td>+</td>
<td>Confirmed</td>
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</table>
Table I-03, Continued. VOCs emitted by carpet assembly in large-scale Experiment C-1 at 24- and 240-hours elapsed times.

<table>
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<tr>
<th>COMPOUND</th>
<th>Code*</th>
<th>RT (min)</th>
<th>24-h ET</th>
<th>240-h ET</th>
<th>Match Quality</th>
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</table>

*T = Toxic air contaminant; A = Abundant compound; B = Component of chamber background; Q = Quantified target compound.
Table I-04. Target compounds quantified in large-scale Experiments C-1 through C-3. Toxic Air Contaminant (TAC) Category for June 1996 is indicated where applicable.

<table>
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<th>Compound</th>
<th>TAC Cat.</th>
<th>Group</th>
<th>Abbrev.</th>
<th>Sources</th>
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<td>Styrene</td>
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<td>4-PCH</td>
<td>CP4</td>
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<td>Other Hydrocarbons</td>
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</tr>
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<td>Other Oxidized Cmpds</td>
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<td>MeGlutN</td>
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Table 1-05. Concentrations of Group 1 target VOCs for large-scale Experiment C-1.

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Table I-10. Concentrations of Group 2 target VOCs for large-scale Experiment C-3.

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<th>AIBN</th>
<th>MEGlutN</th>
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Table I-11. Concentrations of TVOC for large-scale Experiments C-1 through C-3.

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<tr>
<td>Background</td>
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<td>1-h</td>
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<td>24-h</td>
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<tr>
<td>48a-h</td>
<td>781</td>
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<tr>
<td>48b-h</td>
<td>812</td>
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<tr>
<td>72-h</td>
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*Average ± 1 standard deviation.*
Table I-12. Concentrations of SigmaVOC (i.e., sum of 13 target VOCs) for large-scale Experiments C-1 through C-3.

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<th>Exp C-3</th>
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<td>&lt;24</td>
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<td>&lt;24</td>
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<td>87</td>
<td>&lt;24</td>
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Table I-13. Concentrations of formaldehyde and acetaldehyde for large-scale Experiment C-1. Formaldehyde and acetaldehyde were not measured for Experiments C-2 and C-3.

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</thead>
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<td>Background</td>
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<tr>
<td>3-h</td>
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<td>6-h</td>
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<td>24-h</td>
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*Average ± 1 standard deviation.

**md = Missing data; sample was not collected.
Table I-14. Quasi steady-state specific emission rates of Group 1 target VOCs for large-scale Experiment C-1.

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<th>4-VCH</th>
<th>1,2-DCB</th>
<th>DPGME</th>
<th>Phenol</th>
<th>Phen alc</th>
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<td>6</td>
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Table I-15. Quasi steady-state specific emission rates of Group 2 target VOCs for large-scale Experiment C-1.

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<td>10</td>
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Table I-16. Quasi steady-state specific emission rates of Group 1 target VOCs for large-scale Experiment C-2.

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<th>DPGME</th>
<th>Phenol</th>
<th>Phen alc</th>
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<td>8</td>
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Table I-17. Quasi steady-state specific emission rates of Group 2 target VOCs for large-scale Experiment C-2.

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<th>AIBN</th>
<th>MeGlutN</th>
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Table I-18. Quasi steady-state specific emission rates of Group 1 target VOCs for large-scale Experiment C-3.

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<td>24-h</td>
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<td>48-h</td>
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</tr>
<tr>
<td>72-h</td>
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<td>96-h</td>
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</tr>
<tr>
<td>120-h</td>
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<td>144-h</td>
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<tr>
<td>168-h</td>
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<tr>
<td>192-h</td>
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<td>&lt;1</td>
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Table I-19. Quasi steady-state specific emission rates of Group 2 target VOCs for large-scale Experiment C-3.

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<th>Specific Emission Rate, µg m⁻² h⁻¹</th>
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<th>BDMA</th>
<th>AIBN</th>
<th>MeGlutN</th>
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<td>24-h</td>
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<td>&lt;12</td>
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<td>8</td>
<td>&lt;12</td>
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Table I-20. Quasi steady-state specific emission rates of TVOC for large-scale Experiments C-1 through C-3.

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<th>Exp C-3</th>
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<td>353</td>
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<td>48-h</td>
<td>834</td>
<td>1,230</td>
<td>396</td>
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<tr>
<td>72-h</td>
<td>815</td>
<td>1,140</td>
<td>367</td>
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<td>96-h</td>
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<td>585</td>
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<td>168-h</td>
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<td>192-h</td>
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<td>221</td>
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<td>216-h</td>
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<td>657</td>
<td>182</td>
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<tr>
<td>240-h</td>
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<td>336-h</td>
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Table I-21. Cumulative masses (milligrams) of target VOCs and TVOC emitted over 0 - 336 hours in large-scale Experiments C-1 through C-3.

<table>
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<th>Compound</th>
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<tr>
<td>Di(propylene glycol)methyl ethers</td>
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Table I-22. Cumulative exposures (ppb-hour) to target VOCs during the first 48 hours of large-scale Experiments C-1 through C-3. Estimates assume 20 hours of occupancy per day.

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<td>Other Oxidized Cmpds</td>
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<tr>
<td>Di(propylene glycol)methyl ethers</td>
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Table I-23. Cumulative exposures (ppb-hour) to target VOCs over 48 - 336 hours in large-scale Experiments C-1 through C-3. Estimates assume 20 hours of occupancy per day.

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<td>1,2-Dichlorobenzene</td>
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<td>Di(propylene glycol)methyl ethers</td>
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</tr>
<tr>
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<td>Nitrogen-Containing Cmpds</td>
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<td>N,N-Dimethylbenzylamine</td>
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<td>2,2'-Azobisisobutyronitrile</td>
<td>954</td>
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<tr>
<td>2-Methylene glutaronitrile</td>
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APPENDIX J

EXPOSURE REDUCTION EXPERIMENTS WITH THE VINYL FLOORING ASSEMBLY

Appendix J presents the analytical data for the four large-scale exposure reduction experiments with the vinyl flooring assembly. The experiments were conducted in 25.5 m³ chamber compartments over a period of 336 hours. The 10.4-m² floor area was covered with Sheet Vinyl SV5. The concentrations of selected compounds and TVOC were measured throughout the experiments. Specific emission rates of these components were calculated. Cumulative mass emissions and cumulative exposures were estimated.

List of Tables

<table>
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<th>Description</th>
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<td>Summary of environmental parameters for large-scale Experiments V-1 through V-4 with sheet vinyl flooring materials</td>
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<td>J-02</td>
<td>Sheet vinyl flooring materials and quantities used in large-scale Experiments V-1 through V-4</td>
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<td>J-03</td>
<td>VOCs emitted by sheet vinyl flooring assembly in large-scale Experiment V-4 at 24- and 240-hours elapsed times</td>
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<td>Target compounds quantified in large-scale Experiments V-1 through V-4</td>
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<td>Concentrations of Group 1 target VOCs for large-scale Experiment V-1</td>
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<td>Concentrations of TVOC for large-scale Experiments V-1 through V-4</td>
<td>409</td>
</tr>
<tr>
<td>J-14</td>
<td>Concentrations of SigmaVOC for large-scale Experiments V-1 through V-4</td>
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</tr>
<tr>
<td>J-15</td>
<td>Concentrations of formaldehyde for large-scale Experiments V-1 through V-4</td>
<td>411</td>
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<tr>
<td>J-16</td>
<td>Concentrations of acetaldehyde for large-scale Experiments V-1 through V-4</td>
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<tr>
<td>J-17</td>
<td>Quasi steady-state specific emission rates of Group 1 target VOCs for large-scale Experiment V-1</td>
<td>413</td>
</tr>
<tr>
<td>J-18</td>
<td>Quasi steady-state specific emission rates of Group 2 target VOCs for large-scale Experiment V-1</td>
<td>414</td>
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<tr>
<td>J-19</td>
<td>Quasi steady-state specific emission rates of Group 1 target VOCs for large-scale Experiment V-4</td>
<td>415</td>
</tr>
<tr>
<td>J-20</td>
<td>Quasi steady-state specific emission rates of Group 2 target VOCs for large-scale Experiment V-4</td>
<td>416</td>
</tr>
<tr>
<td>J-21</td>
<td>Quasi steady-state specific emission rates of Group 1 target VOCs for large-scale Experiment V-2</td>
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</tr>
<tr>
<td>J-22</td>
<td>Quasi steady-state specific emission rates of Group 2 target VOCs for large-scale Experiment V-2</td>
<td>418</td>
</tr>
<tr>
<td>J-23</td>
<td>Quasi steady-state specific emission rates of Group 1 target VOCs for large-scale Experiment V-3</td>
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</tr>
<tr>
<td>J-24</td>
<td>Quasi steady-state specific emission rates of Group 2 target VOCs for large-scale Experiment V-3</td>
<td>420</td>
</tr>
<tr>
<td>J-25</td>
<td>Quasi steady-state specific emission rates of TVOC for large-scale Experiments V-1 through V-4</td>
<td>421</td>
</tr>
<tr>
<td>J-26</td>
<td>Quasi steady-state specific emission rates of formaldehyde for large-scale Experiments V-1 through V-4</td>
<td>422</td>
</tr>
<tr>
<td>J-27</td>
<td>Quasi steady-state specific emission rates of acetaldehyde for large-scale Experiments V-1 through V-4</td>
<td>423</td>
</tr>
<tr>
<td>Table J-28. Cumulative masses of target compounds and TVOC emitted over 0 - 336 hours in large-scale Experiments V-1 through V-4</td>
<td>Page</td>
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<tr>
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<td>------</td>
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<td>424</td>
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<tr>
<td>Table J-29. Cumulative exposures to target compounds during the first 48 hours of large-scale Experiments V-1 through V-4</td>
<td>Page</td>
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<td>Table J-30. Cumulative exposures to target compounds over 48 - 336 hours in large-scale Experiments V-1 through V-4</td>
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</table>
Table J-01. Summary of environmental parameters for large-scale Experiments V-1 through V-4 with sheet vinyl flooring materials.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>V-1*</th>
<th>V-4</th>
<th>V-2</th>
<th>V-3</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Starting date</strong></td>
<td>08/07/97</td>
<td>10/21/97</td>
<td>08/14/97</td>
<td>09/15/97</td>
</tr>
<tr>
<td><strong>Treatment</strong></td>
<td>Base case</td>
<td>Base case</td>
<td>Add ventilation</td>
<td>Air out SV, CB</td>
</tr>
<tr>
<td><strong>Ventilation rate, 2 - 72 h (h⁻¹)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average ± 1 std. dev.</td>
<td>0.48 ± 0.01†</td>
<td>0.50 ± 0.01†</td>
<td>1.93 ± 0.01‡</td>
<td>0.49 ± 0.01†</td>
</tr>
<tr>
<td>Range</td>
<td>0.48 - 0.49</td>
<td>0.49 - 0.51</td>
<td>1.09 - 1.97</td>
<td>0.48 - 0.49</td>
</tr>
<tr>
<td><strong>Ventilation rate, 72 - 336 h (h⁻¹)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average ± 1 std. dev.</td>
<td>0.49 ± 0.01</td>
<td>0.50 ± 0.01</td>
<td>0.50 ± 0.01</td>
<td>0.48 ± 0.01</td>
</tr>
<tr>
<td>Range</td>
<td>0.47 - 0.49</td>
<td>0.49 - 0.50</td>
<td>0.49 - 0.50</td>
<td>0.48 - 0.49</td>
</tr>
<tr>
<td><strong>Temperature (°C)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average ± 1 std. dev.</td>
<td>23.5 ± 1.0</td>
<td>23.1 ± 0.9</td>
<td>24.1 ± 0.9</td>
<td>24.0 ± 1.1</td>
</tr>
<tr>
<td>Range</td>
<td>21.7 - 26.8</td>
<td>21.4 - 25.1</td>
<td>22.0 - 26.2</td>
<td>21.5 - 26.3</td>
</tr>
<tr>
<td><strong>Relative Humidity (%)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average ± 1 std. dev.</td>
<td>55 ± 2</td>
<td>50 ± 6</td>
<td>56 ± 3</td>
<td>49 ± 4</td>
</tr>
<tr>
<td>Range</td>
<td>52 - 61</td>
<td>40 - 62</td>
<td>49 - 61</td>
<td>39 - 57</td>
</tr>
</tbody>
</table>

*Statistics were calculated for first 144 hours only.
†Ventilation rate for 0 - 2 hours was 2 h⁻¹.
‡Ventilation rate for 0 - 2 hours was 5 h⁻¹.
Table J-02. Sheet vinyl flooring materials and quantities used in large-scale Experiments V-1 through V-4. See Appendix E, Table E-01, for complete material descriptions.

