

Interface Comments on June 2004 Draft Report for Public Review

Page 7&8

“Polycyclic Aromatic Hydrocarbons (PAHs) – PAHs, emitted from combustion sources such as cigarettes, woodstoves and fireplaces, include a number of known or suspected carcinogens. They have been found to adsorb onto particles in the air and deposit onto carpets, from which they can be re-suspended during vacuuming or other activity.”

“Pesticides and metals - Pesticides are widely used and can cause adverse developmental and neurological effects at elevated exposure levels. Some are very persistent in the environment, lasting 20 or 30 years or more. Carpet dust from homes and schools have been shown to contain numerous residues of pesticides, lead, mercury and other long-lasting contaminants. This is of special concern for very young children, who spend time on the floor and put their hands in their mouths, because ingestion is often the primary route of exposure.”

Comments: Mentioned again on page 37 in the report, the language under “Polycyclic Aromatic Hydrocarbons” seems to point the finger towards carpet when in fact, a hard surface floor can be several times worse than carpet. If both are maintained to the industry recommendations, these issues should be alleviated. If both are neglected, the carpet is more able to take the neglect and remove the dust/dirt by settling to the base where it is not easily accessible. The hard surface just allows it to stay on top, causing more exposure (especially to children playing on the floor).

The reference to “re-suspension from carpet” seems to point to the carpet as being the “source.” The true “sources” are the combustion sources themselves and they are what needs to be addressed. Re-suspension of particles during vacuuming is directly related to the efficiency of the vacuum cleaner. CRI has the Green Label Vacuum Cleaner program that should be followed. See this link:

http://www.carpet-rug.com/drill_down_2.cfm?page=8&sub=9

Removing the word “carpet” here is critical. Use this language instead:

Dust in homes and schools have been shown to contain numerous residues of pesticides, lead, mercury and other long lasting contaminants. This is of special concern for very young children, who spend time on the floor, where dust originating from cigarettes, fireplaces and wood stoves may settle and put their hands in their mouths, because ingestion is often the primary route of exposure.

See this paper:

Luedtke, Alan E., [Floor Coverings, Dust and Airborne Contaminants, August 2003](http://www.flooringsciences.org/e-journal/0407/0407_Luedtke_Dust-Airborne-Contaminants.pdf)
http://www.flooringsciences.org/e-journal/0407/0407_Luedtke_Dust-Airborne-Contaminants.pdf

Page 5 -“It has been reported in a handful of studies that blood lead levels for small children correlate with lead levels in house and carpet dusts....It should be noted that reported associations were not indicative of cause and effect. The fact that carpet dusts explained only a relatively small percentage of the variance in the data (Clark et al.) suggests other factors had a role. Carpet dusts may serve as a marker for the lead burden of the environment as a whole. Research to date has indicated lead can be especially difficult to remove from carpet, attributable in part to lead residing with very fine particles (<1um). Therefore, lead in carpet dust may not be readily available for exposure.”

Page 9 – “Although soil capacity for carpet was potentially quite high, it was not unusual for the reported differences in accumulated soils to be less than ten times that of smooth floors.”

Page 21 –“Despite the fact that carpet typically carried higher burdens of contaminants than smooth surfaces, it was extremely rare to find a study that reported a statistically significant contribution for carpet of contaminants in the air.”

“There was a substantial amount of data that indicated small particles <5 microns were not easily re-suspended. Note that this was likely a positive from the standpoint of exposure to lead (Pb), pesticides, PAH’s and PCBs, which were associated predominantly with sub-micron particles.”

Also see these papers which are all linked from the first issue of The International E-Journal of Flooring Sciences, published by the International Flooring Sciences Resource Center:
<http://www.flooringsciences.org>

Berry, Michael, A., A Systems Modeling Approach to Assessing Carpet and Environmental Risk, August 2003
http://www.flooringsciences.org/e-journal/0407/0407_Berry_Assessing-Carpet-Environmental-Risk.pdf

Ryan, P. Barry, The Impact of Carpet on Indoor Air Quality and Health Effects: An Annotated Bibliography, October 2003
http://www.flooringsciences.org/e-journal/0407/0407_ryan_carpet-iaq-health-effects.pdf

