November 20, 2000

Ms. Penny Bonda
Chair, LEED Commercial Interiors Steering Committee
U.S. Green Building Council
1015 18th Street, N.W.
Suite 805
Washington DC 20036

Re: Comments on LEED CI Draft Proposed Rating System

Dear Ms. Bonda:

The Vinyl Institute, Inc. (VI) appreciates the opportunity to submit these comments on the U.S. Green Building Council's (USGBC) Leadership in Energy and Environmental Design Commercial Interiors (LEED CI) draft proposed rating system.[1]

These comments supplement our letter of November 3. Since that time, Mark Sofman of our staff attended the LEED CI's pre-charrette on November 8, and, in keeping with our request, we received materials from you used by the USGBC to support its proposed its Green Building Rating System Version 2.0 "Materials Credit 9: Alternative Materials."

Unfortunately, neither the pre-charrette nor the materials we subsequently received adequately addressed serious issues, raised in our November 3 letter, related to the USGBC's standards development process in general and proposed Materials Credit 9 in particular. For purposes of brevity, we will not in this letter completely restate the issues we discussed in our November 3 letter, but rather will focus on the deficiencies of the materials we obtained from USGBC and on proposed Materials Credit 9.

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[1] The Vinyl Institute, Inc. (VI) is a U.S. trade association representing the leading manufacturers of vinyl, vinyl chloride monomer, vinyl additives and modifiers, and vinyl packaging materials. The Institute has a dual charter to promote and protect the industry and the markets it serves. The VI's mission is to gather and communicate technical information to support the responsible manufacture, use and disposal of vinyl products, to build recognition among a wide range of stakeholders on the benefits and value of vinyl, and to maintain a level playing field with other materials. VI member companies include: Borden Chemicals and Plastics Limited Partnership, CertainTeed Corporation, The Dow Chemical Company, Formosa Plastics Corporation, U.S.A., Kaneka Delaware Corporation, Georgia Gulf Corporation, Oxyvinyls, LP, PolyOne Corporation, and Shintech, Inc.

I. Procedural Issues

As we stated in our November 3 letter, although USGBC describes itself as a consensus-based organization, the procedural framework under which Materials Credit 9 is being developed does not satisfy the criteria for developing voluntary consensus standards. For example, the paper by Joe Thornton, Ph.D., discussed below, which appears to be the sole basis for proposed Materials Credit 9, is 88 pages in length, and contains approximately 300 footnotes. If an open, fair, and deliberative consensus process is sought, then USGBC cannot properly provide such a short period of time to review such a document. In this regard, we note that our request for an extension of the due date for comments on Dr. Thornton's paper was denied. The absence of adequate lead-time, as well as the inability to meaningfully review and respond to relevant issues, undermines the consensus process and risks converting USGBC from a consensus driven organization into an advocacy group.

II. Basis for Proposed Materials Credit 9

Proposed Materials Credit 9 appears to have been based solely on an undated document entitled "The Environmental Health Impacts of Polyvinyl Chloride (PVC) Building Materials," prepared by Joe Thornton, Ph.D., of the Columbia Earth Institute, Columbia University, for the U.S. Green Building Council, "under the direction of the Center for Maximum Potential Building Systems and the Healthy Building Network." The stated purpose of Dr. Thornton's paper is "to show that the lifecycle of [vinyl] represents a significant hazard to human health and the environment." Dr. Thornton acknowledges that the paper was prepared in support of the USGBC's proposal to incorporate into the USGBC's LEED CI standard a credit for eliminating the use of virgin PVC and other chlorinated plastics, and states that "in considering this proposal, USGBC requested separate 'presentations' of the arguments for and against the view that PVC is not a green building material."

We are troubled by the lack of objectivity of the stated purpose of Dr. Thornton's paper, which by its terms, is not to perform an objective review of vinyl, but rather is to provide arguments solely in favor of the elimination of vinyl as a building material. With respect to USGBC's request for "presentations" against the view that PVC is not a "green" building material, it appears that USGBC did receive such presentations, or did so and did not provide them to us in response to our November 3 request. We respectfully request clarification with respect to this issue.

Turning to the paper itself, Dr. Thornton's basic conclusion is that:

> when the entire lifecycle of PVC is considered, it is apparent that PVC is one of the most environmentally hazardous materials in production. Vinyl production, use and disposal is [sic] responsible for the genreration [sic] of very large quantities of persistent, bioaccumulative and toxic pollutants and releasing them into the global environment. Available data suggest that PVC has contributed a significant portion of the world's burden of persistent organic pollutants and endocrine disrupting chemicals, including dioxins and phthalates, that have accumulated universally in the environment and the bodies of the human

population . . . PVC is the antithesis of a green building material. Efforts to speed adoption of safer, viable substitute building materials can have significant, tangible benefits for human health and the environment.

While we have not had adequate time to comprehensively review Dr. Thornton's paper, based on our preliminary review, significant deficiencies exist due to misrepresentation and mischaracterization of underlying data. Dr. Thornton's paper contains a number of misstatements and inaccuracies regarding the production of vinyl and its impact on the environment throughout its lifecycle.

All manufacturing processes that extract raw materials from the earth to produce products have environmental burdens and generate toxic or hazardous by-products or wastes. All of these processes consume energy, a manufacturing process that has its own environmental burdens. These toxic and hazardous materials are well documented in various federal agency rulemakings, making it unnecessary for USGBC to develop new novel lists. The attempt by Dr. Thornton to have USGBC focus on one material or one subset of toxic chemicals is myopic in approach.