<table>
<thead>
<tr>
<th>Material Description</th>
<th>Material ID</th>
<th>Unit of Measure</th>
<th>Exp V-1</th>
<th>Exp V-4</th>
<th>Exp V-2</th>
<th>Exp V-3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Particle board underlayment</td>
<td>UL</td>
<td>m²</td>
<td>10.4</td>
<td>10.4</td>
<td>10.4</td>
<td>10.4</td>
</tr>
<tr>
<td>Residential sheet vinyl*</td>
<td>SV5</td>
<td>m²</td>
<td>10.4</td>
<td>10.4</td>
<td>10.4</td>
<td>10.4</td>
</tr>
<tr>
<td>Rubber cove base, 4&quot; wide</td>
<td>CB</td>
<td>m</td>
<td>12.5</td>
<td>12.5</td>
<td>12.5</td>
<td>12.5</td>
</tr>
<tr>
<td>Sheet flooring adhesive</td>
<td>SFA</td>
<td>kg</td>
<td>2.73</td>
<td>3.40</td>
<td>2.95</td>
<td>2.97</td>
</tr>
<tr>
<td>Cove base adhesive</td>
<td>CBA</td>
<td>kg</td>
<td>0.51</td>
<td>0.47</td>
<td>0.50</td>
<td>0.48</td>
</tr>
<tr>
<td>Seam sealer</td>
<td>SS</td>
<td>mL</td>
<td>15</td>
<td>15</td>
<td>15</td>
<td>15</td>
</tr>
</tbody>
</table>

*Area of sheet vinyl was used in specific emission rate calculations.
### Table J-03. VOCs emitted by sheet vinyl flooring assembly in large-scale Experiment V-4 at 24- and 240-hours elapsed times.

<table>
<thead>
<tr>
<th>COMPOUND</th>
<th>Code*</th>
<th>RT (min)</th>
<th>24-h ET</th>
<th>240-h ET</th>
<th>Match Quality</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Alkane Hydrocarbons</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C7 Branched alkane HC</td>
<td></td>
<td>9.4</td>
<td>+</td>
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<td>Probable</td>
</tr>
<tr>
<td>n-Octane</td>
<td></td>
<td>10.9</td>
<td>+</td>
<td>+</td>
<td>Confirmed</td>
</tr>
<tr>
<td>n-Nonane</td>
<td></td>
<td>15.2</td>
<td>+</td>
<td>+</td>
<td>Confirmed</td>
</tr>
<tr>
<td>C10 Branched alkane HC</td>
<td></td>
<td>16.6</td>
<td>+</td>
<td>+</td>
<td>Probable</td>
</tr>
<tr>
<td>C10 Branched alkane HC</td>
<td></td>
<td>17.6</td>
<td>+</td>
<td>+</td>
<td>Probable</td>
</tr>
<tr>
<td>C10 Branched alkane HC</td>
<td></td>
<td>17.7</td>
<td>+</td>
<td>+</td>
<td>Probable</td>
</tr>
<tr>
<td>C10 Branched alkane HC</td>
<td></td>
<td>18.1</td>
<td>+</td>
<td>+</td>
<td>Probable</td>
</tr>
<tr>
<td>n-Decane</td>
<td>A,Q</td>
<td>19.2</td>
<td>+</td>
<td>+</td>
<td>Confirmed</td>
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<tr>
<td>C11 Branched alkane HC</td>
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<td>+</td>
<td>+</td>
<td>Probable</td>
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<td>C11 Branched alkane HC</td>
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<tr>
<td>C11 Branched alkane HC</td>
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<td>C11 Branched alkane HC</td>
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<tr>
<td>C11 Branched alkane HC</td>
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<td>n-Undecane</td>
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<td>22.8</td>
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<tr>
<td>n-Dodecane</td>
<td>B,Q</td>
<td>26.2</td>
<td>+</td>
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<tr>
<td>n-Tridecane</td>
<td>A,B,Q</td>
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<tr>
<td>n-Tetradecane</td>
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<td>n-Pentadecane</td>
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<td><strong>Aromatic Hydrocarbons</strong></td>
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<tr>
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<td>1,2,4-Trimethylbenzene</td>
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<td>+</td>
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<tr>
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<td>C4 Alkylbenzene</td>
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<td>26.9</td>
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</table>
Table J-03, Continued. VOCs emitted by sheet vinyl flooring assembly in large-scale Experiment V-4 at 24- and 240-hours elapsed times.

<table>
<thead>
<tr>
<th>COMPOUND</th>
<th>Code*</th>
<th>RT (min)</th>
<th>24-h ET</th>
<th>240-h ET</th>
<th>Match Quality</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Aromatic Hydrocarbons, Cont.</strong></td>
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<tr>
<td>C4 Alkylbenezene</td>
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<td>27.0</td>
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<td>+</td>
<td>Probable</td>
</tr>
<tr>
<td>C6 Alkylbenezene</td>
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<td>+</td>
<td>Probable</td>
</tr>
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<td>Naphthalene</td>
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<td>29.5</td>
<td>+</td>
<td>+</td>
<td>Confirmed</td>
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<td>+</td>
<td>+</td>
<td>Probable</td>
</tr>
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<td>C2 Tetraydronaphthalene</td>
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<td>+</td>
<td>+</td>
<td>Probable</td>
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<td>(1-Butylhexy)lbenzene</td>
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<td>Probable</td>
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<td>37.9</td>
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<td>Probable</td>
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</tr>
<tr>
<td>(1-Butylheptyl)benzene</td>
<td></td>
<td>39.5</td>
<td>+</td>
<td>+</td>
<td>Probable</td>
</tr>
<tr>
<td>(1-Propylcoyl)benzene</td>
<td></td>
<td>39.8</td>
<td>+</td>
<td>+</td>
<td>Probable</td>
</tr>
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<td>(1-Ethylcoyl)benzene</td>
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<td>+</td>
<td>+</td>
<td>Probable</td>
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<td></td>
<td>41.5</td>
<td>+</td>
<td>+</td>
<td>Probable</td>
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<td>(1-Penythepyl)benzene</td>
<td></td>
<td>41.8</td>
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<td>+</td>
<td>Probable</td>
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<td>(1-Butylcoyl)benzene</td>
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<td>+</td>
<td>+</td>
<td>Probable</td>
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<td>(1-Propylcoyl)benzene</td>
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<td>+</td>
<td>+</td>
<td>Probable</td>
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<td><strong>Other Hydrocarbons</strong></td>
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<td></td>
<td></td>
<td></td>
</tr>
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<td>Dimethylcyclohexane isomer</td>
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<td>+</td>
<td></td>
<td>Probable</td>
</tr>
<tr>
<td>Trimethylcyclohexane isomer</td>
<td></td>
<td>13.6</td>
<td>+</td>
<td></td>
<td>Probable</td>
</tr>
<tr>
<td>C3 Alky substituted cyclohexene</td>
<td></td>
<td>15.1</td>
<td>+</td>
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<td>Probable</td>
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<tr>
<td>Propylcyclohexane</td>
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<td>+</td>
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</tr>
<tr>
<td>C10 Alkene or cyclic HC</td>
<td></td>
<td>18.8</td>
<td>+</td>
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<td>Probable</td>
</tr>
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<td>Butylcyclohexane</td>
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</tr>
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<td>C11 Alkene HC</td>
<td></td>
<td>21.0</td>
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</tr>
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<td>Alkene HC</td>
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<td>+</td>
<td>+</td>
<td>Tentative</td>
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<tr>
<td>Alkene HC or cyclic HC</td>
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<td>28.9</td>
<td>+</td>
<td>+</td>
<td>Tentative</td>
</tr>
<tr>
<td>Alkene HC or cyclic HC</td>
<td></td>
<td>29.0</td>
<td>+</td>
<td>+</td>
<td>Tentative</td>
</tr>
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<td>Alkene HC</td>
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<td>29.4</td>
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<tr>
<td>Alkene HC</td>
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<td>30.0</td>
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<td>+</td>
<td>Tentative</td>
</tr>
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<td>Alkene HC</td>
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<td>Hexanal</td>
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<td>B</td>
<td>14.5</td>
<td>+</td>
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<td>Cyclohexanone</td>
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<td>A,Q</td>
<td>19.7</td>
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<td>Benzaldehyde</td>
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<td>B,Q</td>
<td>22.5</td>
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<tr>
<td>Nonanal</td>
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<td>B</td>
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</tr>
<tr>
<td>1-Phenylethanone</td>
<td></td>
<td>T</td>
<td>26.5</td>
<td>+</td>
<td>Confirmed</td>
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<td><strong>Other Oxidized Compounds</strong></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tetrahydrofuran</td>
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<td>A,B,Q</td>
<td>6.2</td>
<td>+</td>
<td>Confirmed</td>
</tr>
<tr>
<td>1-Butanol</td>
<td></td>
<td>A,B,Q</td>
<td>9.9</td>
<td>+</td>
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Table J-03, Continued. VOCs emitted by sheet vinyl flooring assembly in large-scale Experiment V-4 at 24- and 240-hours elapsed times.

<table>
<thead>
<tr>
<th>COMPOUND</th>
<th>Code*</th>
<th>RT (min)</th>
<th>24-h ET</th>
<th>240-h ET</th>
<th>Match Quality</th>
</tr>
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<td>Other Oxidized Cmpds., Cont.</td>
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<td></td>
<td></td>
<td></td>
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<tr>
<td>Acetic acid</td>
<td>B</td>
<td>10.6</td>
<td>+</td>
<td>+</td>
<td>Confirmed</td>
</tr>
<tr>
<td>1-Octanol</td>
<td>Q</td>
<td>25.4</td>
<td>+</td>
<td>+</td>
<td>Confirmed</td>
</tr>
<tr>
<td>Benzyl alcohol</td>
<td>Q</td>
<td>26.5</td>
<td>+</td>
<td>+</td>
<td>Confirmed</td>
</tr>
<tr>
<td>Phenol</td>
<td>T,A,B,Q</td>
<td>26.6</td>
<td>+</td>
<td>+</td>
<td>Confirmed</td>
</tr>
<tr>
<td>2-Ethylhexanoic acid</td>
<td></td>
<td>28.4</td>
<td></td>
<td>+</td>
<td>Probable</td>
</tr>
<tr>
<td>2,2,4-Trimethyl-1,3-pentanediol</td>
<td>B</td>
<td>35.2</td>
<td>+</td>
<td>+</td>
<td>Confirmed</td>
</tr>
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<td>monoisobutyrate (Texanol 1)</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2,2,4-Trimethyl-1,3-pentanediol</td>
<td>B</td>
<td>35.6</td>
<td>+</td>
<td>+</td>
<td>Confirmed</td>
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<td>monoisobutyrate (Texanol 3)</td>
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</tr>
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<td>1-Dodecanol</td>
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<td>37.0</td>
<td></td>
<td>+</td>
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<td>A,B,Q</td>
<td>40.3</td>
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<td>diisobutyrate (TXIB)</td>
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<td></td>
<td></td>
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<td>Miscellaneous Compounds</td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>tert-Butyl isothiocyanate</td>
<td>Q</td>
<td>16.6</td>
<td>+</td>
<td>+</td>
<td>Confirmed</td>
</tr>
<tr>
<td>Octamethylcyclohexasiloxane</td>
<td>B</td>
<td>18.2</td>
<td>+</td>
<td>+</td>
<td>Confirmed</td>
</tr>
<tr>
<td>Benzothiazole</td>
<td>A,Q</td>
<td>31.6</td>
<td>+</td>
<td>+</td>
<td>Confirmed</td>
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<tr>
<td>Unidentified Compounds</td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unidentified compound</td>
<td></td>
<td>29.1</td>
<td>+</td>
<td>+</td>
<td>Unident.</td>
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</tbody>
</table>

*T = Toxic air contaminant; A = Abundant compound; B = Component of chamber background; Q = Quantified target compound.
Table J-04. Target compounds quantified in large-scale Experiments V-1 through V-4. Toxic Air Contaminant (TAC) Category for June 1996 is indicated where applicable.