Lewis, Roger D. and Causer, Simon, Retention and Removal of House Dust Contaminants from Carpet: Integrating our Knowledge of Source Dusts, Carpet Properties, and Carpet Cleaning for a Healthier Indoor Environment, August 2003.
http://www.flooringsciences.org/e-journal/0407/0407_Lewis_Retention-Removal-House-Dust-Contaminants.pdf

Berry, Michael A., Carpet in the Modern Indoor Environment Summary of a Science-Based Assessment of Carpet, October 2003
http://www.flooringsciences.org/e-journal/0407/0407_berry_carpet-assessment-summary.pdf

Page 14:

“Industry and professional guidelines include the American Society of Heating, Refrigerating, and Air-conditioning Engineers’ (ASHRAE) ventilation requirements for assuring adequate indoor air quality, the Carpet and Rug Institute’s (CRI) Green Label Program, the Composite Wood Manufacturers’ voluntary formaldehyde limits, and a number of others. They vary in their degree of IAQ protection, but are widely used and generally have helped reduce indoor pollutants over the years.”

Need to mention Carpet and Rug Institute’s (CRI) Green Label Plus
http://www.carpet-rug.com/News/040614_GLP.cfm

Need to mention CA 01350
http://www.chps.net/manual/lem_table.htm

Need to mention Scientific Certification Systems' Indoor Air Quality Product Certification Program (PCP)

<http://www.scscertified.com/iaq>

South Coast Air Quality Management District Rule # 1168 (for adhesives),

Need to mention Scientific Certification Systems' Environmentally Preferable Product Certification

<http://www.scscertified.com/carpet>

Page 17 – Table ES3

Carpet is listed as a "source" next to the following pollutants: Formaldehyde, acetaldehyde, benzene derivatives, acrylates, naphthalene, phenol, other VOCs

Caution should be used when attempting to categorize items in order of highest priority. Carpet should not be in a higher priority category than cigarette smoking, paints, adhesives, etc. What are the sources for this information? They are not clearly cited. This table seems to insinuate that "all carpet" emits the listed chemicals and this is not true. Certain chemicals are more typical to specific kinds of carpet ---not ALL carpet

Page 26: "Dampness, mold, dirty carpeting, and pest infestations are often components of substandard housing, each leading to associated health problems, especially allergy symptoms and exacerbation of asthma attacks in asthmatics."

Comment: This seems to insinuate that all "carpet" is "dirty carpet." The moisture, pesticides, pests themselves and "lack of proper maintenance" are the causes and sources. The wording here needs to be changed to:

Moisture infiltration resulting in dampness and mold, improperly maintained carpeting, and pest infestations are often components of substandard housing, each leading to associated health problems, especially allergy symptoms and exacerbation of asthma attacks in asthmatics.

Page 31:

"In another European study cited by Delfino, elevated levels of benzene and styrene were associated with respiratory infections in newborns at risk for atopic disease, and wheezing was related to house painting and carpet installation during the first year of life."

It seems like selective information from this report is being reported here. Did ALL of the homes where wheezing occur have new carpet? Did they ALL have new paint? If not, then this has been taken out of context. If there is an issue with installation, it is usually an issue with adhesives. Most commercial carpet companies have now developed water-based adhesives that are low-emitting. This sounds like residential carpet that may have been applied with high emitting adhesives. It was also not necessarily subject to guidelines as strict as what it would be in California. Due to the fact this example is overseas, many of the factors make it a poor comparison to make for a scenario in California. This is an example of repetitive theme within this document for "carpet" being put into a broad category that does not apply to ALL carpet.

Page 34:

"Those pollutants are found in dry-cleaned clothing, ETS, cleaning agents, glued carpet, gasoline, and degreasers. The authors concluded that "Chemical concentrations resulting from 'off-gassing'

from normal household activities and materials can result in a health risk estimate that exceeds the benchmark used at hazardous waste sites”.

Glued carpet is mentioned as one of the materials that off-gases pollutants above a risk threshold considered to be hazardous. Here is a quote from earlier in the paragraph: "Indoor VOC concentrations from two studies completed in the 1980s (Wallace, 1987; Cohen et al., 1989) were used to determine the level of risk associated with VOCs measured inside residences."

The data used are from a 1980s study. It would be wrong to assume that carpet manufacturers are using the same glues, adhesives, formulations as they used in the 1980s. This study is not representative of modern carpet installations, particularly of Interface's.