For purposes of brevity, and because we only received a complete copy of Dr. Thornton's paper on November 10, we cannot in this letter respond to each and every misstatement and inaccuracy regarding vinyl that appear in the paper. Instead, we respectfully request that the LEED CI Steering Committee review this and our November 3 letter and all of the attached documents, which provide a significant amount of truthful and factual information regarding vinyl that refutes much of Dr. Thornton's allegations. Below, we briefly respond to certain of the issues raised in Dr. Thornton's paper.

A. Safety of Vinyl and Its Precursors

Vinyl is not toxic or hazardous. Indeed, in a preamble to a Toxic Substances Control Act (TSCA) rulemaking, the U.S. Environmental Protection Agency (EPA) acknowledges the safety of high molecular weight polymers, such as PVC, as a class.[2] Today, commercial vinyl resin contains less than 1 part per million (ppm) by weight VCM as a residual monomer, and, thus, measurable exposure to VCM in the general PVC fabrication workplace is not expected. In 1977, a study of more than 15,000 workers in vinyl fabrication plants (plants that convert vinyl resin or compound into finished products) found no evidence of VCM-related health effects in that group.[3]

With respect to vinyl's precursors, data indicate that risks to workers due to exposure to vinyl chloride monomer (VCM), and ethylene dichloride (EDC), vinyl precursors, have been virtually eliminated. Further, the U.S. Occupational Safety and Health Administration (OSHA)

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[2] 60 Fed. Reg. 16,316, 16,322 (March 29, 1995) ("this category of high [molecular weight] polymers . . . as a class in general, is considered to be one of the safest categories of chemicals in commerce").

[3] The following studies all support the conclusion that exposure to VCM in fabrication facilities is unlikely: "Process Emissions for Vinyl Pipe Industry," published in the Journal of Vinyl & Additives Technology (September 1996, vol. 2, No. 3), "Emissions from Processing Thermoplastics," Rapra Technology Ltd., Shawbury, Shrewbury Shropshire SY4 4NR, U.K. Published in Ann. Occup. Hygiene Vol. 39, No.1 pp. 35-53, and "Thermal Degradation Products of Polyethylene, Polypropylene, Polystyrene, Polyvinylchloride, and Polytetrafluoroethylene in the Processing of Plastics," Nordic Council of Ministers, Arbetslivsinstitutet 1998:12.

oversees all workplace standards related to vinyl production, and, in 1975, established an eight-hour time weighted average occupational exposure limit for VCM of 1 ppm (part per million), and an action level of 0.5 ppm, to protect workers.

Studies also have revealed no local community health risks from EDC/VCM manufacturing sites. Based on the physical and chemical properties of VCM, it is safe to say that the greatest risks of exposure exist in workplaces and local environment of PVC and EDC/VCM manufacturing sites. However, EPA estimates that the industry's VCM emissions have been reduced by over 99 percent since new workplace standards were introduced in the 1970's, when a link was made between extremely high, prolonged exposure levels to VCM among vinyl production workers and a rare form of liver cancer, angiosarcoma. Angiosarcoma has also been linked to thorium dioxide given medically, arsenic given medically and, perhaps, to the use of anabolic steroids.

Several independent studies have examined angiosarcoma in the general population and exposure to VCM, as well as correlations between exposure and other types of cancer. These include studies conducted by the U.S. Centers for Disease Control and specific reviews conducted in the states of New York and Wisconsin, and in Great Britain, Sweden, Holland, and Canada. In no case could a correlation be found. EPA representatives have further stated that the Agency has been unable to establish a link between living near a VCM/PVC manufacturing site and angiosarcoma.

Although it is indisputable that EDC and VCM are released from EDC/VCM and PVC manufacturing processes, the figures cited in Dr. Thornton's paper are outdated and grossly overstate EDC and VCM emissions. For example, while Dr. Thornton's paper recognizes that these substances degrade in the environment, it fails to fully appreciate the significance of such degradation on environmental and health effects.

U.S. releases of EDC and VCM are closely monitored by EPA and are reported to the public annually. The attached VI report "Performance Report for the Vinyl Industry" provides information on current and past releases of these chemicals, and shows the significant improvements made by the vinyl industry with respect to releases of these substances to the environment as part of its commitment to continuously improve its health, safety, and environmental performance.

B. Vinyl Chloride Issues

There also is no conclusive epidemiological evidence proving that brain tumors might also be linked to VCM exposure. The third follow-up report of over 10,000, US workers exposed to vinyl chloride monomer prior to 1972 was recently completed. Before this update, an excess of brain tumors had been observed in the cohort for this study. Whatever the cause of the earlier excess, this update indicates its influence has diminished substantially over time. One facility in Louisville, Kentucky with high excesses of brain cancers in the study mentioned above was recently researched. The study confirmed that workers at a Louisville, Kentucky, vinyl chloride monomer plant have a higher than normal rate of brain cancer deaths, but said it could find no evidence that it was related to VCM exposure. The study, prepared by the University of

Louisville, also reported there is no evidence that current employees who work at the plant are at risk for brain cancer.

The "Update of the Follow-up of Mortality and Cancer Incidence among European Workers Employed in the Vinyl Chloride Industry" (IARC September 2000) reported that brain cancer was of *a priori* interest because earlier epidemiological studies of VC-exposed workers found evidence for an excess of brain cancer. However, evidence for an association of brain cancer with VC exposure in this most recent IARC study was generally negative, although a few elevations were noted in subgroups.