<table>
<thead>
<tr>
<th>Compound</th>
<th>TAC Cat.</th>
<th>Group</th>
<th>Table Abbrev.</th>
<th>Source(s)</th>
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<tr>
<td><strong>Alkane Hydrocarbons</strong></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>n-Decane</td>
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<td>n-C10</td>
<td>SV5, CBA</td>
<td></td>
</tr>
<tr>
<td>n-Dodecanes</td>
<td>1</td>
<td>n-C12</td>
<td>SV5, CBA</td>
<td></td>
</tr>
<tr>
<td>n-Tridecane</td>
<td>1</td>
<td>n-C13</td>
<td>SV5, CB</td>
<td></td>
</tr>
<tr>
<td>n-Tetradecane</td>
<td>1</td>
<td>n-C14</td>
<td>SV5</td>
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</tr>
<tr>
<td><strong>Aromatic Hydrocarbons</strong></td>
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</tr>
<tr>
<td>Toluene</td>
<td>I</td>
<td>1</td>
<td>SV5, CB, SFA, CBA</td>
<td></td>
</tr>
<tr>
<td>m-,p-Xylene</td>
<td>I</td>
<td>1</td>
<td>Xylenes</td>
<td>SV5, CBA</td>
</tr>
<tr>
<td>Styrene</td>
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<td>1</td>
<td>CB, CBA</td>
<td></td>
</tr>
<tr>
<td>1,2,4-Trimethylbenzene</td>
<td>III</td>
<td>1</td>
<td>1,2,4-TMB</td>
<td>SV5</td>
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<td><strong>Carbonyl Compounds</strong></td>
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<td></td>
<td></td>
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<td>Formaldehyde</td>
<td>I</td>
<td>Ald</td>
<td>No dominant src.</td>
<td></td>
</tr>
<tr>
<td>Acetaldehyde</td>
<td>I</td>
<td>Ald</td>
<td>No dominant src.</td>
<td></td>
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<td>CB, SS</td>
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</tr>
<tr>
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<td>Benzal</td>
<td>SV5, CB, SFA</td>
<td></td>
</tr>
<tr>
<td><strong>Other Oxidized Cmpds.</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tetrahydrofuran</td>
<td>2</td>
<td>THF</td>
<td>SS</td>
<td></td>
</tr>
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<td>1-Octanol</td>
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<td>Octanol</td>
<td>SV5</td>
<td></td>
</tr>
<tr>
<td>Benzyl alcohol</td>
<td>2</td>
<td>Benz alc</td>
<td>SV5</td>
<td></td>
</tr>
<tr>
<td>Phenol</td>
<td>I</td>
<td>2</td>
<td>SV5</td>
<td></td>
</tr>
<tr>
<td>2,2,4-Trimethyl-1,3-pentanediol diisobutyrate</td>
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<td>TXIB</td>
<td>SV5</td>
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</tr>
<tr>
<td><strong>Miscellaneous Cmpds.</strong></td>
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<td></td>
<td></td>
</tr>
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<td>tert-Butylisothiocyanate</td>
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<td>Butisothio</td>
<td>CB</td>
<td></td>
</tr>
<tr>
<td>Benzothiazole</td>
<td>2</td>
<td>Benzothiaz</td>
<td>CB</td>
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Table J-05. Concentrations of Group 1 target VOCs for large-scale Experiment V-1. Data subsequent to 144-hours elapsed time were invalid (see Report).

<table>
<thead>
<tr>
<th>Sample ID</th>
<th>n-C10</th>
<th>n-C12</th>
<th>n-C13</th>
<th>n-C14</th>
<th>Toluene</th>
<th>Xylenes</th>
<th>Styrene</th>
<th>1,2,4-TMB</th>
</tr>
</thead>
<tbody>
<tr>
<td>Avg. Inlet</td>
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<td>&lt;1</td>
<td>&lt;1</td>
<td>&lt;1</td>
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<td>&lt;1</td>
<td>&lt;1</td>
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<td>&lt;1</td>
<td>&lt;1</td>
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<tr>
<td>1-h</td>
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<td>76</td>
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<td>112</td>
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<td>14</td>
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<td>140</td>
<td>78</td>
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<td>35</td>
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<td>7</td>
<td>16</td>
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<td>72a-h</td>
<td>39</td>
<td>23</td>
<td>63</td>
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<td>130</td>
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<td>6</td>
<td>17</td>
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<td>72b-h</td>
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<td>65</td>
<td>30</td>
<td>134</td>
<td>4</td>
<td>6</td>
<td>17</td>
</tr>
<tr>
<td>96-h</td>
<td>35</td>
<td>24</td>
<td>65</td>
<td>31</td>
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<td>5</td>
<td>5</td>
<td>16</td>
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<td>120-h</td>
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<td>25</td>
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<td>32</td>
<td>108</td>
<td>5</td>
<td>5</td>
<td>17</td>
</tr>
<tr>
<td>144-h</td>
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Table J-06. Concentrations of Group 2 target VOCs for large-scale Experiment V-1. Data subsequent to 144-hours elapsed time were invalid (see Report).

<table>
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<tr>
<th>Sample ID</th>
<th>C-hexone</th>
<th>Benzald</th>
<th>THF</th>
<th>Octanol</th>
<th>Benz alc</th>
<th>Phenol</th>
<th>TXIB</th>
<th>Butisothio</th>
<th>Benzothiax</th>
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<td>&lt;1</td>
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<td>7,020</td>
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<td>28</td>
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<td>196</td>
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<td>24</td>
<td>70</td>
<td>28</td>
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<tr>
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<td>57</td>
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<td>72a-h</td>
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<td>28</td>
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<td>72b-h</td>
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<td>75</td>
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<td>35</td>
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<td>26</td>
<td>75</td>
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<td>3</td>
<td>29</td>
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<td>120-h</td>
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<td>43</td>
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<td>25</td>
<td>74</td>
<td>32</td>
<td>3</td>
<td>27</td>
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<tr>
<td>144-h</td>
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*md = Missing data.
Table J-07. Concentrations of Group 1 target VOCs for large-scale Experiment V-4.

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<th>Sample ID</th>
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<th>n-C12</th>
<th>n-C13</th>
<th>n-C14</th>
<th>Toluene</th>
<th>Xylenes</th>
<th>Styrene</th>
<th>1,2,4-TMB</th>
</tr>
</thead>
<tbody>
<tr>
<td>Avg. Inlet</td>
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<td>&lt;1</td>
<td>&lt;1</td>
<td>&lt;1</td>
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<tr>
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<tr>
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<tr>
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<td>66</td>
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<td>6</td>
<td>24</td>
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<td>8</td>
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Table J-12. Concentrations of Group 2 target VOCs for large-scale Experiment V-3.

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*md = Missing data.
Table J-13. Concentrations of TVOC for large-scale Experiments V-1 through V-4.

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<th>Exp V-2</th>
<th>Exp V-3</th>
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*Data subsequent to 144-h elapsed time were invalid.

**Average ± 1 standard deviation.
Table J-14. Concentrations of SigmaVOC (i.e., sum of 17 target VOCs) for large-scale Experiments V-1 through V-4.

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<th>Exp V-3</th>
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*Data subsequent to 144-h elapsed time were invalid.
Table J-15. Concentrations of formaldehyde for large-scale Experiments V-1 through V-4.

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*Data subsequent to 144-h elapsed time were invalid.

**Average ± 1 standard deviation.
Table J-16. Concentrations of acetaldehyde for large-scale Experiments V-1 through V-4.

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<th>Exp V-3</th>
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*Data subsequent to 144-h elapsed time were invalid.
**Average ± 1 standard deviation.
Table J-17. Quasi steady-state specific emission rates of Group 1 target VOCs for large-scale Experiment V-1. Data subsequent to 144-hours elapsed time were invalid (see Report).

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Table J-18. Quasi steady-state specific emission rates of Group 2 target VOCs for large-scale Experiment V-1. Data subsequent to 144-hours elapsed time were invalid (see Report).

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<th>Benz alc</th>
<th>Phenol</th>
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Table J-21. Quasi steady-state specific emission rates of Group 1 target VOCs for large-scale Experiment V-2.

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Table J-22. Quasi steady-state specific emission rates of Group 2 target VOCs for large-scale Experiment V-2.

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<td>22</td>
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Table J-23. Quasi steady-state specific emission rates of Group 1 target VOCs for large-scale Experiment V-3.

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<th>Xylenes</th>
<th>Styrene</th>
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<td>208</td>
<td>98</td>
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Table J-24. Quasi steady-state specific emission rates of Group 2 target VOCs for large-scale Experiment V-3.

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<th>THF</th>
<th>Specific Emission Rate, $\mu$g m$^{-2}$ h$^{-1}$</th>
<th>TXIB</th>
<th>Butisothio</th>
<th>Benzothiaz</th>
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<td>29,800</td>
<td>27</td>
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<td>16</td>
<td>2,560</td>
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<td>86</td>
<td>24</td>
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<td>6-h</td>
<td>719</td>
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<td>1,480</td>
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<td>15</td>
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<td>153</td>
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<td>82</td>
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<td>8</td>
<td>22</td>
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<td>9</td>
<td>23</td>
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<td>9</td>
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<td>74</td>
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<td>16</td>
<td>7</td>
<td>17</td>
<td>72</td>
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Table J-25. Quasi steady-state specific emission rates of TVOC for large-scale Experiments V-1 through V-4.

<table>
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<th>Sample ID</th>
<th>Exp V-1*</th>
<th>Exp V-4</th>
<th>Exp V-2</th>
<th>Exp V-3</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-h</td>
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<td>42,300</td>
<td>23,300</td>
<td>28,600</td>
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<td>4,620</td>
<td>3,480</td>
<td>8,120</td>
<td>2,680</td>
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<td>2,670</td>
<td>5,560</td>
<td>2,390</td>
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<td>2,200</td>
<td>1,400</td>
<td>4,190</td>
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<td>48-h</td>
<td>1,700</td>
<td>1,090</td>
<td>3,550</td>
<td>1,180</td>
</tr>
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<td>1,080</td>
<td>4,240</td>
<td>1,020</td>
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<td>96-h</td>
<td>1,400</td>
<td>1,350</td>
<td>967</td>
<td>980</td>
</tr>
<tr>
<td>120-h</td>
<td>1,530</td>
<td>1,330</td>
<td>1,230</td>
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<td>144-h</td>
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<td>1,310</td>
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<td>1,160</td>
<td>1,000</td>
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<td>192-h</td>
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<td>955</td>
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*Data subsequent to 144-h elapsed time were invalid.
Table J-26. Quasi steady-state specific emission rates of formaldehyde for large-scale Experiments V-1 through V-4.

<table>
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<th>Exp V-3</th>
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<td>13.7</td>
<td>9.9</td>
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<td>&lt;10.0</td>
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<td>&lt;10.0</td>
<td>4.7</td>
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<td>96-h</td>
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<td>&lt;2.5</td>
<td>3.7</td>
<td>4.3</td>
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<tr>
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<tr>
<td>168-h</td>
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<td>7.2</td>
<td>4.2</td>
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<td>8.3</td>
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<td>11.3</td>
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<tr>
<td>240-h</td>
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<td>14.6</td>
<td>6.6</td>
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<td>336-h</td>
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<td>8.1</td>
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*Data subsequent to 144-h elapsed time were invalid.
Table J-27. Quasi steady-state specific emission rates of acetaldehyde for large-scale experiments V-1 through V-4.

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<th>Exp V-3</th>
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<tr>
<td>3-h</td>
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<tr>
<td>6-h</td>
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<td>24-h</td>
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<td>4.3</td>
<td>&lt;10.0</td>
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<td>48-h</td>
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<td>&lt;10.0</td>
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<td>96-h</td>
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<tr>
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<td>2.8</td>
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<td>&lt;2.5</td>
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<td>168-h</td>
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<td>2.5</td>
<td>&lt;2.5</td>
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<tr>
<td>216-h</td>
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<tr>
<td>240-h</td>
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<td>4.7</td>
</tr>
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<td>&lt;2.5</td>
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*Data subsequent to 144-h elapsed time were invalid.
Table J-28. Cumulative masses (milligrams) of target compounds and TVOC emitted over 0 - 336 hours in large-scale Experiments V-1 through V-4.

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<th>Compound</th>
<th>Exp V-1*</th>
<th>Cumulative Mass, mg</th>
<th>Exp V-4</th>
<th>Exp V-2</th>
<th>Exp V-3</th>
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<td>112</td>
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<td>n-Tridecane</td>
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<td>n-Tetradecane</td>
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<td>129</td>
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<td><strong>Aromatic Hydrocarbons</strong></td>
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<td>179</td>
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<td>3,280</td>
<td>2,860</td>
<td>2,880</td>
<td></td>
</tr>
<tr>
<td>TVOC</td>
<td>3,580</td>
<td>5,200</td>
<td>6,970</td>
<td>4,630</td>
<td></td>
</tr>
</tbody>
</table>

*Cumulative masses emitted over 0 - 144 hours only.
Table J-29. Cumulative exposures (ppb-hour) to target compounds during the first 48 hours of large-scale Experiments V-1 through V-4. Estimates assume 20 hours of occupancy per day.

