

Elevated Formaldehyde in Energy Efficient Homes

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Data on Formaldehyde in Homes

A study funded by California Air Resources Board (CARB) and the California Energy Commission indicated that many California homes built in 2003 do not have adequate ventilation. Homes with inadequate ventilation often have poor indoor air quality, including elevated formaldehyde.

Our research indicates that GreenPoint Rated homes have more formaldehyde than those in the CARB study. Increased formaldehyde is associated with decreased ventilation and increased use of manufactured wood products. GreenPoint Rated homes can be expected to have both decreased ventilation and manufactured wood. Build It Green has not obtained any data on indoor air quality in GreenPoint Rated homes.

In December 2007, Los Altos adopted a green building ordinance. Beginning January 2008, homes in Los Altos are built to the specifications required for GreenPoint Rated. Our testing found that new Los Altos homes have considerably more formaldehyde than homes in surrounding cities that were built in the same period. Two thirds of the new homes we tested in Los Altos had formaldehyde above 80 ppb. Median formaldehyde in the Katrina FEMA trailers was 77 ppb.

To date, we have measured formaldehyde in room air of 48 new unoccupied single-family homes in Santa Clara County. Of eleven homes with greater than 100 ppb formaldehyde, nine homes were GreenPoint Rated. Of four homes with greater than 120 ppb formaldehyde, three were GreenPoint Rated. Some of those GreenPoint Rated homes had nearly 300 ppb formaldehyde.

The California Office of Environmental Health Hazard Assessment (OEHHA) has set an Acute Reference Exposure Level of 55 $\mu\text{g}/\text{m}^3$ or 48 ppb for a 3-hour exposure. The OEHHA Chronic Reference Exposure Level (CREL) is 9 $\mu\text{g}/\text{m}^3$ or 7.3 ppb.

Build It Green & GreenPoint Rated

The GreenPoint Rated system is a program provided by Build It Green, a private organization located in Berkeley. Build It Green is not a governmental agency, nor is it a research organization. Build It Green does not have scientists or indoor air quality specialists on staff. They do not have data to support their claims that GreenPoint Rated homes are healthy.

We have urged Build It Green to require testing for formaldehyde, to require their optional item K8 on the GreenPoint Rated worksheet. The U.S. Green Building Council is discussing testing requirements for

LEED 2012. Unfortunately, Build It Green is resistant to testing. They have refused to disclose what percentage of GreenPoint Rated homes achieve item K8.

Build It Green encourages use of manufactured wood products in building homes. Engineered wood consumes less virgin timber, making it environmentally friendly. However, some engineered wood emits considerable formaldehyde.

Build It Green encourages energy conservation through insulating and sealing homes. This practice reduces energy needed to heat and cool a home. Unfortunately, the lack of fresh air allows contaminants to concentrate inside well-sealed homes.

Build It Green does not place equal emphasis on indoor air quality. The five points required for indoor air quality on the GreenPoint Rated worksheet can be obtained by:

1. Providing a binder explaining green features
2. No wood burning fireplace
3. Kitchen fan vented outdoors
4. Energy Star bathroom fan vented to outdoors
5. Moisture resistant materials in damp areas

Builders can accrue additional indoor air quality points by using low-VOC paints and finishes. However, the VOCs emitted from paints are a short-term concern, and they are easily remedied by temporary ventilation. Formaldehyde emission from engineered wood persists for decades.

Real Estate Industry

Real estate agents are resistant to addressing formaldehyde in homes. Agents typically give misinformation to buyers that ask questions. They often fail to disclose exposure to formaldehyde (a Prop 65 carcinogen). Therefore, we have shared our testing data with the California Attorney General and filed a 60-Day Notice of intent to sue.

Green Building Ordinances & Legal Liability

The City of Los Altos implemented their green building ordinance in January 2008. Elevated formaldehyde is found in homes built under that ordinance. The majority of those homes have more formaldehyde than the Katrina FEMA trailers.

The City of San Jose recently passed an ordinance requiring new homes to be GreenPoint Rated or LEED for Homes certified. Santa Clara County passed a similar ordinance in December 2008.

We urge government jurisdictions to consider the legal liability of requiring citizens to participate in private programs that can adversely affect their health. Occupants of the Katrina FEMA trailers experienced the effects of formaldehyde exposure. Many of those occupants became ill. FEMA has received considerable negative publicity, and litigation continues.

GreenPoint Rated is a chemical exposure experiment involving human subjects. Those subjects have not been informed, nor have they consented to participate. Such exposures are unethical and possible illegal.

Recommendations

Current building codes assure electrical and fire safety. Given recent trends in green building, steps are needed to assure acceptable indoor air quality.

Item K8 on the GreenPoint Rated worksheet requires formaldehyde to be less than 27 ppb. The Formaldehyde Council, Inc. indicates typical formaldehyde concentration in a home is 14 ppb. The Office of Environmental Health Hazard Assessment (OEHHA) has set a Chronic Reference Exposure Level (CREL) of 7 ppb ($9 \mu\text{g}/\text{m}^3$). However, our data show formaldehyde exceeds 80 ppb in the majority of GreenPoint Rated homes.