Recently, EPA published an updated Toxicological Profile and Summary Health Assessment for VCM in its Integrated Risk Information System (IRIS) database. The cancer unit risk estimate (inhalation) reported by EPA is 20 times lower than the previous EPA estimate. Moreover, EPA now states that "[b]ecause of the consistent evidence for liver cancer in all the studies . . . and the weaker association for other sites, it is concluded that the liver is the most sensitive site, and protection against liver cancer will protect against possible cancer induction in other tissues."

C. Vinyl and Dioxin

The question of polychlorinated dibenzo-*p*-dioxin and furan ("dioxin") emissions from EDC/VCM/PVC facilities also has been thoroughly researched, as the VI soon will complete one of the largest voluntary dioxin characterization programs ever undertaken. The contribution these facilities make to overall dioxin emissions in the United States is small. Taken together, the data generated by the vinyl industry's dioxin characterization study indicate that the EDC/VCM/PVC production chain is likely accountable for only about 13 grams of dioxin equivalents to air, land and water, or less than one-half of one percent of the approximately 3,000 grams EPA estimates is emitted to these media each year (based on 1995 data).

In sections of his paper, Dr. Thornton does a careful job to review the literature that supports his position that (1) dioxins and furans are virtually exclusively manmade and (2) dioxins and furans accumulated in the environment consistent with the growth of the industrial use of chlorine. He is careful to marginalize or ignore the most relevant fact for people today: **Dioxin emissions to the environment have been declining over the past thirty years, in some cases to pre-chlorine-industry levels.**

It is probably true that dioxins and furans are largely anthropogenic, although there are interesting examples of breathtakingly high concentrations of apparently primordial dioxins in clay.[4] Thornton dismisses findings of dioxins and furans in pre-chlorine-industry soil and herbage as possible laboratory contamination and urges their replication, but doesn't explain that the experiments were repeated and republished using exceptional means to avoid

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[4] Ferrario, J., Byrne, C., Lorber, M., Saunders, P., Leese, W., Winters, D., Cleverly, D., Schaum, J., Pinsky, P., Deyrup, C., Ellis, R., Walcott, J., "A Statistical Survey of Dioxin-like Compounds in United States Poultry Fat" *Organohalogen Compounds* **32**, 245 (1997). Comments from one of the authors at Dioxin '97 indicated the source of dioxin contamination in a subset of the poultry samples arose from ball clay used as an additive in chicken feed.

contamination.[5,6,7] The dioxins and furans are truly there in the mid-1800's, well before industrial chlorine. Moreover, after the mid-1900's rise, the decline of dioxins and furans in these samples is dramatic: 1990 levels were the same as those in 1940, and very similar to those at the end of the 19th century.[8]

A much more complete and apolitical study of the history of dioxin in the environment appeared in a peer-reviewed journal of the American Chemical Society, Environmental Science and Technology.[9] Within its 91 references, authors Kevin Jones and Ruth Alcock of Lancaster University in the United Kingdom (UK) temper Thornton's analysis somewhat by noting that the rise in dioxins and furans occurs variously between the 1930s and 1960's. The authors find it curious that the authors of Thornton's key studies, Czuczwa and Hites find no dioxins and furans prior to 1940, but Kjeller and Rappe[10] find them in all sediment cores dating back to 1882, and Kjeller *et al*. finds them in the aforementioned archived soil and herbage samples dating to the mid-1800s. Alcock and Jones express the concern that Hites' lab may not have had the sensitivity to detect these materials in the early-1980's when their analyses were performed.

Alcock and Jones catalog the fall of dioxins in the ecological record after 1970, and that fact is critical, stating "the evidence reviewed here suggests that PCDD/F emissions to the environment in Europe and North America increased post-1940, probably reaching a peak in the 1960s/1970s before declining through the late 1970s, 1980s and early 1990s."

Every sediment article cited by Thornton in press at the time was cited by Alcock and Jones. Beyond those Thornton cites, however, are additional studies of sediment, as well as soil, herbage, wildlife, eggs, blood, milk, air and other samples that present the same consistent picture. Thornton's analysis only detracts from the completeness of the picture provided by Alcock and Jones.

In his rush to indict, Thornton doesn't even entertain the possibility that the rise is not due to the chlorine industry at all, but is due to the extensive use of open burning for waste disposal, particularly in the United States. Contrary to Thornton's assertion that the issue is "not settled" —his approach when evidence is clear and not in his favor--it is well known that

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[5] Alcock, R. E., McLachlan, M. S., Johnston, A. E., Jones, K.C. "Evidence for the Presence of PCDD/F in the Environment Prior to 1900 and Further Studies on Their Temporal Trends," *Environ. Sci. Tech*. **32**, 1580-1587 (1998).

[6] Baker, J. I.,Hites, R. A. **"**Comment on "Evidence for the Presence of PCDD/Fs in the Environment Prior to 1900 and Further Studies on Their Temporal Trends"**,** *Environ. Sci. Tech.* **33***,* 205-205 (1999).

[7] Alcock, R. E., Jones, K. C., McLachlan, M. S., Johnston, A. E. "Response to Comment on "Evidence for the Presence of PCDD/Fs in the Environment Prior to 1900 and Further Studies on Their Temporal Trends", *Environ. Sci. Tech* **33**, 206-207 (1999).