<table>
<thead>
<tr>
<th>Compound</th>
<th>Cumulative Exposure, ppb-hour</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Exp V-1</td>
</tr>
<tr>
<td><strong>Alkane Hydrocarbons</strong></td>
<td></td>
</tr>
<tr>
<td>n-Decane</td>
<td>338</td>
</tr>
<tr>
<td>n-Dodecane</td>
<td>198</td>
</tr>
<tr>
<td>n-Tridecane</td>
<td>473</td>
</tr>
<tr>
<td>n-Tetradecane</td>
<td>228</td>
</tr>
<tr>
<td><strong>Aromatic Hydrocarbons</strong></td>
<td></td>
</tr>
<tr>
<td>Toluene</td>
<td>5,430</td>
</tr>
<tr>
<td>m-, p-Xylene</td>
<td>74</td>
</tr>
<tr>
<td>Styrene</td>
<td>100</td>
</tr>
<tr>
<td>1,2,4-Trimethylbenzene</td>
<td>193</td>
</tr>
<tr>
<td><strong>Carbonyl Compounds</strong></td>
<td></td>
</tr>
<tr>
<td>Formaldehyde</td>
<td>468</td>
</tr>
<tr>
<td>Acetaldehyde</td>
<td>381</td>
</tr>
<tr>
<td>Cyclohexanone</td>
<td>4,170</td>
</tr>
<tr>
<td>Benzaldehyde</td>
<td>109</td>
</tr>
<tr>
<td><strong>Other Oxidized Cmpds.</strong></td>
<td></td>
</tr>
<tr>
<td>Tetrahydrofuran</td>
<td>9,440</td>
</tr>
<tr>
<td>1-Octanol</td>
<td>78</td>
</tr>
<tr>
<td>Benzyl alcohol</td>
<td>227</td>
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<tr>
<td>Phenol</td>
<td>801</td>
</tr>
<tr>
<td>2,2,4-Trimethyl-1,3-pentanediol disobutyrate</td>
<td>101</td>
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<td><strong>Miscellaneous Cmpds.</strong></td>
<td></td>
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<tr>
<td>tert-Butyliisothiocyanate</td>
<td>55</td>
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<tr>
<td>Benzothiazole</td>
<td>204</td>
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Table J-30. Cumulative exposures (ppb-hour) to target compounds over 48 - 336 hours in large-scale Experiments V-1 through V-4. Estimates assume 20 hours of occupancy per day.

<table>
<thead>
<tr>
<th>Compound</th>
<th>Cumulative Exposure, ppb-hour</th>
<th>Exp V-1*</th>
<th>Exp V-4</th>
<th>Exp V-2</th>
<th>Exp V-3</th>
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<tr>
<td>Alkane Hydrocarbons</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>n-Decane</td>
<td>509</td>
<td>1,050</td>
<td>974</td>
<td>1,020</td>
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<tr>
<td>n-Dodecane</td>
<td>277</td>
<td>665</td>
<td>631</td>
<td>657</td>
<td></td>
</tr>
<tr>
<td>n-Tridecane</td>
<td>691</td>
<td>1,720</td>
<td>1,620</td>
<td>1,820</td>
<td></td>
</tr>
<tr>
<td>n-Tetradecane</td>
<td>312</td>
<td>813</td>
<td>782</td>
<td>868</td>
<td></td>
</tr>
<tr>
<td>Aromatic Hydrocarbons</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Toluene</td>
<td>2,550</td>
<td>2,830</td>
<td>2,080</td>
<td>2,190</td>
<td></td>
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<tr>
<td>m-,p-Xylene</td>
<td>87</td>
<td>200</td>
<td>192</td>
<td>204</td>
<td></td>
</tr>
<tr>
<td>Styrene</td>
<td>105</td>
<td>169</td>
<td>179</td>
<td>142</td>
<td></td>
</tr>
<tr>
<td>1,2,4-Trimethylbenzene</td>
<td>277</td>
<td>678</td>
<td>664</td>
<td>705</td>
<td></td>
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<tr>
<td>Carbonyl Compounds</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Formaldehyde</td>
<td>&lt;157</td>
<td>&lt;470</td>
<td>1,310</td>
<td>869</td>
<td></td>
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<tr>
<td>Acetaldehyde</td>
<td>155</td>
<td>&lt;320</td>
<td>&lt;320</td>
<td>553</td>
<td></td>
</tr>
<tr>
<td>Cyclohexanone</td>
<td>703</td>
<td>1,160</td>
<td>1,040</td>
<td>1,120</td>
<td></td>
</tr>
<tr>
<td>Benzaldehyde</td>
<td>171</td>
<td>431</td>
<td>436</td>
<td>432</td>
<td></td>
</tr>
<tr>
<td>Other Oxidized Cmpds.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tetrahydrofuran</td>
<td>1,170</td>
<td>2,010</td>
<td>1,400</td>
<td>2,390</td>
<td></td>
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<tr>
<td>1-Octanol</td>
<td>127</td>
<td>296</td>
<td>329</td>
<td>312</td>
<td></td>
</tr>
<tr>
<td>Benzyl alcohol</td>
<td>443</td>
<td>1,010</td>
<td>1,060</td>
<td>965</td>
<td></td>
</tr>
<tr>
<td>Phenol</td>
<td>1,540</td>
<td>4,660</td>
<td>3,910</td>
<td>3,960</td>
<td></td>
</tr>
<tr>
<td>2,2,4-Trimethyl-1,3-pentanediol diisobutyrate</td>
<td>209</td>
<td>630</td>
<td>609</td>
<td>623</td>
<td></td>
</tr>
<tr>
<td>Miscellaneous Cmpds.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>tert-Butylisothiocyanate</td>
<td>58</td>
<td>124</td>
<td>116</td>
<td>181</td>
<td></td>
</tr>
<tr>
<td>Benzothiazole</td>
<td>407</td>
<td>894</td>
<td>903</td>
<td>730</td>
<td></td>
</tr>
</tbody>
</table>

*Cumulative exposures over 48 - 144 hours only.
APPENDIX K

EXPOSURE REDUCTION AND LONG-TERM EXPERIMENTS WITH COMBINED ASSEMBLIES

Appendix K presents the analytical data for the two large-scale exposure reduction experiments with the combined source assemblies. The experiments were conducted in 25.5 m³ chamber compartments over a period of 336 hours. One of the experiments was extended for a period of 2,016 hours. Paints LPS2, FLP3 and SGLP3 were applied to gypsum board and plywood panels with a total surface area of 16 m². Two-thirds of the 10.4-m² floor area was carpeted with Carpet CP4 and Carpet Cushion CC4. The remaining floor area was covered with Sheet Vinyl SV5. The concentrations of selected compounds and TVOC were measured throughout the experiments. Specific emission rates of these components were calculated. Cumulative mass emissions and cumulative exposures were estimated.

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</tr>
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<td>Concentrations of SigmaVOCp and TVOCp for large-scale Experiments A-1 and A-2</td>
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<td>Quasi steady-state specific emission rates of Group 2 target VOCs for large-scale Experiment A-2</td>
</tr>
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<td>Table K-13</td>
<td>Quasi steady-state specific emission rates of Group 1 target VOCs for large-scale Experiment A-1</td>
</tr>
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<td>Quasi steady-state specific emission rates of Group 2 target VOCs for large-scale Experiment A-1</td>
</tr>
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</tr>
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</tr>
<tr>
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</tr>
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</tr>
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<td>Summary of environmental parameters over 336 - 2,016 hours in large-scale Experiment A-2</td>
</tr>
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<td>Concentrations of Group 1 target VOCs over 336 - 2,016 hours in large-scale Experiment A-2</td>
</tr>
<tr>
<td>Table K-21</td>
<td>Concentrations of Group 2 target VOCs over 336 - 2,016 hours in large-scale Experiment A-2</td>
</tr>
<tr>
<td>Table K-22</td>
<td>Concentrations of SigmaVOCp and TVOCp over 336 - 2,016 hours in large-scale Experiment A-2</td>
</tr>
<tr>
<td>Table K-23</td>
<td>Quasi steady-state specific emission rates of Group 1 target VOCs over 336 - 2,016 hours in large-scale Experiment A-2</td>
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<table>
<thead>
<tr>
<th>Parameter</th>
<th>Experiment A-2</th>
<th>Experiment A-1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paint application date</td>
<td>02/09/98</td>
<td>01/20/98</td>
</tr>
<tr>
<td>Treatment</td>
<td>Add ventilation</td>
<td>Add vent. &amp; heating</td>
</tr>
<tr>
<td>Paint drying &amp; flooring install., -72 - 0 h</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ventilation rate (h⁻¹), Avg. ± 1 std. dev. (Range)</td>
<td>1.97 ± 0.01</td>
<td>1.91 ± 0.01</td>
</tr>
<tr>
<td>Temperature (°C), Avg. ± 1 std. dev. (Range)</td>
<td>1.94 - 2.00</td>
<td>1.88 - 1.94</td>
</tr>
<tr>
<td>Temperature (°C), Avg. ± 1 std. dev. (Range)</td>
<td>22.1 ± 0.3</td>
<td>22.3 ± 0.3</td>
</tr>
<tr>
<td>Temperature (°C), Avg. ± 1 std. dev. (Range)</td>
<td>21.4 - 22.8</td>
<td>21.2 - 22.9</td>
</tr>
<tr>
<td>Relative Humidity (%), Avg. ± 1 std. dev. (Range)</td>
<td>46 ± 1</td>
<td>43 ± 2</td>
</tr>
<tr>
<td>Relative Humidity (%), Avg. ± 1 std. dev. (Range)</td>
<td>43 - 49</td>
<td>40 - 49</td>
</tr>
<tr>
<td>Post flooring installation, 0 - 6 h</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ventilation rate (h⁻¹), Avg. ± 1 std. dev. (Range)</td>
<td>1.96 ± 0.01</td>
<td>1.91 ± 0.01</td>
</tr>
<tr>
<td>Temperature (°C), Avg. ± 1 std. dev. (Range)</td>
<td>1.93 - 2.00</td>
<td>1.89 - 1.93</td>
</tr>
<tr>
<td>Temperature (°C), Avg. ± 1 std. dev. (Range)</td>
<td>23.1 ± 0.3</td>
<td>23.5 ± 0.2</td>
</tr>
<tr>
<td>Temperature (°C), Avg. ± 1 std. dev. (Range)</td>
<td>22.7 - 24.1</td>
<td>21.2 - 22.9</td>
</tr>
<tr>
<td>Relative Humidity (%), Avg. ± 1 std. dev. (Range)</td>
<td>47 ± 2</td>
<td>44 ± 1</td>
</tr>
<tr>
<td>Relative Humidity (%), Avg. ± 1 std. dev. (Range)</td>
<td>44 - 54</td>
<td>41 - 49</td>
</tr>
<tr>
<td>Heating period, 12 - 72 h</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ventilation rate (h⁻¹), Avg. ± 1 std. dev. (Range)</td>
<td>1.96 ± 0.01</td>
<td>1.91 ± 0.01</td>
</tr>
<tr>
<td>Temperature (°C), Avg. ± 1 std. dev. (Range)</td>
<td>1.93 - 2.00</td>
<td>1.88 - 1.94</td>
</tr>
<tr>
<td>Temperature (°C), Avg. ± 1 std. dev. (Range)</td>
<td>22.4 ± 0.2</td>
<td>32.7 ± 0.6</td>
</tr>
<tr>
<td>Temperature (°C), Avg. ± 1 std. dev. (Range)</td>
<td>21.9 - 23.1</td>
<td>31.8 - 33.8</td>
</tr>
<tr>
<td>Relative Humidity (%), Avg. ± 1 std. dev. (Range)</td>
<td>47 ± 2</td>
<td>28 ± 1</td>
</tr>
<tr>
<td>Relative Humidity (%), Avg. ± 1 std. dev. (Range)</td>
<td>44 - 50</td>
<td>24 - 30</td>
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<tr>
<td>Remaining period, 80 - 336 h</td>
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<tr>
<td>Ventilation rate (h⁻¹), Avg. ± 1 std. dev. (Range)</td>
<td>0.50 ± 0.01</td>
<td>0.48 ± 0.01</td>
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<tr>
<td>Temperature (°C), Avg. ± 1 std. dev. (Range)</td>
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<td>0.47 - 0.49</td>
</tr>
<tr>
<td>Temperature (°C), Avg. ± 1 std. dev. (Range)</td>
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<td>22.5 ± 0.8</td>
</tr>
<tr>
<td>Temperature (°C), Avg. ± 1 std. dev. (Range)</td>
<td>21.0 - 22.4</td>
<td>21.7 - 27.4</td>
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<tr>
<td>Relative Humidity (%), Avg. ± 1 std. dev. (Range)</td>
<td>44 ± 1</td>
<td>46 ± 3</td>
</tr>
<tr>
<td>Relative Humidity (%), Avg. ± 1 std. dev. (Range)</td>
<td>41 - 47</td>
<td>35 - 50</td>
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**Table K-02.** Source materials and quantities used in large-scale Experiments A-1 and A-2. See Appendices C, D and E (Tables C-01, D-01 and E01) for material descriptions.