Glued carpet is a vague term. With the assumption that you mean "carpet adhesive" when you say "glue", it is important to note that this section, like sections before it makes a broad blanket statement that is not applicable to ALL carpet or ALL carpet adhesives. While this may be an issue with some residential adhesive products (in other countries, as the study notes), not all carpet adhesives are high emitting. There are many low emitting water based adhesives available for commercial carpeting today, and they are widely used.

Pages 34 and 35:

"Identifying a cause for SBS has been elusive. Mendell (1993) conducted a review of the epidemiological literature related to SBS. In reviewing 32 studies, he found consistent findings linking SBS symptoms with air-conditioning, **carpets**, more workers in a space, Video Display use, and ventilation rates at or below 10 liters/second/person. With specific causes unidentified, Mendell stressed the importance of using prudent design, operation, and maintenance practices to prevent sick building symptoms."

Comments: The official definition of "Sick Building Syndrome" makes it clear that it is non-specific, meaning that it cannot be tied to any single source, yet this document proceeds to single out other "potential" sources simply as "sources." It also does not give the same detail on carpet that it does on the other things. Simply putting "carpet" here in this context is irresponsible and inappropriate.

Page 36:

"These particles become trapped in **carpets** and have been shown to persist for a very long time, due to the difficulty of removing all particles by vacuuming, and may be re-suspended into the air."

Comment: This statement is misleading, indicating that they persist in carpets longer than on other surfaces, and also insinuating that they only "persist" in carpet. A better way to say this would be:

These particles become trapped **in/on building surfaces** and have been shown to persist for a very long time, due to the difficulty of removing all particles **with regular cleaning procedures.**

See the comments and references for Pages 7&8 above.

Page 40:

"Indoor surfaces **such as carpets and draperies** attract and re-emit particles (Thatcher and Layton, 1995, Kamens *et al.*, 1991). **Particle concentrations from carpets can be high even in homes where good cleaning practices are used.** The particles can become re-entrained in the indoor air when people walk or play on the carpeted surface (Wallace 2000a; Roberts and Dickey 1995; Abt *et al.*, 2000, Vette *et al.*, 2001)."

Comments: Singling out carpet and draperies here is inappropriate and the particle concentrations are not "from the carpets." They are emitted from other sources and end up on the carpets. Get rid of the particles—not the carpets.

It would be better to say this:

Soft or porous interior surfaces have the potential to attract particles that can potentially be re-emitted (Thatcher and Layton, 1995, Kamens *et al.*, 1991). Particle concentrations from carpets can be high even in homes where good cleaning practices are used. The particles can become re-entrained in the indoor air when people walk or play on the carpeted surface (Wallace 2000a; Roberts and Dickey 1995; Abt *et al.*, 2000, Vette *et al.*, 2001). The Solutia study disproved this theory.

Page 40:

"Particles in carpet pose an additional risk to children. House dust particles include vapors*, metals, and semi-volatile chemicals, such as pesticides and some PAHs, that have their own toxic properties..."

Comment: The particles pose the risks, not the carpet.
"additional risk" ---additional to what?

It should be stated like this:

Particles in house dust, such as metals, and semi-volatile chemicals such as pesticides and some PAHs that have their own toxic properties...

*Vapors are not particles. You have stated that they are.

Page 49:

"Ozone generators can destroy microorganisms and gases, but only at concentrations unsafe for occupied spaces. In addition, ozone from ozone generators can react with indoor surfaces, such as latex paint and carpet, or airborne chemicals, including the fragrance compounds from commercial air fresheners, to produce toxic and irritating byproducts such as formaldehyde..."

Comment: The problem here is the ozone generator. The language translates the blame to the interior surfaces. This is not appropriate. We know of no scientific data supporting the allegation that formaldehyde is formed when carpet is exposed to ozone. Ozone generators can demean many other interior products in addition to paint and carpet.

Page 49:

"Formaldehyde is a pungent smelling gas emitted from numerous indoor sources. These include many building materials (especially pressed wood products), most carpets, composite wood furnishings, consumer products, personal care products and cosmetics, permanent pressed..."

It is not accurate to say that "most carpets" emit formaldehyde.