[8] Kjeller, L. O., Jones, K. C., Johnston, A. E., Rappe, C., "Evidence for a Decline in Atmospheric Emissions of PCDD/F in the UK," *Environ. Sci. Tech*. **30**, 1398-1403 (1996).

[9] Alcock, R. E., Jones, K. C., "Dioxins in the Environment: A Review of Trend Data," *Environ. Sci. Tech*. **30**, 3133-3143 (1996).

[10] Kjeller, L. O. and Rappe, C., "Time Trends in Levels, Patterns and Profiles for Polychlorinated Dibenzo-p-dioxins, Dibenzofurans, and Biphenyls in a Sediment Core from the Baltic Proper," *Environ. Sci. Tech*. **29**, 346-356 (1995).

combustion of salt and cellulose or salt with other waste generates dioxin, particularly if done under poor combustion conditions.[11,12,13]

It is also well known that open burning is a relatively highly-polluting process—whether as dioxins and furans or as other products of incomplete combustion.[14,15] What's more, open burning occurred virtually everywhere, just as the rise in dioxins and furans occurred virtually everywhere—even though the chlorine industry was localized in a few areas. Finally, the switch from open burning to landfilling as the main mode of disposal occurred about the same time as the decline in dioxin.

And while Thornton and Greenpeace would like to blame the pollution from open burning on PVC, it should be noted that the rise of dioxin—if occurring in the 1940's as Thornton suggests--occurred prior to the widespread use of PVC. Some of the studies omitted by Thornton show decline in recent years; other studies are shown graphically or mentioned in the Alcock and Jones text.

Plot (a) from Figure 1 on page 3135 of Alcock and Jones shows data from sediment cores reported by Smith *et al.*[16] and by Czuczwa and Hites.[17] Both studies show significant decline post-1970, with cores taken only up to 1985.

However, Alcock and Jones also mention a study by Hagenmaier at Lake Constance that follows dioxin deposition up to 1995.[18] Deposition peaked circa 1965, and the slice dated 1993 was nearly as low as the slice dated 1933.

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[11] Vikelsoe, J., Nielsen, P. R., Blinksbjerg, P., Madsen, H., Manscher, O. "Significance of Chlorine Sources for the Generation of Dioxins During Incineration of MSW," *Organohalogen Compds*, **3**, 193-196 (1990).

[12] Hatanaka, T., Imagawa, T., Takeuchi, M. "Formation of PCDD/Fs in artificial solid waste incineration in a laboratory-scale fluidized bed reactor" *Organohalogen Cmpds* **41**, 161-164 (1999).

[13] Pandompatam, B., Kumar, Y., Liem, A. J. "Comparison of PCDD and PCDF Emissions from Hog Fuel Boilers and Hospital Waste Incinerators," *Chemosphere* **34**, 1065-1073 (1997).

[14] Lemieux, P. M. "Evaluation of Emissions from the Open Burning of Household Waste in Barrels" EPA-6--/R-97-134a.

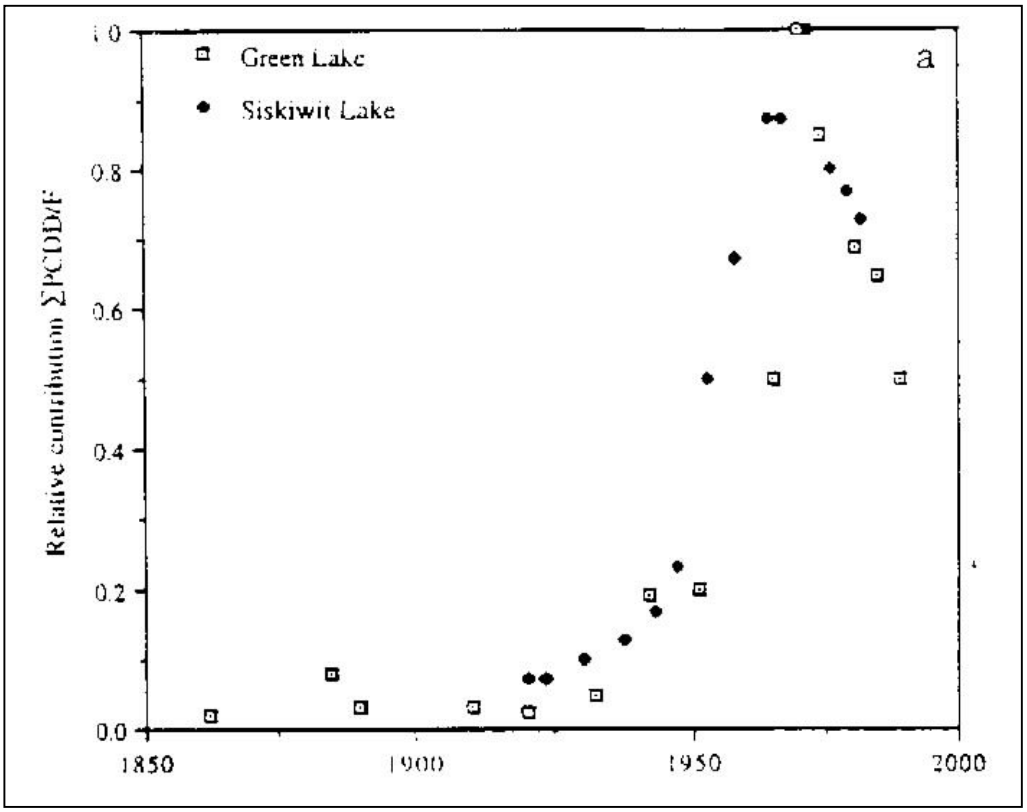
[15] Gullett, B. K., Lemieux, P. M., Lutes, C. C., Winterrowd, C. K., Winters, D. L. "PCDD/F Emissions from Uncontrolled, Domestic Waste Burning" *Organohalogen Cmpds.,* **41** 157-160 (1999).