<table>
<thead>
<tr>
<th>Material Description</th>
<th>Material ID</th>
<th>Unit of Measure</th>
<th>Quantity Exp A-2</th>
<th>Quantity Exp A-1</th>
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<td>Primer Sealer</td>
<td>LPS2</td>
<td>g</td>
<td>2,150</td>
<td>1,910</td>
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<td>Flat</td>
<td>FLP3</td>
<td>g</td>
<td>1,900</td>
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<td>Semi-Gloss</td>
<td>SGLP3</td>
<td>g</td>
<td>90</td>
<td>91</td>
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<td><strong>Vinyl Flooring Materials</strong></td>
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<td></td>
<td></td>
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<tr>
<td>Particle board underlayment</td>
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<td>m²</td>
<td>3.48</td>
<td>3.48</td>
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<tr>
<td>Residential sheet vinyl</td>
<td>SV5</td>
<td>m²</td>
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<td>Rubber cove base, 4&quot; wide</td>
<td>CB</td>
<td>m</td>
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<td>5.33</td>
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<tr>
<td>Sheet flooring adhesive</td>
<td>SFA</td>
<td>g</td>
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<tr>
<td>Cove base adhesive</td>
<td>CBA</td>
<td>g</td>
<td>222</td>
<td>174</td>
</tr>
<tr>
<td>Seam sealer</td>
<td>SS</td>
<td>mL</td>
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<td>5</td>
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<td><strong>Carpet Materials</strong></td>
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<tr>
<td>Commercial olefin carpet</td>
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<td>m²</td>
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<td>Rebonded urethane carpet cushion</td>
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<td>5.94</td>
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<tr>
<td>Thermal seam tape</td>
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<td>m</td>
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Table K-03. VOCs emitted by combined source materials in large-scale Experiment A-2 at 24- and 240-hours elapsed times.

<table>
<thead>
<tr>
<th>COMPOUND</th>
<th>Code*</th>
<th>RT (min)</th>
<th>24-h</th>
<th>240-h</th>
<th>Match</th>
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</thead>
<tbody>
<tr>
<td>Alkane Hydrocarbons</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C9 Branched alkane HC</td>
<td></td>
<td>13.7</td>
<td>+</td>
<td>+</td>
<td>Probable</td>
</tr>
<tr>
<td>C9 Branched alkane HC</td>
<td></td>
<td>14.1</td>
<td>+</td>
<td>+</td>
<td>Probable</td>
</tr>
<tr>
<td>n-Nonane</td>
<td>B</td>
<td>15.2</td>
<td>+</td>
<td>+</td>
<td>Confirmed</td>
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<tr>
<td>C10 Branched alkane HC</td>
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<td>16.6</td>
<td>+</td>
<td>+</td>
<td>Probable</td>
</tr>
<tr>
<td>C10 Branched alkane HC</td>
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<td>17.7</td>
<td>+</td>
<td>+</td>
<td>Probable</td>
</tr>
<tr>
<td>C10 Branched alkane HC</td>
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<td>17.8</td>
<td>+</td>
<td>+</td>
<td>Probable</td>
</tr>
<tr>
<td>C10 Branched alkane HC</td>
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<td>+</td>
<td>+</td>
<td>Probable</td>
</tr>
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<td>n-Decane</td>
<td>A,Q</td>
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<td>(1-Etheninonyl)benzene</td>
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<td>alpha-Pinene</td>
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<td></td>
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Table K-03, Continued. VOCs emitted by combined source materials in large-scale Experiment A-2 at 24- and 240-hours elapsed times.

<table>
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<tr>
<th>COMPOUND</th>
<th>Code*</th>
<th>RT (min)</th>
<th>24-h ET</th>
<th>240-h ET</th>
<th>Match Quality</th>
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<td>+</td>
<td>Probable</td>
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<tr>
<td>C10 Alkene or cyclic HC</td>
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<td>18.9</td>
<td>+</td>
<td>+</td>
<td>Probable</td>
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<tr>
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<td>20.9</td>
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<td>Confirmed</td>
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<td>+</td>
<td>Probable</td>
</tr>
<tr>
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<td>22.0</td>
<td>+</td>
<td>+</td>
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<tr>
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<td>+</td>
<td>+</td>
<td>Probable</td>
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<td>C11 Alkene HC</td>
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<td>22.4</td>
<td>+</td>
<td>+</td>
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</tr>
<tr>
<td>C11 Alkene HC</td>
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<td>22.6</td>
<td>+</td>
<td>+</td>
<td>Probable</td>
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<td>C12 Alkene HC</td>
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<td>+</td>
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<td>C12 Alkene HC</td>
<td></td>
<td>23.2</td>
<td>+</td>
<td>+</td>
<td>Probable</td>
</tr>
<tr>
<td>Alkene HC</td>
<td></td>
<td>23.9</td>
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<td>+</td>
<td>Probable</td>
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<td>+</td>
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<tr>
<td>Cyclohexanone</td>
<td>Q</td>
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<td>+</td>
<td>+</td>
<td>Confirmed</td>
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<tr>
<td>Benzaldehyde</td>
<td>B</td>
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<td>+</td>
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<td>Confirmed</td>
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<td><strong>Other Oxidized Compounds</strong></td>
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</tr>
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<td>Tetrahydrofuran</td>
<td>B,Q</td>
<td>6.2</td>
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<td>Confirmed</td>
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<td>Acetic acid</td>
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<td>n-Butyl ether</td>
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<td>15.3</td>
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<td>Confirmed</td>
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<td>T,A,Q</td>
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<td>+</td>
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<td>Propylene glycol</td>
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<td>16.3</td>
<td>+</td>
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<td>2-Methylpropanoic acid</td>
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<td>Confirmed</td>
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<tr>
<td>Benzyl alcohol</td>
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<td>26.5</td>
<td>+</td>
<td>+</td>
<td>Confirmed</td>
</tr>
<tr>
<td>Phenol</td>
<td>T,A,B,Q</td>
<td>26.6</td>
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<td>+</td>
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<td>2,2,4-Trimethyl-1,3-pentanediol</td>
<td>A,Q</td>
<td>35.2</td>
<td>+</td>
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<td>monoisobutyrate (Texanol 1)</td>
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</tr>
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<td>2,2,4-Trimethyl-1,3-pentanediol</td>
<td>A,Q</td>
<td>35.7</td>
<td>+</td>
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<td>monoisobutyrate (Texanol 3)</td>
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<td>1-Dodecanol</td>
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<td>37.1</td>
<td>+</td>
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<td>2,6-Di-tert-butyl-4-methylphenol</td>
<td>Q</td>
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<td>+</td>
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<td>Confirmed</td>
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<td>(butylated hydroxytoluene)</td>
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<td>diisobutyrate (TXIB)</td>
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<td>31.1</td>
<td>+</td>
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Table K-03, Continued. VOCs emitted by combined source materials in large-scale Experiment A-2 at 24- and 240-hours elapsed times.

<table>
<thead>
<tr>
<th>COMPOUND</th>
<th>Code*</th>
<th>RT (min)</th>
<th>24-h ET</th>
<th>240-h ET</th>
<th>Match Quality</th>
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<td><strong>Miscellaneous Compounds</strong></td>
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<td>Benzothiazole</td>
<td>Q</td>
<td>31.6</td>
<td>+</td>
<td>+</td>
<td>Confirmed</td>
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<td><strong>Unidentified Compounds</strong></td>
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<td>Unidentified glycol ether</td>
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<td>Unident.</td>
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<td>Unidentified glycol ether</td>
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*T = Toxic air contaminant; A = Abundant compound; B = Component of chamber background; Q = Quantified target compound.
Table K-04. Target compounds quantified in large-scale Experiments A-1 and A-2.

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<th>Compound</th>
<th>Group</th>
<th>Table Abbrev.</th>
<th>Dominant Source(s)</th>
<th>Source Area* (m²)</th>
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<td>n-C10</td>
<td>SV5, CBA</td>
<td>3.48</td>
</tr>
<tr>
<td>n-Tridecane</td>
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<td>n-C13</td>
<td>SV5, CB</td>
<td>3.48</td>
</tr>
<tr>
<td><strong>Aromatic Hydrocarbons</strong></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Toluene</td>
<td>1</td>
<td></td>
<td>SV5, CB, SFA, CBA</td>
<td>3.48</td>
</tr>
<tr>
<td>Styrene</td>
<td>2</td>
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<td>CP4, CB, CBA</td>
<td>6.97</td>
</tr>
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<td>1,2,4-TMB</td>
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<td>3.48</td>
</tr>
<tr>
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<td>4-PCH</td>
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<td>Ald</td>
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<tr>
<td>Acetaldehyde</td>
<td>Ald</td>
<td></td>
<td>No dominant src.</td>
<td>10.4</td>
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<td>Cyclohexanone</td>
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<td>C-hexone</td>
<td>CB, SS</td>
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<tr>
<td><strong>Other Oxidized Cmpds.</strong></td>
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<td></td>
</tr>
<tr>
<td>Tetrahydrofuran</td>
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<td>THF</td>
<td>SS</td>
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<td>EG</td>
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<td>Benz alc</td>
<td>SV5</td>
<td>3.48</td>
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<td>Phenol</td>
<td>1</td>
<td></td>
<td>SV5</td>
<td>3.48</td>
</tr>
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<td>2-(2-Butoxyethoxy)ethanol</td>
<td>2</td>
<td>DEGBE</td>
<td>LPS2, SGLP3</td>
<td>16.0</td>
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<tr>
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<td>Benzothia</td>
<td>CB</td>
<td>3.48</td>
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*Area used for calculation of specific emission rates.
Table K-05. Concentrations of Group 1 target VOCs for large-scale Experiment A-2.

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<th>Sample ID</th>
<th>n-C10</th>
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<th>Toluene</th>
<th>1,2,4-TMB</th>
<th>C-hexone</th>
<th>THF</th>
<th>Benz alc</th>
<th>Phenol</th>
<th>TXIB</th>
<th>Benzothia</th>
</tr>
</thead>
<tbody>
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<td>240-h</td>
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<td>159</td>
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Table K-09. Concentrations of Sigma VOCP (i.e., sum of four target VOCs for paint) and TVOCR (i.e., remainder of chromatographic response) for large-scale Experiments A-1 and A-2.

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<td>46 ± 11</td>
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<td>&lt;47</td>
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<td>2,780</td>
<td>329</td>
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</tr>
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<td>---</td>
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</tr>
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<td>1,350</td>
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<td>800</td>
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<td>1,000</td>
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<td>748</td>
</tr>
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<td>1,110</td>
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*Average ± 1 standard deviation.
Table K-10. Concentrations of formaldehyde and acetaldehyde for large-scale Experiments A-1 and A-2.

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<td>2 ± 1</td>
<td>2 ± 1</td>
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<td>5</td>
<td>3</td>
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<tr>
<td>Minus 3 h</td>
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<td>&lt;1</td>
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<td>2</td>
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<tr>
<td>1-h</td>
<td>6</td>
<td>1</td>
<td>5</td>
<td>5</td>
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<tr>
<td>3-h</td>
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<tr>
<td>72-h</td>
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<td>96-h</td>
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<td>144-h</td>
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<td>168-h</td>
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<td>2</td>
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<td>216-h</td>
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<td>240-h</td>
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<td>&lt;1</td>
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*Average ± 1 standard deviation.
Table K-11. Quasi steady-state specific emission rates of Group 1 target VOCs for large-scale Experiment A-2. Source areas were taken from Table K-02.

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<th>Toluene</th>
<th>1,2,4-TMB</th>
<th>C-hexone</th>
<th>THF</th>
<th>Benz alc</th>
<th>Phenol</th>
<th>TXIB</th>
<th>Benzothia</th>
</tr>
</thead>
<tbody>
<tr>
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<td>3.48</td>
<td>3.48</td>
<td>3.48</td>
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<td>3.48</td>
<td>3.48</td>
<td>3.48</td>
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<td>31,300</td>
<td>68,200</td>
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<td>840</td>
<td>426</td>
<td>164</td>
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<td>558</td>
<td>690</td>
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<td>15,300</td>
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<td>607</td>
<td>272</td>
<td>139</td>
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<td>425</td>
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<td>3,810</td>
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<td>523</td>
<td>251</td>
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<td>125</td>
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<td>544</td>
<td>264</td>
<td>70</td>
<td>446</td>
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<td>157</td>
<td>81</td>
<td>29</td>
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<td>413</td>
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<td>353</td>
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<td>144-h</td>
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<td>26</td>
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<td>123</td>
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<td>168-h</td>
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Table K-12. Quasi steady-state specific emission rates of Group 2 target VOCs for large-scale Experiment A-2. Source areas were taken from Table K-02.