Page 51:

"When modeling was conducted on emissions from acoustical ceiling panels, a carpet, medium density fiberboard, gypsum board, resilient flooring (non-rubber based), and thermal insulation, room concentrations were estimated to exceed 16.5 µg/m³ (13.5 ppb), the upper bound allowed for formaldehyde contribution from a single product under Section 01350 guidelines. The nine products with elevated emissions account for 11% of the items tested in this study. Formaldehyde was detected in additional product categories at lower levels."

Pages 50, 51 and 56: The study cited (CIWMB) had several problems with it. There was a lot of controversy about the testing methods, sampling methods and possibility of cross contamination due to chemicals from known materials showing up in samples that did not have those materials. This study not used unless proper justification can be made for the particular references, particularly to carpet. Otherwise, it is introducing severely controversial results.

According to the referenced CIMWB report, seven of the samples received for testing were carpet tiles and the rest were broadloom. Of the 13 samples, the date of manufacture was only known for eight samples. The samples tested ranged in age from 4-634 days. This is in direct conflict with Section 01350 which states the testing should be conducting in keeping with ASTM D5116-97, which clearly recommends that samples should be tested within five to seven days of manufacture. The unknown age and exposure history of the some of the samples presents unknown test variables, preventing the ability to draw firm conclusions from the test data, and therefore rendering the results and conclusions for the samples of unknown age to be unreliable.

The CIMWB report also made the assumption that since some of the products were obtained commercially and the manufacture date was unknown, that the situation would be more representative of those a consumer might acquire in the marketplace. While that assumption may be true for residential broadloom carpets, it is NOT true for the commercial carpet tile market where the majority of orders are made to order in specific quantities for specific customers. We believe the assumption of "real world" exposures due to unknown sample age was misguided in the CIMWB report.

ASTM Standard D5116-97 used for Section 01350 also clearly states that there must be chain of custody documentation and verification. There was no evidence in the CIMWB report of the chain of custody protocols used for the testing. The varied ages and means of sample collection also strongly suggested that no chain of custody was followed. It is Interface's position that the sampling collection, chain of custody, and possibly even the sample identification were flawed.

The published results of the CIMWB study showed a sample identified by the Department of Health Services to be an Interface Flooring Systems sample. The report indicated that the sample contained the presence of 4-phenylcyclohexene (4-PCH), which is known to be emitted from SBR Latex. Carpet tiles do not contain SBR Latex and it was therefore not used in the manufacture of any of the products that Interface submitted for the CIMWB test. This indicates that there was a sample identification error or an issue of cross contamination from other material samples. That being the case, the test was flawed.

The CIMWB results went on to say that two test samples submitted by Interface failed to meet the Section 01350 requirements for indoor air emissions, which Interface believed to be wrong. On August 8, 2003, Interface submitted samples of the same products to an independent laboratory (Berkeley Analytical Associates) for testing under the Section 01350 protocol. Each sample submitted passed.

For the reasons aforementioned, it is our position at Interface that the CIMWB study is an inappropriate reference to use in your report to the California Legislature.

Page 51:

Floor finishing materials such as carpet and vinyl flooring may also emit formaldehyde. In a study funded by the ARB, Hodgson (1999) measured the formaldehyde emissions of several flooring products. Results for formaldehyde emissions at 24 hours showed:

- Carpet emissions were generally below the limit of detection of 1 µg/m³.
- One carpet cushion had an emission rate of 8 µg/m²/hr.
- Seam tape applied to carpet had an emission rate of 5 µg/m²/hr.
- Emissions from five different sheet vinyl flooring samples were less than or equal to 4 µg/m²/hr.
- Adhesives applied to sheet flooring and cove base had emission rates ranging from 72 to 258 µg/m²/hr.
- When the vinyl flooring or coving was placed on top of the adhesive, the surface product served as a relatively effective barrier, causing a drop in emissions.

Carpet and vinyl are not the only two types of flooring that can emit formaldehyde. Why are they singled out? Looking further down, the study shows that carpet emissions were below the detectable limit. The first reference is misleading. The problem is not the "carpet." It is the adhesive or the cushion and the seam tape.