[16] Smith, R. M., O'Keefe, P. W., Alduous, A., Briggs, R., Hilker, D., Connor, S., Liddle, M. *Chemosphere* **25,** 95-98 (1992)

[17] Czuczwa, J. M., Hites, R. A. "Airborne Dioxins and Furans, Sources and Fate," *Environ. Sci. Tech*. **20,** 195-200 (1986).

[18] Hagenmaier, H. and Walczok, M. "Time Trends in Levels, Patterns and Profiles for PCDD/PCDF in Sediment Cores of Lake Constance," *Organohalogen Compounds* **28**, 101-104 (1996).

Figure 1. Sediment results from Green Lake and Siskiwit Lake, from Alcock and Jones.



In the years since Alcock and Jones published their review, a rich literature has grown up around what is now accepted as scientific consensus: dioxin emissions to the environment have fallen and continue to fall. This is occurring particularly in regions that adopt Best Available Control Technologies for incineration.

Sediments And Sludges

"Comparison of the central estimates suggests there was about a 75% decrease in dioxin releases to the US environment between 1987 and 1995. This reduction was primarily caused by reductions in air emissions from municipal and medical waste incinerators." Cleverly, *et al., Organohalogen Compounds* **36**, 1 (1998) "The Inventory of Sources of Dioxin in the United States."

"UK sediments, archived vegetation and soil, major food groups and comparisons with direct air measurements all consistently suggest that air concentrations and deposition fluxes were much higher in the 1950s to 1970s and have shown a sustained decline since that time." Alcock, *et al., Organohalogen Compounds* **33**, 88 (1997) "Reconstructing air concentrations and deposition fluxes of PCDD/Fs in the UK."

"Generally, CDD and CDF concentrations begin to rise in the 1930s and 1940s and begin to decline in some lakes in the 1960s and 1970s….This is consistent with the findings of other researchers involving North American and Swiss lakes." Cleverly, *et al*., *Organohalogen Compounds* **28**, 77 (1996) "A Time-Trends Study of the Occurrences and Levels of CDDs CDFs and Dioxin-Like PCBs in Sediment Cores from 11 Geographically Distributed Lakes in the United States."

"In samples from sewage treatment plants that we collected and analyzed both in 1989/90 and in 1995 we have found a downgoing trend in PCDDs PCDFs and TEQ in eight out of ten samples." Rappe, *et al*., *Organohalogen Compounds* **33**, 82 (1997) "Decrease in the Concentrations of PCDDs and PCDFs in Sewage Sludge from Switzerland."

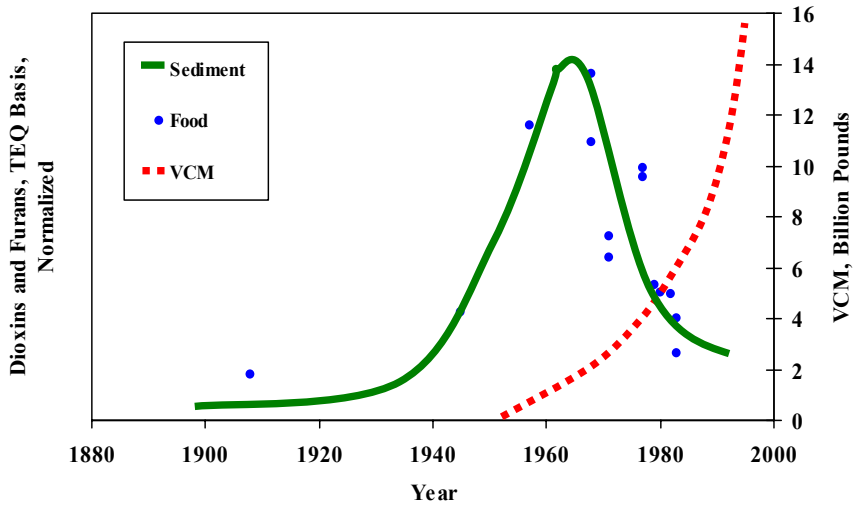
Food

Humans absorb dioxin primarily through food. Dioxin moves through the air or water, deposits in plants and sediments and accumulates in fish or animals who eat them. We are exposed when we eat the fish or meat.

Because our food is grown all around the country its levels of dioxin reflect the levels present in the overall environment. In its 1994 Dioxin Reassessment, EPA calculated that Americans received about 125 trillionths of a gram of dioxin equivalents per day. Based on four years of study of U.S. produce, their 1998 estimate is half that.

This year, EPA obtained archived food samples from government museums dating from 1908, but mainly from 1960 to 1983. When these samples were analyzed for dioxins and furans, the results were comparable to the other time trends data.