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<th>AIBN</th>
<th>EG</th>
<th>PG</th>
<th>DEGBE</th>
<th>Texanol</th>
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<td>6.97</td>
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<td>49</td>
<td>47</td>
<td>131</td>
<td>1,930</td>
<td>192</td>
<td>81</td>
<td>7,450</td>
</tr>
<tr>
<td>3-h</td>
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<td>28</td>
<td>77</td>
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<td>56</td>
<td>6,320</td>
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<td>6-h</td>
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<td>35</td>
<td>21</td>
<td>73</td>
<td>952</td>
<td>&lt;109</td>
<td>44</td>
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<td>28</td>
<td>14</td>
<td>63</td>
<td>634</td>
<td>&lt;109</td>
<td>30</td>
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<td>46</td>
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<td>&lt;92</td>
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Table K-13. Quasi steady-state specific emission rates of Group 1 target VOCs for large-scale Experiment A-1. Source areas were taken from Table K-02.

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<th>C-hexone</th>
<th>THF</th>
<th>Benz alc</th>
<th>Phenol</th>
<th>TXIB</th>
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<tr>
<td>192-h</td>
<td>81</td>
<td>78</td>
<td>53</td>
<td>21</td>
<td>47</td>
<td>48</td>
<td>21</td>
<td>114</td>
<td>50</td>
<td>19</td>
</tr>
<tr>
<td>216-h</td>
<td>80</td>
<td>74</td>
<td>49</td>
<td>20</td>
<td>45</td>
<td>41</td>
<td>19</td>
<td>108</td>
<td>48</td>
<td>19</td>
</tr>
<tr>
<td>240-h</td>
<td>78</td>
<td>72</td>
<td>48</td>
<td>20</td>
<td>41</td>
<td>37</td>
<td>19</td>
<td>104</td>
<td>47</td>
<td>19</td>
</tr>
<tr>
<td>336-h</td>
<td>70</td>
<td>71</td>
<td>41</td>
<td>20</td>
<td>38</td>
<td>27</td>
<td>19</td>
<td>104</td>
<td>48</td>
<td>19</td>
</tr>
</tbody>
</table>
Table K-14. Quasi steady-state specific emission rates of Group 2 target VOCs for large-scale Experiment A-1. Source areas were taken from Table K-02.

<table>
<thead>
<tr>
<th>Sample ID</th>
<th>Styrene</th>
<th>4-PCH</th>
<th>BHT</th>
<th>AIBN</th>
<th>EG</th>
<th>PG</th>
<th>DEGBE</th>
<th>Texanol</th>
</tr>
</thead>
<tbody>
<tr>
<td>Area, m²</td>
<td>6.97</td>
<td>6.97</td>
<td>6.97</td>
<td>6.97</td>
<td>16.0</td>
<td>16.0</td>
<td>16.0</td>
<td>16.0</td>
</tr>
<tr>
<td>1-h</td>
<td>75</td>
<td>61</td>
<td>75</td>
<td>149</td>
<td>2,120</td>
<td>269</td>
<td>86</td>
<td>7,300</td>
</tr>
<tr>
<td>3-h</td>
<td>34</td>
<td>41</td>
<td>34</td>
<td>81</td>
<td>1,050</td>
<td>&lt;106</td>
<td>47</td>
<td>5,980</td>
</tr>
<tr>
<td>6-h</td>
<td>27</td>
<td>34</td>
<td>27</td>
<td>68</td>
<td>736</td>
<td>&lt;106</td>
<td>53</td>
<td>4,190</td>
</tr>
<tr>
<td>12-h</td>
<td>34</td>
<td>102</td>
<td>45</td>
<td>113</td>
<td>931</td>
<td>&lt;106</td>
<td>89</td>
<td>11,300</td>
</tr>
<tr>
<td>24-h</td>
<td>14</td>
<td>102</td>
<td>41</td>
<td>129</td>
<td>946</td>
<td>&lt;106</td>
<td>77</td>
<td>13,900</td>
</tr>
<tr>
<td>48-h</td>
<td>6</td>
<td>68</td>
<td>40</td>
<td>90</td>
<td>763</td>
<td>&lt;89</td>
<td>30</td>
<td>7,390</td>
</tr>
<tr>
<td>72-h</td>
<td>5</td>
<td>45</td>
<td>36</td>
<td>68</td>
<td>445</td>
<td>&lt;71</td>
<td>18</td>
<td>4,880</td>
</tr>
<tr>
<td>78-h</td>
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<td>13</td>
<td>11</td>
<td>27</td>
<td>138</td>
<td>&lt;18</td>
<td>4</td>
<td>1,240</td>
</tr>
<tr>
<td>96-h</td>
<td>2</td>
<td>9</td>
<td>9</td>
<td>22</td>
<td>102</td>
<td>&lt;18</td>
<td>2</td>
<td>714</td>
</tr>
<tr>
<td>120-h</td>
<td>3</td>
<td>9</td>
<td>11</td>
<td>24</td>
<td>111</td>
<td>&lt;13</td>
<td>3</td>
<td>820</td>
</tr>
<tr>
<td>144-h</td>
<td>2</td>
<td>8</td>
<td>11</td>
<td>20</td>
<td>153</td>
<td>&lt;13</td>
<td>3</td>
<td>649</td>
</tr>
<tr>
<td>168-h</td>
<td>2</td>
<td>7</td>
<td>11</td>
<td>16</td>
<td>124</td>
<td>&lt;13</td>
<td>2</td>
<td>688</td>
</tr>
<tr>
<td>192-h</td>
<td>2</td>
<td>8</td>
<td>13</td>
<td>17</td>
<td>131</td>
<td>&lt;13</td>
<td>3</td>
<td>795</td>
</tr>
<tr>
<td>216-h</td>
<td>2</td>
<td>7</td>
<td>14</td>
<td>16</td>
<td>106</td>
<td>&lt;13</td>
<td>3</td>
<td>661</td>
</tr>
<tr>
<td>240-h</td>
<td>2</td>
<td>7</td>
<td>15</td>
<td>13</td>
<td>156</td>
<td>&lt;13</td>
<td>5</td>
<td>690</td>
</tr>
<tr>
<td>336-h</td>
<td>&lt;2</td>
<td>6</td>
<td>18</td>
<td>10</td>
<td>122</td>
<td>&lt;9</td>
<td>2</td>
<td>537</td>
</tr>
</tbody>
</table>
Table K-15. Quasi steady-state specific emission rates of TVOC\_R (i.e., remainder of chromatographic response after subtracting target VOCs for paint) for large-scale Experiments A-1 and A-2. Total floor area of 10.4 m\textsuperscript{2} was used to calculate values.

<table>
<thead>
<tr>
<th>Sample ID</th>
<th>Specific Emission Rate, (\mu g \text{ m}^{-2} \text{ h}^{-1})</th>
<th>Exp A-2</th>
<th>Exp A-1</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-h</td>
<td>27,000</td>
<td>20,500</td>
<td></td>
</tr>
<tr>
<td>3-h</td>
<td>6,900</td>
<td>7,750</td>
<td></td>
</tr>
<tr>
<td>6-h</td>
<td>4,510</td>
<td>5,120</td>
<td></td>
</tr>
<tr>
<td>12-h</td>
<td>---</td>
<td>8,120</td>
<td></td>
</tr>
<tr>
<td>24-h</td>
<td>2,540</td>
<td>7,070</td>
<td></td>
</tr>
<tr>
<td>48-h</td>
<td>1,830</td>
<td>4,670</td>
<td></td>
</tr>
<tr>
<td>72-h</td>
<td>1,500</td>
<td>3,560</td>
<td></td>
</tr>
<tr>
<td>78-h</td>
<td>---</td>
<td>1,360</td>
<td></td>
</tr>
<tr>
<td>96-h</td>
<td>852</td>
<td>1,010</td>
<td></td>
</tr>
<tr>
<td>120-h</td>
<td>828</td>
<td>936</td>
<td></td>
</tr>
<tr>
<td>144-h</td>
<td>876</td>
<td>808</td>
<td></td>
</tr>
<tr>
<td>168-h</td>
<td>813</td>
<td>744</td>
<td></td>
</tr>
<tr>
<td>192-h</td>
<td>747</td>
<td>824</td>
<td></td>
</tr>
<tr>
<td>216-h</td>
<td>710</td>
<td>786</td>
<td></td>
</tr>
<tr>
<td>240-h</td>
<td>741</td>
<td>762</td>
<td></td>
</tr>
<tr>
<td>336-h</td>
<td>682</td>
<td>765</td>
<td></td>
</tr>
</tbody>
</table>
Table K-16. Cumulative masses (milligrams) of target VOCs and TVOC$_R$
(i.e., remainder of chromatographic response after subtracting target VOCs
for paint) emitted over 0 - 336 hours in large-scale Experiments A-1 and A-2.

<table>
<thead>
<tr>
<th>Compound</th>
<th>Cumulative Mass, mg</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Exp A-2</td>
</tr>
<tr>
<td><strong>Alkane Hydrocarbons</strong></td>
<td></td>
</tr>
<tr>
<td>n-Decane</td>
<td>135</td>
</tr>
<tr>
<td>n-Tridecane</td>
<td>121</td>
</tr>
<tr>
<td><strong>Aromatic Hydrocarbons</strong></td>
<td></td>
</tr>
<tr>
<td>Toluene</td>
<td>108</td>
</tr>
<tr>
<td>Styrene</td>
<td>20</td>
</tr>
<tr>
<td>1,2,4-Trimethylbenzene</td>
<td>28</td>
</tr>
<tr>
<td>4-Phenylcyclohexene</td>
<td>32</td>
</tr>
<tr>
<td><strong>Carbonyl Compounds</strong></td>
<td></td>
</tr>
<tr>
<td>Cyclohexanone</td>
<td>479</td>
</tr>
<tr>
<td><strong>Other Oxidized Cmpds.</strong></td>
<td></td>
</tr>
<tr>
<td>Tetrahydrofuran</td>
<td>795</td>
</tr>
<tr>
<td>Ethylene glycol</td>
<td>1,490</td>
</tr>
<tr>
<td>Propylene glycol</td>
<td>&lt;200</td>
</tr>
<tr>
<td>Benzyl alcohol</td>
<td>37</td>
</tr>
<tr>
<td>Phenol</td>
<td>225</td>
</tr>
<tr>
<td>2-(2-Butoxyethoxy)ethanol</td>
<td>53</td>
</tr>
<tr>
<td>2,2,4-Trimethyl-1,3-pentanediol monoisobutyrates (Texanol)</td>
<td>10,800</td>
</tr>
<tr>
<td>2,2,4-Trimethyl-1,3-pentanediol diisobutyrate (TXIB)</td>
<td>99</td>
</tr>
<tr>
<td>2,6-Di-tert-butyl-4-methylphenol</td>
<td>30</td>
</tr>
<tr>
<td><strong>Miscellaneous Cmpds.</strong></td>
<td></td>
</tr>
<tr>
<td>2,2'-Azobisisobutyronitrile</td>
<td>73</td>
</tr>
<tr>
<td>Benzothiazole</td>
<td>58</td>
</tr>
<tr>
<td>TVOC$_R$</td>
<td>4,630</td>
</tr>
</tbody>
</table>

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### Table K-17
Cumulative exposures (ppb-hour) to target VOCs over 0 - 48 and 48 - 336 hours in large-scale Experiment A-2. Estimates assume 20 hours of occupancy per day. Exposure ratios were calculated by dividing the 0- to 48-hour exposures by the total exposures over 0 - 336 hours.