Page 54:

VOCs include a variety of chemical properties and functional groups: alkanes, alcohols, esters, ethers, and aromatic compounds. Indoor sources of VOCs include building and furnishing materials such as carpet, paint, and vinyl flooring; consumer products such as air fresheners, adhesives, and cleaning agents; water treated with chlorine; dry-cleaned clothing; environmental tobacco smoke; plastic products, computers, and others.

Comments: VOCs are everywhere. VOCs result from simple things like breathing. This paragraph has singled out certain products. The better way to word this would be:

VOCs include a variety of chemicals such as: alkanes, alcohols, esters, ethers, and aromatic compounds. Potential indoor sources of VOCs include building and furnishing materials such as carpet, paint, and vinyl flooring; consumer products such as air fresheners, adhesives, and cleaning agents; water treated with chlorine; dry-cleaned clothing; environmental tobacco smoke; plastic products, computers, and others.

Page 56:

Most recently, emission testing funded by CIWMB indicates that building materials potentially can emit enough VOCs to produce potentially harmful levels (Alevantis, 2003). Several products exceeded the Section 01350 guideline levels as follows:

- Carpet exceeded the emission rate limits for naphthalene and acetaldehyde.

Comment: Harmful levels of what??

See comments on CIMWB study above.

In another study, Hodgson (1999) identified 17 toxic air contaminants in the emissions from carpet, vinyl flooring, and latex paint. These toxic compounds are routinely emitted to the indoor environment, particularly in new or recently remodeled homes and offices. Table 2.6 contains a list of TACs identified by Hodgson in building material emissions. In addition to TACs, all of the bonded urethane carpet cushions emitted butylated hydroxytoluene (BHT), an irritant, and all carpet samples emitted 4-phenylcyclohexene (4-PC), the compound largely responsible for new carpet odor.

The Hodgson (1999) study indicates that all carpet samples emitted 4-PC. This chemical is known to be emitted from one particular class of carpet, not all carpet types. SBR Latex is the main source of 4-PC.

Table 2.6. Toxic Air Contaminants in Building and Finishing Materials

Carpet and Cushion

Toluene m,p-Xylene Toluene
m,p-Xylene Ethylene glycol m,p-Xylene
o-Xylene 2-(2-Butoxyethoxy)ethanol o-Xylene
Styrene Formaldehyde Styrene
Ethylene glycol Acetaldehyde 1,2,4-Trimethyl benzene
Formaldehyde Naphthalene
Acetaldehyde Acetophenone
Acetophenone Phenol
2-(2-Butoxy)ethanol Formaldehyde
Ethylbenzene Acetaldehyde
Tetrachloroethane
Naphthalene
Phenol

It is obvious that only a few kinds of carpet were tested here. The VOC emissions associated with certain types of carpet with different intended uses are being mixed. Tests of one or two specific kinds of carpet are being generalized to the whole.

See comments on CIMWB study above.

Page 64:

House dust mites, cockroaches, and animal dander are all known allergens for sensitive individuals. House dust mites are microscopic organisms that live on human skin cells and other organic material. Consequently they are found in **carpets**, bedding, and sofa cushions.

See this paper:

Luedtke, Alan E., [Floor Coverings, Dust and Airborne Contaminants, August 2003](#)

http://www.flooringsciences.org/e-journal/0407/0407_Luedtke_Dust-Airborne-Contaminants.pdf

Page 7: Referring to Munir et al, Luedtke reported, "They also included data which separated mite allergen loading in rooms with and without carpet...Bedrooms were significantly higher than living rooms (p,0.01). Carpet was not significantly different from hard surfaces in allergen concentration per gram of dust."

Page 9: "Although soil capacity for carpet was potentially quite high, it was not unusual for the reported differences in accumulated soils to be less than ten times that of smooth floors."

Page 19: "As indicated earlier, loadings of dust mite allergen can range widely in dusts from carpet, upholstery, and bedding, but airborne levels do not appear to correlate....Although carpet has frequently been identified as a nest for dust mites, it does not appear that it plays a major role in airborne exposures."

Page 21: "Despite the fact that carpet typically carried higher burdens of contaminants than smooth surfaces, it was extremely rare to find a study that reported a statistically significant contribution for carpet of contaminants to the air...There was no correlation between dust mite allergen loads in carpet and airborne concentrations."