Dioxin in Sediments and Food vs VCM



Sediment D/F: Hagenmaier and Walczok, *Organohalogen Compounds* **28**, 101 (1996); VCM production: Chemical Manufacturers Association, 1996; Food D/F: Ferrario, et al., *Organohalogen Compounds* **35,** 29 (1998) and Winters, et al., *Organohalogen Compounds* **38,** 75 (1998). Height of sediment and food dioxin curves normalized to allow comparison of curve shape.

"All 10 samples from 1957-1982 were higher in PCDD/F TEQ than the current mean concentrations." Winters, *et al., Organohalogen Compounds* **38**, 75 (1998) "Trends in Dioxin and PCB Concentrations in Meat Samples from Several Decades of the 20th Century."

"The study revealed a significant decline in the mean dietary intake of PCDDs, PCDFs and PCBs in the period between 1984/5 and 1994….the onset of the decline in the dietary exposure to dioxins and PCBs already occurred at the end of the 1970s." Liem, *et al., Organohalogen Compounds* **33**, 112 (1997) "Trends in Dietary Exposure to Dioxins and PCBs in the Netherlands. Results from a Duplicate Diet Study."

Human Tissues

Lower emission to the environment translates to less exposure for humans, a result confirmed by declining concentrations in human blood, milk and fat.

"The PCDD/F levels found in 1996 are approximately half the concentrations measured in 1991." Wittsiepe, *et al*., *Organohalogen Compounds* **38**, 211 (1998) "Decrease of PCDD/F levels in human blood from Germany (1991-1996)."

"The decrease in I-TEQs of PCDD/Fs and TEQs of PCBs in primiparae mothers milk was found to be 28% and 53% respectively…" Kiviranta, *et al., Organohalogen Compounds* **38**, 121 (1998) "Levels of PCDD/Fs and PCBs in Human Milk in 1994 in Finland: Decrease in Concentration from 1987 to 1994."

"…(T)he human PCDD/F intake via food decreased by almost 50% within the past few years….human milk samples… revealed that the mean PCDD/F levels decreased from 34 pg I-TEQ/g milk fat in 1898 to 14.2 pg I-TEQ/g milk fat in 1996" Furst, *et al. Organohalogen Compounds* **33**, 116 (1997) "Decline of Human PCDD/F Intake via Food between 1989 and 1996."

"As shown in earlier observations…the time trend of PCDD/F levels in humans is still indicating a decrease over a period of 11 years" Papke and Ball, *Organohalogen Compounds* **33**, 530 (1997) "PCDD/PCDFs in Humans, Follow up of Background Data for Germany, 1996."

D. Vinyl and Recycling

As we noted in our November 3 letter, vinyl can be and is being recycled. According to a study conducted for the VI last year, the post-industrial recycling rate for vinyl is on the order of 70 to 80 percent. While the post-consumer recycling rate is lower than, for example, that for soda bottles, this is largely because so much vinyl is durable and still in service. A new directory of vinyl recyclers from the VI (attached) lists almost 280 companies handling scrap vinyl -- twice the number of recyclers in the previous version published only two years ago. This shows the strength of vinyl scrap recycling based simply on market economics. The VI also has a history of funding and supporting the development of vinyl recycling technology.

E. Vinyl and Incineration

As we noted in our November 3 letter, with respect to incineration of vinyl, most scientific studies show that the most important variable impacting dioxin emissions from incinerators is the design and operation of the unit, not the feedstock. In one of the largest studies of all, the American Society of Mechanical Engineers (ASME), a professional society representing 125,000 mechanical engineers worldwide, found little or no correlation between chlorine input and dioxin emissions from municipal incinerators.[19]

It is also the clear operational conclusion of governments the world over including the United States, Sweden, the Netherlands and Germany that when they regulate incinerators for dioxin generation and emission they do so by regulating technology, not the material being burned.

The ASME study examined data from 170 combustors and found enough information to evaluate 100. The evaluation determined the impact of chlorine in the feed, as measured by HCl in the combustion gases, on generation of dioxin, measured upstream of scrubbers. This is particularly important because dioxin is primarily generated in these combustion gases, not in the combustion zone itself. Thus, if chlorine were to have an effect it is important to evaluate it in the gas phase.

Statistically, of the 100 incinerators evaluated, 80 percent showed no significant effect of chlorine, 10 percent showed that dioxin increased with chlorine, 10 percent showed that dioxin decreased with chlorine. Additionally, the statistics showed that temperature and incinerator design were important in dioxin generation.

The ASME study was largely funded by the VI, and the funding was acknowledged. It was also funded by Environment Canada. The design and oversight as well as peer review by 25 combustion experts from around the world was conducted by ASME.

As we have seen, dioxin emissions to the environment have been decreasing for about thirty years. This is happening as vinyl production has tripled. Thornton argues that vinyl is *the largest* source of dioxin to the environment (emphasis added) and that incinerators are the largest generators. No one can utterly rule out the possibility that there is some small effect of chlorine on dioxin in incinerators. In the words of the ASME study authors themselves:

> whatever effect waste feed chlorine has on PCDD/F concentrations in combustor flue gases, it is smaller than the influence of other causative factors.

On the other hand, it defies logic to argue that dioxin emissions to the environment can fall precipitously for thirty years—according to EPA 60-80 percent between 1987 and 1995 alone--while *the largest* source triples.

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[19] "The Relationship Between Chlorine in Waste Streams and Dioxin Emissions From Waste Combustor Stacks," The American Society of Mechanical Engineers (CRTD-Vol. 36) (1995).