<table>
<thead>
<tr>
<th>Compound</th>
<th>Cumulative Exposure, ppb-hour</th>
<th>Exp. Ratio 0 - 48 h/Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0 - 48 h</td>
<td>48 - 336 h</td>
</tr>
<tr>
<td><strong>Alkane Hydrocarbons</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>n-Decane</td>
<td>147</td>
<td>793</td>
</tr>
<tr>
<td>n-Tridecane</td>
<td>103</td>
<td>523</td>
</tr>
<tr>
<td><strong>Aromatic Hydrocarbons</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Toluene</td>
<td>198</td>
<td>933</td>
</tr>
<tr>
<td>Styrene</td>
<td>46</td>
<td>94</td>
</tr>
<tr>
<td>1,2,4-Trimethylbenzene</td>
<td>31</td>
<td>211</td>
</tr>
<tr>
<td>4-Phenylcyclohexene</td>
<td>26</td>
<td>178</td>
</tr>
<tr>
<td><strong>Carbonyl Compounds</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cyclohexanone</td>
<td>1,530</td>
<td>690</td>
</tr>
<tr>
<td><strong>Other Oxidized Cmpds.</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tetrahydrofuran</td>
<td>3,730</td>
<td>491</td>
</tr>
<tr>
<td>Ethylene glycol</td>
<td>3,920</td>
<td>16,400</td>
</tr>
<tr>
<td>Propylene glycol</td>
<td>&lt;450</td>
<td>&lt;1,600</td>
</tr>
<tr>
<td>Benzyl alcohol</td>
<td>49</td>
<td>273</td>
</tr>
<tr>
<td>Phenol</td>
<td>341</td>
<td>1,860</td>
</tr>
<tr>
<td>2-(2-Butoxyethoxy)ethanol</td>
<td>65</td>
<td>181</td>
</tr>
<tr>
<td>2,2,4-Trimethyl-1,3-pentanediol</td>
<td>6,810</td>
<td>39,900</td>
</tr>
<tr>
<td>monoisobutyrates (Texanol)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2,2,4-Trimethyl-1,3-pentanediol</td>
<td>49</td>
<td>277</td>
</tr>
<tr>
<td>diisobutyrate (TXIB)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2,6-Di-tert-butyl-4-methylphenol</td>
<td>11</td>
<td>164</td>
</tr>
<tr>
<td><strong>Miscellaneous Cmpds.</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2,2'-Azobisisobutyronitrile</td>
<td>54</td>
<td>405</td>
</tr>
<tr>
<td>Benzothiazole</td>
<td>58</td>
<td>364</td>
</tr>
</tbody>
</table>
Table K-18. Cumulative exposures (ppb-hour) to target VOCs over 96 - 336 hours in large-scale Experiments A-1 and A-2. Estimates assume 20 hours of occupancy per day.

<table>
<thead>
<tr>
<th>Compound</th>
<th>Cumulative Exposure, ppb-h</th>
<th>Exp A-2</th>
<th>Exp A-1</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Alkane Hydrocarbons</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>n-Decane</td>
<td>716</td>
<td>779</td>
<td></td>
</tr>
<tr>
<td>n-Tridecane</td>
<td>465</td>
<td>550</td>
<td></td>
</tr>
<tr>
<td><strong>Aromatic Hydrocarbons</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Toluene</td>
<td>842</td>
<td>767</td>
<td></td>
</tr>
<tr>
<td>Styrene</td>
<td>79</td>
<td>46</td>
<td></td>
</tr>
<tr>
<td>1,2,4-Trimethylbenzene</td>
<td>193</td>
<td>233</td>
<td></td>
</tr>
<tr>
<td>4-Phenylcyclohexene</td>
<td>155</td>
<td>125</td>
<td></td>
</tr>
<tr>
<td><strong>Carbonyl Compounds</strong></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Cyclohexanone</td>
<td>560</td>
<td>678</td>
<td></td>
</tr>
<tr>
<td><strong>Other Oxidized Cmpds.</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tetrahydrofuran</td>
<td>394</td>
<td></td>
<td>973</td>
</tr>
<tr>
<td>Ethylene glycol</td>
<td>13,600</td>
<td>12,600</td>
<td></td>
</tr>
<tr>
<td>Propylene glycol</td>
<td>&lt;1,200</td>
<td>&lt;1,400</td>
<td></td>
</tr>
<tr>
<td>Benzyl alcohol</td>
<td>235</td>
<td>249</td>
<td></td>
</tr>
<tr>
<td>Phenol</td>
<td>1,580</td>
<td>1,580</td>
<td></td>
</tr>
<tr>
<td>2-(2-Butoxyethoxy)ethanol</td>
<td>145</td>
<td></td>
<td>131</td>
</tr>
<tr>
<td>2,2,4-Trimethyl-1,3-pentanediol monoisobutyrate (Texanol)</td>
<td>33,600</td>
<td>14,600</td>
<td></td>
</tr>
<tr>
<td>2,2,4-Trimethyl-1,3-pentanediol diisobutyrate (TXIB)</td>
<td>237</td>
<td>239</td>
<td></td>
</tr>
<tr>
<td>2,6-Di-tert-butyl-4-methylphenol</td>
<td>153</td>
<td>186</td>
<td></td>
</tr>
<tr>
<td><strong>Miscellaneous Cmpds.</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2,2'-Azobisisobutyronitrile</td>
<td>352</td>
<td>268</td>
<td></td>
</tr>
<tr>
<td>Benzothiazole</td>
<td>315</td>
<td>195</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Time Interval</th>
<th>Ventilation Rate (h⁻¹)</th>
<th>Temperature (°C)</th>
<th>Relative Humidity (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>336 - 504 h</td>
<td>0.50 ± 0.01</td>
<td>21.9 ± 0.3</td>
<td>44 ± 3</td>
</tr>
<tr>
<td></td>
<td>Range 0.50 - 0.51</td>
<td>21.0 - 22.6</td>
<td>38 - 48</td>
</tr>
<tr>
<td>504 - 672 h</td>
<td>0.50 ± 0.01</td>
<td>22.0 ± 0.7</td>
<td>43 ± 3</td>
</tr>
<tr>
<td></td>
<td>Range 0.49 - 0.51</td>
<td>20.9 - 24.5</td>
<td>39 - 49</td>
</tr>
<tr>
<td>672 - 840 h</td>
<td>0.50 ± 0.01</td>
<td>22.6 ± 0.7</td>
<td>50 ± 1</td>
</tr>
<tr>
<td></td>
<td>Range 0.49 - 0.50</td>
<td>21.5 - 24.5</td>
<td>47 - 52</td>
</tr>
<tr>
<td>840 - 1,008 h</td>
<td>0.50 ± 0.01</td>
<td>22.5 ± 0.5</td>
<td>51 ± 2</td>
</tr>
<tr>
<td></td>
<td>Range 0.49 - 0.50</td>
<td>21.6 - 24.4</td>
<td>48 - 56</td>
</tr>
<tr>
<td>1,008 - 1,176 h</td>
<td>0.50 ± 0.01</td>
<td>22.0 ± 0.4</td>
<td>44 ± 2</td>
</tr>
<tr>
<td></td>
<td>Range 0.48 - 0.50</td>
<td>21.2 - 23.3</td>
<td>40 - 48</td>
</tr>
<tr>
<td>1,176 - 1,344 h</td>
<td>0.50 ± 0.01</td>
<td>22.0 ± 0.2</td>
<td>44 ± 1</td>
</tr>
<tr>
<td></td>
<td>Range 0.49 - 0.50</td>
<td>21.3 - 22.5</td>
<td>42 - 46</td>
</tr>
<tr>
<td>1,344 - 1,512 h</td>
<td>0.50 ± 0.01</td>
<td>22.0 ± 0.4</td>
<td>43 ± 2</td>
</tr>
<tr>
<td></td>
<td>Range 0.49 - 0.50</td>
<td>21.2 - 23.5</td>
<td>40 - 47</td>
</tr>
<tr>
<td>1,512 - 1,680 h</td>
<td>0.50 ± 0.01</td>
<td>23.0 ± 1.0</td>
<td>47 ± 3</td>
</tr>
<tr>
<td></td>
<td>Range 0.49 - 0.50</td>
<td>21.5 - 25.4</td>
<td>42 - 53</td>
</tr>
<tr>
<td>1,680 - 1,848 h</td>
<td>0.50 ± 0.01</td>
<td>22.9 ± 1.0</td>
<td>49 ± 2</td>
</tr>
<tr>
<td></td>
<td>Range 0.49 - 0.50</td>
<td>21.5 - 25.3</td>
<td>45 - 53</td>
</tr>
<tr>
<td>1,848 - 2,016 h</td>
<td>0.49 ± 0.01</td>
<td>22.6 ± 0.6</td>
<td>51 ± 1</td>
</tr>
<tr>
<td></td>
<td>Range 0.49 - 0.50</td>
<td>21.8 - 24.8</td>
<td>48 - 54</td>
</tr>
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</table>
Table K-20. Concentrations of Group 1 target VOCs over 336 - 2,016 hours in large-scale Experiment A-2.

<table>
<thead>
<tr>
<th>Sample ID</th>
<th>n-C10</th>
<th>n-C13</th>
<th>Toluene</th>
<th>1,2,4-TMB</th>
<th>C-hexone</th>
<th>Chamber Concentration, µg m⁻³</th>
<th>THF</th>
<th>Benz alc</th>
<th>Phenol</th>
<th>TXIB</th>
<th>Benzoithia</th>
</tr>
</thead>
<tbody>
<tr>
<td>Avg. Inlet</td>
<td>&lt;1</td>
<td>&lt;1</td>
<td>&lt;1</td>
<td>&lt;1</td>
<td>&lt;1</td>
<td>2</td>
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<td>&lt;1</td>
<td>&lt;1</td>
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<td>18</td>
<td>16</td>
<td>13</td>
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</tr>
<tr>
<td>504-h</td>
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<td>4</td>
<td>25</td>
<td>12</td>
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<td>6</td>
</tr>
<tr>
<td>672-h</td>
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<td>840-h</td>
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<td>1,176-h</td>
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<td>21</td>
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</tr>
<tr>
<td>1,512-h</td>
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</tr>
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<td>1,680-h</td>
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<td>3</td>
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<td>14</td>
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<td>4</td>
</tr>
<tr>
<td>1,848-h</td>
<td>14</td>
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<td>5</td>
<td>4</td>
<td>4</td>
<td>1</td>
<td>3</td>
<td>21</td>
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<td>BHT</td>
<td>AIBN</td>
<td>EG</td>
<td>PG</td>
<td>DEGBE</td>
<td>Texanol</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
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<td>---------</td>
<td>-------</td>
<td>-----</td>
<td>------</td>
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<td>----</td>
<td>-------</td>
<td>--------</td>
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<td></td>
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</tr>
<tr>
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<td>&lt;1</td>
<td>&lt;12</td>
<td>&lt;1</td>
<td>&lt;2</td>
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<td></td>
<td></td>
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<td>8</td>
<td>135</td>
<td>&lt;14</td>
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<td></td>
<td></td>
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<tr>
<td>504-h</td>
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<td>4</td>
<td>10</td>
<td>5</td>
<td>108</td>
<td>&lt;14</td>
<td>2</td>
<td>825</td>
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</tr>
<tr>
<td>672-h</td>
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<td>4</td>
<td>12</td>
<td>4</td>
<td>178</td>
<td>&lt;14</td>
<td>3</td>
<td>1,050</td>
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<tr>
<td>840-h</td>
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<td>12</td>
<td>2</td>
<td>146</td>
<td>&lt;14</td>
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<td>813</td>
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</tr>
<tr>
<td>1,008-h</td>
<td>&lt;1</td>
<td>3</td>
<td>11</td>
<td>1</td>
<td>131</td>
<td>&lt;14</td>
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<td>625</td>
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<td></td>
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<td>1,176-h</td>
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<td>1</td>
<td>122</td>
<td>&lt;14</td>
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<td>605</td>
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<td></td>
<td></td>
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<tr>
<td>1,344-h</td>
<td>&lt;1</td>
<td>2</td>
<td>15</td>
<td>1</td>
<td>111</td>
<td>&lt;14</td>
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<td>438</td>
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</tr>
<tr>
<td>1,512-h</td>
<td>&lt;1</td>
<td>2</td>
<td>14</td>
<td>1</td>
<td>92</td>
<td>&lt;14</td>
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<td>498</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1,680-h</td>
<td>&lt;1</td>
<td>2</td>
<td>13</td>
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<td>73</td>
<td>&lt;14</td>
<td>1</td>
<td>385</td>
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<td></td>
</tr>
<tr>
<td>1,848-h</td>
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<td>15</td>
<td>&lt;1</td>
<td>54</td>
<td>&lt;14</td>
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<td>13</td>
<td>&lt;1</td>
<td>98</td>
<td>&lt;14</td>
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<td>294</td>
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</table>
Table K-22. Concentrations of SigmaVOC_p (i.e., sum of four target VOCs for paint) and TVOC_R (i.e., remainder of chromatographic response) over 336 - 2,016 hours in large-scale Experiment A-2.

<table>
<thead>
<tr>
<th>Sample ID</th>
<th>SigmaVOC_p</th>
<th>TVOC_R</th>
</tr>
</thead>
<tbody>
<tr>
<td>Avg. Inlet*</td>
<td>&lt;47</td>
<td>31 ± 11</td>
</tr>
<tr>
<td>336-h</td>
<td>1,250</td>
<td>642</td>
</tr>
<tr>
<td>504-h</td>
<td>936</td>
<td>580</td>
</tr>
<tr>
<td>672-h</td>
<td>1,230</td>
<td>768</td>
</tr>
<tr>
<td>840-h</td>
<td>962</td>
<td>596</td>
</tr>
<tr>
<td>1,008-h</td>
<td>758</td>
<td>528</td>
</tr>
<tr>
<td>1,176-h</td>
<td>730</td>
<td>645</td>
</tr>
<tr>
<td>1,344-h</td>
<td>550</td>
<td>560</td>
</tr>
<tr>
<td>1,512-h</td>
<td>591</td>
<td>532</td>
</tr>
<tr>
<td>1,680-h</td>
<td>459</td>
<td>536</td>
</tr>
<tr>
<td>1,848-h</td>
<td>404</td>
<td>579</td>
</tr>
<tr>
<td>2,016-h</td>
<td>393</td>
<td>479</td>
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</table>

*Average ± 1 standard deviation.
Table K-23. Quasi steady-state specific emission rates of Group 1 target VOCs over 336 - 2,016 hours in large-scale Experiment A-2. Source areas were taken from Table K-02.