Page 65:

Two classes of widely used insecticides in the U.S. are the organophosphates and pyrethroids, both are neurotoxins. Neurological signs resulting from acute toxicity may include nausea, headaches, dizziness, and general weakness. Pesticides are often measurable **in house dust and carpet dust**; levels of contamination are discussed below. The effects of pesticides on children are a particular concern because their behavior can lead to greater exposure than to an adult. Children spend time on the floor where they contact dust that may contain pesticides. The hand-to-mouth behavior of young children may lead to ingesting pesticides.

House dust and carpet dust are the same thing. It is house dust that ends up in the carpet. The carpet does not generate the dust. Other "sources" create the dust that can compromise the carpet. By calling it "carpet dust" it is alluding that the carpet generates the dust. This is not true.

See comments on pesticides in carpets above.

Luedtke, Alan E., *Floor Coverings, Dust and Airborne Contaminants*, August 2003

http://www.flooringsciences.org/e-journal/0407/0407_Luedtke_Dust-Airborne-Contaminants.pdf

Page 68:

Mean concentrations of all detectable **pesticides in carpet dust** ranged from 0.01 µg/g to 15.4 µg/g. The mean concentrations for chlorpyrifos and diazinon in carpet dust were 5.8 µg/g and 1.7 µg/g, respectively.

Once again, the carpet does not generate the dust. The dust is generated by other sources, so it is not "carpet dust." This should be redone to say:

Mean concentrations of all detectable **pesticides captured in the carpet** ranged from 0.01 µg/g to 15.4 µg/g. The mean concentrations for chlorpyrifos and diazinon **found captured in the carpet dust** were 5.8 µg/g and 1.7 µg/g, respectively.

See comments on pesticides in carpets above.

Luedtke, Alan E., *Floor Coverings, Dust and Airborne Contaminants*, August 2003

http://www.flooringsciences.org/e-journal/0407/0407_Luedtke_Dust-Airborne-Contaminants.pdf

Page 69:

Much of the lead present in indoor air appears to result from the infiltration of lead particles in outdoor air. Tracked-in and infiltrated lead dust **can accumulate in carpets that can serve as a reservoir for lead-laden dust** (U.S. EPA, 1997a). Research has shown that lead-dust loadings and concentrations per unit mass of dust are correlated with blood-lead levels, but no causal effect can be inferred from this association. Children's mouthing behaviors and activities that put them in direct contact with lead-contaminated surfaces increase their probability for exposure to lead by ingestion.

See comments on pesticides in carpets above.

Luedtke, Alan E., [Floor Coverings, Dust and Airborne Contaminants, August 2003](#)

http://www.flooringsciences.org/e-journal/0407/0407_Luedtke_Dust-Airborne-Contaminants.pdf

Page 104:

Conventional building materials such as vinyl flooring, carpet, paint, cabinets, and composite wood products can be strong indoor sources of VOCs with a major impact on human health.

The key here is "can be." It alludes to the fact that this is a probability, which is inaccurate.

Page 106:

Concerns remain regarding **carpets** contribution to population exposures to formaldehyde and other potentially carcinogenic VOCs.

Need to be more specific to the kinds of carpet that continue to rate this concern with formaldehyde and need to be clear on what other carcinogenic chemicals are still of concern with carpet.

The mention of CRI's air quality testing standard is good in this section but the reference should be to the Green Label Plus.

http://www.carpet-rug.com/News/040614_GLP.cfm

Page 120:

Ionizers, or negative ion generators, cause particles to stick to materials near the ionizer (such as the carpet and walls).

The ionizers are the problem. Not the carpet. This wording might lead someone to eliminate the carpet and keep using the ionizer. Better wording is needed. Here is a suggestion:

Ionizers, or negative ion generators, can compromise other product investments when ionized particles stick to soft surfaces near the ionizer.

Page 123:

Low-emitting carpets, no-formaldehyde furniture, and non-toxic cleaning products are currently available, and **would grow** in market share.

Use this wording instead:

Low-emitting carpets, no-formaldehyde furniture, and non-toxic cleaning products are currently **readily** available, and **whose market share is growing**.

Page 124:

Table 6.1. Prioritization of Pollutant Sources for Mitigation

This table shows carpet as a "source." In many cases it is not the "source." Other things adsorb onto it. When carpet is a "source" of a particular pollutant, it is not broadly applicable to all kinds of carpet.