F. Vinyl and Mercury Emissions

Approximately 10 percent of U.S. chlorine is produced in mercury cells. Less than 20 percent of that, or less than two percent, is used in production of VCM. Further, the entire discussion of mercury pollution and allocation of pollution burdens to products points to several deficiencies of the Thornton report.

The approach outlined with mercury pollution oversimplifies the allocation of environmental burdens to one product or another, resulting in a nice academic exercise, but without application to real world. As an example, the market demand can vary in any time period for one or the other of the byproducts of the electrolytic process, chlorine or potassium hydroxide or caustic soda. This leaves a question as to which product should be allocated the burden, or should it be the products that require the high purity caustic soda or potassium hydroxide manufactured in the mercury cells that should be allocated the environmental burdens in this analysis. Regardless, it is the market place that creates the demand and the specification for the products.

The mercury cell production of chlor-alkali products is a great example of an industry voluntary initiative in pollution prevention. As indicated in the attached letter from EPA, a 42 percent reduction in mercury usage over four years achieved by the chlorine industry is described as "impressive accomplishment" and "well on target to the 50% reduction goal" and "aimed beyond compliance with current regulations." It would seem that USGBC would want to develop guidelines that would encourage and recognize this type of environmental performance for all materials in interior products rather than the single focused approach discussed in Dr. Thornton's paper.

G. Vinyl Additives

1. Stabilizers

Use of metal stabilizers in the European vinyl market, particularly related to end of life issues, recently has been studied in the European Union (EU) Horizontal study and resulting Green Paper. Heavy metal contribution originating from vinyl in incineration was found to be less than 1 percent compared to other input sources. Cadmium was the only exception, contributing approximately 11 percent, although this is in the process of being phased out as a stabilizer for use within PVC. This seems to be supported by a recent Canadian study on the use of metals in the Canadian vinyl market, which may be more representative of the North American market, which indicated that cadmium stabilizers are less than 1 percent of the metal used in vinyl products as heat stabilizers and flame retardants.

The conclusions of the Green Paper themselves point to an absence of data on how much lead and cadmium wastes are contributed by vinyl products and states "it is questionable whether a general substitution of these stabilizers would have a major effect on the overall emissions of lead or cadmium to the environment."

Lead stabilizers are mostly used in the North America vinyl market for electrical applications because it provides additional electrical properties. There are no substitute products that match the fire performance and mechanical properties required in certain building codes and standards for vinyl wiring compounds.

Further, generalizations about the toxicity of organotins are misleading and inaccurate. Dr. Thornton seems to confuse USGBC with allegations that organotins all have similar toxicological profiles and that tin stabilizers are toxicologically similar to tributyltin (TBT), an organotin compound that is used as a commercial biocide. This has best been articulated in a response by ORTEP to similar allegations by Greenpeace in which ORTEP states:

> Vinyl additives must have a high product quality in order to achieve the desired characteristics of the plastics materials, for example, long durability through heat and UV light resistance. For these and other uses PVC tin stabilizers have been industrially used for over 60 years for the manufacture of plastics materials. These products are well established and proven to be safe in their recommended applications or uses, which range from medical devices, pharmaceutical packaging, floor coverings used in hospitals and homes, to water pipes and other products used in the construction industry.
>
> It is important to differentiate between tin stabilizers and tributyltin compounds or TBT. TBT has never been used as a stabilizer. Instead, it is used as a biocide in antifouling paints for ocean going vessels. Tin stabilizers, on the other hand, do not have a biocidal effect. In addition, they are considerably less toxic than TBT. Therefore, it is wrong to generalize that all organic compounds are the same. Contrary to the Greenpeace reports, a clear distinction must be made between the favorable characteristics of tin stabilizers and the toxicological and eco-toxicological properties of TBT, which is designed to have a biocidal activity. The Greenpeace allegations, we believe, are not based on scientific evidence or fact.

Finally, use of tin stabilizers for food contact and vinyl pipe is safe**.** Certain tin stabilizers have been sanctioned for use in food contact applications by U.S. Food and Drug Administration (FDA). PVC pipe is routinely tested and certified for safe use by the NSF International to a voluntary third-party consensus standard and certification program for all direct and indirect drinking water additives. The standards were developed to satisfy a request for proposals by EPA by a consortium which includes the American Water Works Association Research Foundation, The Association of State Drinking Water Administrators, the Conference of State Health and Environmental Managers, and the American Water Works Association.

2. Plasticizers

The assertion that phthalate esters, which are use to make vinyl soft and flexible, pose considerable health and environmental hazards, is completely untrue. In this regard, the VI strongly supports the comments of the American Chemistry Council's Phthalate Ester Panel (attached) on this topic.

Briefly, of particular relevance here, the Panel concludes that concentrations of phthalate esters in indoor air are far below levels of concern. This conclusion pertains equally to the tiny amounts of phthalate esters that may be present in microscopic particles of PVC attached to dust. Further, the Panel concludes that use of phthalate esters in building materials does not pose a reproductive or developmental toxicity hazard. The Panel also concludes that there is neither a scientific basis for asserting a link between use of phthalate esters and building materials and asthma nor believing that phthalate esters are responsible for an asserted increase in thelarche or any related medical conditions in children.