<table>
<thead>
<tr>
<th>Sample ID</th>
<th>n-C10</th>
<th>n-C13</th>
<th>Toluene</th>
<th>1,2,4-TMB</th>
<th>C-hexone</th>
<th>THF</th>
<th>Benz alc</th>
<th>Phenol</th>
<th>TXIB</th>
<th>Benzothia</th>
</tr>
</thead>
<tbody>
<tr>
<td>Area, m²</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>336-h</td>
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<td>58</td>
<td>47</td>
<td>16</td>
<td>23</td>
<td>4</td>
<td>16</td>
<td>100</td>
<td>47</td>
<td>28</td>
</tr>
<tr>
<td>504-h</td>
<td>60</td>
<td>56</td>
<td>39</td>
<td>15</td>
<td>17</td>
<td>&lt;4</td>
<td>14</td>
<td>90</td>
<td>44</td>
<td>24</td>
</tr>
<tr>
<td>672-h</td>
<td>75</td>
<td>84</td>
<td>44</td>
<td>19</td>
<td>23</td>
<td>&lt;4</td>
<td>20</td>
<td>111</td>
<td>59</td>
<td>24</td>
</tr>
<tr>
<td>840-h</td>
<td>62</td>
<td>72</td>
<td>33</td>
<td>16</td>
<td>17</td>
<td>&lt;4</td>
<td>17</td>
<td>98</td>
<td>54</td>
<td>20</td>
</tr>
<tr>
<td>1,008-h</td>
<td>58</td>
<td>67</td>
<td>28</td>
<td>14</td>
<td>16</td>
<td>&lt;4</td>
<td>13</td>
<td>88</td>
<td>50</td>
<td>16</td>
</tr>
<tr>
<td>1,176-h</td>
<td>66</td>
<td>82</td>
<td>27</td>
<td>15</td>
<td>15</td>
<td>&lt;4</td>
<td>12</td>
<td>89</td>
<td>56</td>
<td>17</td>
</tr>
<tr>
<td>1,344-h</td>
<td>59</td>
<td>75</td>
<td>25</td>
<td>14</td>
<td>14</td>
<td>&lt;4</td>
<td>11</td>
<td>78</td>
<td>50</td>
<td>15</td>
</tr>
<tr>
<td>1,512-h</td>
<td>56</td>
<td>76</td>
<td>22</td>
<td>14</td>
<td>13</td>
<td>&lt;4</td>
<td>10</td>
<td>73</td>
<td>50</td>
<td>13</td>
</tr>
<tr>
<td>1,680-h</td>
<td>54</td>
<td>71</td>
<td>21</td>
<td>13</td>
<td>13</td>
<td>&lt;4</td>
<td>9</td>
<td>76</td>
<td>52</td>
<td>12</td>
</tr>
<tr>
<td>1,848-h</td>
<td>52</td>
<td>74</td>
<td>20</td>
<td>14</td>
<td>13</td>
<td>&lt;4</td>
<td>10</td>
<td>78</td>
<td>55</td>
<td>13</td>
</tr>
<tr>
<td>2,016-h</td>
<td>40</td>
<td>62</td>
<td>16</td>
<td>12</td>
<td>10</td>
<td>&lt;4</td>
<td>8</td>
<td>63</td>
<td>47</td>
<td>11</td>
</tr>
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</table>
Table K-24. Quasi steady-state specific emission rates of Group 2 target VOCs over 336 - 2,016 hours in large-scale Experiment A-2. Source areas were taken from Table K-02.

<table>
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<tr>
<th>Sample ID</th>
<th>Styrene</th>
<th>4-PCH</th>
<th>BHT</th>
<th>AIBN</th>
<th>EG</th>
<th>PG</th>
<th>DEGEB</th>
<th>Texanol</th>
</tr>
</thead>
<tbody>
<tr>
<td>Area, m²</td>
<td>6.97</td>
<td>6.97</td>
<td>6.97</td>
<td>6.97</td>
<td>16.0</td>
<td>16.0</td>
<td>16.0</td>
<td>16.0</td>
</tr>
<tr>
<td>336-h</td>
<td>2</td>
<td>8</td>
<td>15</td>
<td>14</td>
<td>108</td>
<td>&lt;11</td>
<td>2</td>
<td>885</td>
</tr>
<tr>
<td>504-h</td>
<td>1</td>
<td>7</td>
<td>18</td>
<td>8</td>
<td>86</td>
<td>&lt;11</td>
<td>2</td>
<td>658</td>
</tr>
<tr>
<td>672-h</td>
<td>1</td>
<td>8</td>
<td>22</td>
<td>7</td>
<td>142</td>
<td>&lt;11</td>
<td>2</td>
<td>836</td>
</tr>
<tr>
<td>840-h</td>
<td>1</td>
<td>6</td>
<td>22</td>
<td>4</td>
<td>117</td>
<td>&lt;11</td>
<td>2</td>
<td>648</td>
</tr>
<tr>
<td>1,008-h</td>
<td>&lt;1</td>
<td>5</td>
<td>21</td>
<td>3</td>
<td>105</td>
<td>&lt;11</td>
<td>2</td>
<td>498</td>
</tr>
<tr>
<td>1,176-h</td>
<td>&lt;1</td>
<td>5</td>
<td>25</td>
<td>2</td>
<td>98</td>
<td>&lt;11</td>
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<td>482</td>
</tr>
<tr>
<td>1,344-h</td>
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<td>1</td>
<td>89</td>
<td>&lt;11</td>
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<tr>
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<td>1</td>
<td>73</td>
<td>&lt;11</td>
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<td>397</td>
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<tr>
<td>1,680-h</td>
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<td>58</td>
<td>&lt;11</td>
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<td>307</td>
</tr>
<tr>
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<td>4</td>
<td>27</td>
<td>&lt;1</td>
<td>43</td>
<td>&lt;11</td>
<td>1</td>
<td>279</td>
</tr>
<tr>
<td>2,016-h</td>
<td>&lt;1</td>
<td>3</td>
<td>25</td>
<td>&lt;1</td>
<td>78</td>
<td>&lt;11</td>
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<td>234</td>
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</table>
Table K-25. Quasi steady-state specific emission rates of TVOC_R (i.e., remainder of chromatographic response after subtracting target VOCs for paint) over 336 - 2,016 hours in large-scale Experiment A-2. Total floor area of 10.4 m^2 was used to calculate values.

<table>
<thead>
<tr>
<th>Sample ID</th>
<th>Specific Emission Rate μg m^-2 h^-1</th>
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<tbody>
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<td>336-h</td>
<td>682</td>
</tr>
<tr>
<td>504-h</td>
<td>607</td>
</tr>
<tr>
<td>672-h</td>
<td>838</td>
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<tr>
<td>840-h</td>
<td>626</td>
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<tr>
<td>1,008-h</td>
<td>543</td>
</tr>
<tr>
<td>1,176-h</td>
<td>687</td>
</tr>
<tr>
<td>1,344-h</td>
<td>582</td>
</tr>
<tr>
<td>1,512-h</td>
<td>548</td>
</tr>
<tr>
<td>1,680-h</td>
<td>553</td>
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<tr>
<td>1,848-h</td>
<td>606</td>
</tr>
<tr>
<td>2,016-h</td>
<td>483</td>
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</table>
Table K-26. Cumulative masses (milligrams) of target VOCs and TVOC<sub>R</sub> (i.e., remainder of chromatographic response after subtracting target VOCs for paints) emitted over 336 - 2,016 hours in large-scale Experiment A-2.

<table>
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<th>Compound</th>
<th>Cumulative Mass mg</th>
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<tr>
<td>n-Decane</td>
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<tr>
<td>n-Tridecane</td>
<td>420</td>
</tr>
<tr>
<td>Aromatic Hydrocarbons</td>
<td></td>
</tr>
<tr>
<td>Toluene</td>
<td>169</td>
</tr>
<tr>
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<td>&lt;10</td>
</tr>
<tr>
<td>1,2,4-Trimethylbenzene</td>
<td>86</td>
</tr>
<tr>
<td>4-Phenylcyclohexene</td>
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</tr>
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<td>Carbonyl Compounds</td>
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</tr>
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<td>Cyclohexanone</td>
<td>92</td>
</tr>
<tr>
<td>Other Oxidized Cmpds.</td>
<td></td>
</tr>
<tr>
<td>Tetrahydrofuran</td>
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<tr>
<td>Ethylene glycol</td>
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<tr>
<td>Propylene glycol</td>
<td>&lt;300</td>
</tr>
<tr>
<td>Benzyl alcohol</td>
<td>75</td>
</tr>
<tr>
<td>Phenol</td>
<td>505</td>
</tr>
<tr>
<td>2-(2-Butoxyethoxy)ethanol</td>
<td>38</td>
</tr>
<tr>
<td>2,2,4-Trimethyl-1,3-pentanediol monoisobutyrate (Texanol)</td>
<td>13,500</td>
</tr>
<tr>
<td>2,2,4-Trimethyl-1,3-pentanediol diisobutyrate (TXIB)</td>
<td>302</td>
</tr>
<tr>
<td>2,6-Di-tert-butyl-4-methylphenol</td>
<td>270</td>
</tr>
<tr>
<td>Miscellaneous Cmpds.</td>
<td></td>
</tr>
<tr>
<td>2,2'-Azobisisobutyronitrile</td>
<td>40</td>
</tr>
<tr>
<td>Benzothiazole</td>
<td>101</td>
</tr>
<tr>
<td>TVOC&lt;sub&gt;R&lt;/sub&gt;</td>
<td>10,800</td>
</tr>
</tbody>
</table>
Table K-27. Cumulative exposures (ppb-hour) to target VOCs over 336 - 2,016 hours in large-scale Experiment A-2. Estimates assume 20 hours of occupancy per day.

<table>
<thead>
<tr>
<th>Compound</th>
<th>Cumulative Exposure ppb-hour</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Alkane Hydrocarbons</strong></td>
<td></td>
</tr>
<tr>
<td>n-Decane</td>
<td>3,910</td>
</tr>
<tr>
<td>n-Tridecane</td>
<td>3,650</td>
</tr>
<tr>
<td><strong>Aromatic Hydrocarbons</strong></td>
<td></td>
</tr>
<tr>
<td>Toluene</td>
<td>2,940</td>
</tr>
<tr>
<td>Styrene</td>
<td>&lt;100</td>
</tr>
<tr>
<td>1,2,4-Trimethylbenzene</td>
<td>1,150</td>
</tr>
<tr>
<td>4-Phenylcyclohexene</td>
<td>618</td>
</tr>
<tr>
<td><strong>Carbonyl Compounds</strong></td>
<td></td>
</tr>
<tr>
<td>Cyclohexanone</td>
<td>1,500</td>
</tr>
<tr>
<td><strong>Other Oxidized Cmpds.</strong></td>
<td></td>
</tr>
<tr>
<td>Tetrahydrofuran</td>
<td>834</td>
</tr>
<tr>
<td>Ethylene glycol</td>
<td>62,600</td>
</tr>
<tr>
<td>Propylene glycol</td>
<td>&lt;6,300</td>
</tr>
<tr>
<td>Benzyl alcohol</td>
<td>1,110</td>
</tr>
<tr>
<td>Phenol</td>
<td>8,580</td>
</tr>
<tr>
<td>2-(2-Butoxyethoxy)ethanol</td>
<td>378</td>
</tr>
<tr>
<td>2,2,4-Trimethyl-1,3-pentanediol monoisobutyrates (Texanol)</td>
<td>99,700</td>
</tr>
<tr>
<td>2,2,4-Trimethyl-1,3-pentanediol disobutyrate (TXIB)</td>
<td>1,690</td>
</tr>
<tr>
<td>2,6-Di-tert-butyl-4-methylyphenol</td>
<td>2,110</td>
</tr>
<tr>
<td><strong>Miscellaneous Cmpds.</strong></td>
<td></td>
</tr>
<tr>
<td>2,2'-Azobisisobutyronitrile</td>
<td>394</td>
</tr>
<tr>
<td>Benzothiazole</td>
<td>1,200</td>
</tr>
</tbody>
</table>