We recommend the City of San Jose take action to protect residents from formaldehyde exposure in homes. The following three recommendations are progressively more protective.

1. Require builders to test and report formaldehyde concentration (under discussion for LEED)
2. Require formaldehyde be less than 27 ppb (Item K8 on the GreenPoint Rated worksheet)
3. Require formaldehyde be less than 7 ppb (OEHHA Chronic Reference Exposure Level)

Formaldehyde concentration doubles for each 10° F increase in temperature. An appropriate test protocol would require windows and exterior doors closed and temperature at 78° F for 12 hours prior to testing.

I can be reached at (408) 998-4642 or NanoSafety@gmail.com.

Industrial Hygiene Services

Linda Kincaid, MPH, CIH

SUMMARY

Certified Industrial Hygienist (CIH) with two decades of experience in exposure assessment and regulatory compliance. Twelve years experience in semiconductor facilities monitoring toxic gas exposures. Can address complex exposure assessments, including potent compounds, indoor air quality, nanotechnology safety, radon, and radiation in building materials.

PROFESSIONAL EXPERIENCE

Industrial Hygiene Services (2006 – Present)

Industrial hygiene monitoring and exposure assessment. Specialize in chemical exposures in occupational and residential environments. Perform noise, indoor air quality, mold, asbestos, radon, radiation, and ergonomic assessments. Develop and deliver occupational safety and environmental health training. Developed protocol for assessing radiation in building materials. First to document uranium and radiation exposures in granite fabrication. Provided crucial information for CRCPD nationwide advisory note on radiation exposure to granite fabricators.

UC Berkeley (2003 - 2005)

Advanced graduate study in exposure assessment. Assessed UCB Microfab toxic gas monitoring system. Assisted with design of toxic gas monitoring system for new Microfab. Investigated nanotechnology safety issues.

SafeBridge Consultants, Inc. (2001 – 2002)

Performed exposure assessments for pharmaceutical potent compounds. Developed and presented safety training programs targeted for management and laboratory personnel. Assisted pharmaceutical and biotech clients across the United States.

UC Berkeley (1999 – 2001)

Graduate student – Received Master of Public Health with concentration in Industrial Hygiene.

Industrial Hygiene Services (1990 – 2000)

Tested and calibrated toxic gas monitoring systems to assure client compliance with the Toxic Gas Ordinance. Prepared calibration standards of highly toxic gases at ppm and ppb levels. Conducted noise monitoring, radiation monitoring, and ventilation surveys.

EDUCATION

Master of Public Health (MPH), Specialization in Industrial Hygiene – UC Berkeley

Bachelor of Science in Biology – San Francisco State University

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Industrial Hygiene Services

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Presentations & Activities

American Association of Radon Scientists and Technologists – Panel in 9/09
“Methods of measuring Radiation from Granite”
American Association of Radon Scientists and Technologists – Presenting 9/09
“Radioactive Granite: A Case Study & A Suggested Field Test Method”
Health Physics Society – Presented 7/09
“Implications of Granite Countertop Construction and Uses”
American Industrial Hygiene Association – Presented 6/09:
“Modeling Uranium Exposure during Granite Fabrication”
Semiconductor Environmental, Safety & Health Association – Presented 5/09
“Semiconductor Nanomaterials: Toxicology, Exposure Assessment, Controls”
Center for Environmental Research & Technology – Radon Speakers Bureau
Provide input on radiation in building materials to American Society of Mechanical Engineers
and Council of Radiation Control Program Directors

Continuing Education

Health Physics Society annual conference (2009)
American Industrial Hygiene Association annual conference (2009)
Semiconductor Environmental, Safety & Health Association Symposium (2009)
EPA: 3-day training in DC on Radon Resistant New Construction (2009)
NIOSH: 1-day symposium Occupational Health Effects of Nanomaterials (2008)
Lawrence Berkeley Lab: Symposium on Nanotechnology and Occupational Health (2008)
NanoScale Material Stewardship Seminar (2008)
American Association of Radon Scientists and Technologists annual symposium (2008)
Society for Risk Analysis: 3-day symposium in DC on NanoRisk Analysis (2008)
California Industrial Hygiene Council annual conference (2007)
EPA: 3-day training in DC on Indoor Air Quality (2007)

Professional Associations

American Industrial Hygiene Association – National & Northern California Section
American Board of Industrial Hygiene
American Association of Radon Scientists and Technologists
National Environmental Health Association

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Formaldehyde (ppb)	# GreenPoint Homes	# Non-GreenPoint Homes
>120	4/5	1/5
>100	9/11	2/11
>80	13/19	6/19
77 ppb	FEMA Trailer Average	
<80	5/28	23/28
<50	1/15	14/15
Total	18	29

Note – 9 of 11 homes with HCHO > 100 ppb are in Los Altos. Los Altos is the only community currently requiring GP Rated for all new homes.