H. Vinyl and Mold Growth

The vast majority of poor indoor air quality complaints result from fungi and bacteria growth in poorly ventilated buildings. While problems with mildew are sometimes attributed to vinyl wallcoverings, the primary cause of mildew is actually condensation resulting from warm, humid, air infiltrating the wall cavity. Because vinyl wallcoverings are fairly impermeable, they can trap moisture inside the wall cavity, where it can condense against the relatively cool inside surface of the wall. Manufacturers of vinyl wallcoverings have taken steps to address these concerns with innovations such as mildew-resistant wallcovering and adhesives and "microvented" wallcoverings, which allow moisture trapped behind a show surface to escape into the room.

III. Alternative Materials Criteria

A. General

Our November 3 letter described a number of specific objections to proposed Materials Credit 9. We will not restate our concerns in this letter, except to point out that our concerns were not adequately addressed at the pre-charrette and are as yet unresolved.

Unfortunately, proposed Materials Credit 9 reminds us of efforts by the advocacy group Greenpeace to encourage the International Olympic Committee (IOC) to deselect vinyl as a construction material for the 2000 Olympic games in New South Wales, Sydney, Australia. Greenpeace, a co-author of the IOC's Environmental Guidelines, singled out one specific product – vinyl – for deselection, regardless of its objective merits, simply because of Greenpeace's anti-vinyl agenda.

We believe this type of approach is wholly inappropriate. Others have agreed. The Vinyl Council of Australia has estimated that the PVC clause imposed by Greenpeace cost the people of New South Wales more than $16 million. Indeed, in 1999 the government of New South Wales adopted a new public procurement policy adopted for all subsequent projects. It states:

> Products will be assessed equally and impartially on their demonstrated comparative merits in terms of performance, cost and environmental impacts. Expert scientific opinion, where

available, should form the basis for such (environmental) comparisons.

Note that this approach uses performance, not product, criteria, and emphasizes science-based comparisons. To the extent that USGBC wishes to provide a credit for alternative materials in its rating program, an approach such as this should be adopted and meticulously followed.

B. Material Safety Data Sheets

There is an issue that we did not raise in our November 3 letter due to time restraints. Specifically, the Technologies/Strategies portion of Materials Credit 9 states: "Require Material Safety Data Sheets (MSDS) for all products specified." By examining the criteria under which MSDSs are developed, we can see that MSDSs are not designed to and do not address the concerns underlying Materials Credit 9.

Businesses typically develop MSDSs based on the requirements of the Hazard Communication Standard (Standard or HCS) issued by the U.S. Occupational Safety and Health Administration (OSHA). 29 C.F.R. э 1910.1200. The information required under certain state laws is also commonly added to MSDSs when required.

The HCS is intended to be performance oriented. It requires that manufacturers or importers assess the physical and health hazards of the chemicals they produce or to which their employees are exposed. After establishing which chemicals are hazardous, manufacturers must make a list of these substances and develop a written program together with appropriate labels, MSDS, and other information to communicate these hazards to employees and downstream users.

There are two notable exemptions to the HCS. First, the HCS exempts from compliance some hazardous chemicals present in some mixtures. For example, OSHA presumes that an untested mixture presents the same health hazards as the components that comprise at least one percent (or 0.1% for carcinogens) of the mixture. Components that comprise less than one percent of the mixture (or 0.1% for carcinogens) do not trigger the HCS requirements unless there is clear evidence that there is measurable exposure to employees that present a health hazard. Experience teaches that this is a reasonable approach.

Second, "articles" are exempt from compliance with the standard. An "article" is defined as: "a manufactured item (i) which is formed to a specific shape or design during manufacture; (ii) which has end use function(s) dependent in whole or in part upon its shape or design during end use; and (iii) which does not release, or otherwise result in exposure to, a hazardous chemical, under normal conditions of use."

The stated purpose of the HCS article exemption is to exclude from the hazard communication program items which contain hazardous chemicals in "such a manner that employees won't be exposed to them . . . . substances inextricably bound in a manufactured item do not present a potential for exposure."

Under the HCS, MSDSs for construction materials would be required and prepared only when the product being sold presents a physical or health hazard. Polymeric materials, like vinyl products, would not present a physical or health hazard requiring the preparation of an MSDS. Thus, MSDSs may not be available for Aall products specified.≅ Similarly, we suspect that suppliers of lumber, steel beams, glass, and ceramic tile may not be required to prepare MSDSs. Thus, requiring MSDSs for Aall specified products≅ may impose costs without benefits. In addition, to the extent that proposed Materials Credit 9 seeks to make life cycle analyses of alternative materials, the needed information likely will not be found on the MSDS.

IV. Conclusion

USGBC was founded with the goal of drawing on established ecological principles and assessing buildings for their overall environmental qualities. These are sound concepts. The treatment of vinyl and other materials in the current LEED CI draft rating system, however, drastically deviates from this approach and would set an unworkable precedent. Further, use of Dr. Thornton's paper, a biased advocacy piece, as the sole basis for proposed Materials Credit 9, and providing inadequate time to review and meaningfully respond to this document, is inconsistent with voluntary consensus standard establishment procedures.

Given the safety of its manufacture, its environmental attributes, and the various ways it can be safely and effectively managed at the end of its useful life, vinyl can compete effectively against other materials on the basis of these attributes. The vinyl industry is committed to voluntarily and continuously improving the industry's health, safety, and environmental performance. Proposed Materials Credit 9 should be deleted, or redrafted and reproposed consistent with sound scientific and consensus standard development principles as described in this and our November 3 letter.

We thank you in advance for consideration of these comments.

Sincerely,

Timothy F. Burns
President

Attachments