MBDC Comments on the USGBC Report, "Assessment of Technical Basis for a PVC-Related Materials Credit in LEED®"

After having reviewed the report's findings and the methodology used, MBDC finds no compelling evidence that would warrant a change in our position that Polyvinyl Chloride (PVC) is a problematic material due to its impacts on human and environmental health across its life cycle. We will not take this opportunity to comment on the details of the life cycle and risk assessment analyses but instead will address some of the larger questions related to the USGBC's mission and the intended use of these tools.

Statement 1. Life cycle analysis is not a "one size fits all" methodology – using LCA to compare across products is highly questionable

The methodology of life cycle analysis (LCA) can be very useful for making comparisons between systems when the practitioner is certain that the boundary conditions, impact categories, data (gaps) and assumptions have all been similarly treated, and even then, making direct comparisons between different systems or material types is a difficult task. MBDC believes this methodology is most useful for analyzing a single system with well-defined boundaries, in order to compare multiple scenarios for environmental improvement within that system. For example, a manufacturer might use an abbreviated form of LCA to evaluate alternative feedstock materials or different manufacturing processes for the same product.

Of important note, Ian Boustead, who is one of the most respected practitioners of life cycle analysis and whose work is the basis for much of the energy data used to evaluate polymers worldwide, cautions practitioners to not overstate the reach or applicability of LCA methodology:

> "Although industry is primarily concerned with *products*, it is the *production system* that is of importance in this type of analysis. An industrial system is defined as any collection of operations which, when acting together, perform some defined function. Here it is the emphasis on the function that is important because if any two systems are to be compared then they must be performing equivalent functions. For this reason, a system whose function is to produce one kg of polyethylene cannot be compared to a system whose function is to produce one kg of polypropylene. It is therefore meaningless to compare a system which produces polyethylene with one that produces polypropylene and come up with the answer that polyethylene is better or worse than polypropylene. In the general context, it is this concept of systems that prevents comparisons of materials on the basis of 1 kg of material A is better or worse than 1 kg of material B."[1]

We are concerned by the USGBC's intent to use life cycle analysis alone or in combination with risk assessment as the primary means of identifying "green" or "environmentally-preferred" materials. We would ask the Technical and Science Advisory Committee to consider the following:

- LCA methodology is fraught with uncertainty and confusion if used to make product-to-product comparisons. There are too many differing variables that can lead to data biases or value laden judgments that make apples-to-apples comparisons of two different products very difficult. This is why two LCAs will often arrive at different conclusions for the same comparative analysis.

[1] I. Boustead, "Eco-Profiles of Plastics And Related Intermediates Methodology", The European Centre for Plastics in the Environment of The Association of Plastics Manufacturers in Europe (APME), Brussels, April 1999.

- There is no means of accountability to ensure that practitioners will not take advantage of the many opportunities to manipulate the analysis in ways that favor a particular outcome or obscures important data that suggests an unwanted outcome.

- LCA will allow "green" product claims to be made more easily because, as a tool, it can be manipulated to provide variable results. It also will be much more difficult for anyone besides the immediate researchers to understand the results of a particular analysis.

- The discipline that we now call life cycle analysis still bears a close resemblance to its predecessor, "energy analysis." Our observation is LCA, true to its roots, is dominated by the role and impacts of energy, which disproportionately influence the final outcome. This particular LCA study, either directly or inadvertently, weighs the impacts associated with energy more heavily than other factors.

- LCA studies tend to ignore or discount the importance of hazardous or toxic substances. We applaud the task group for recognizing this and attempting to balance this weakness by using an additional method to calculate risk. However, we have similar concerns about using risk assessment (RA) methodology and do not believe the USGBC has the resources to credibly fund such studies for all the materials within its purview.

- LCA studies are only as good as the data available to measure the selected impacts of concern. Typically, data is available only for impacts that have a demonstrated history of being problematic and usually come from regulated activities. In other words, the LCA methodology is biased towards cases where humans have become sick or systems have been contaminated. This is another reason why the impacts of energy generation and use factor so heavily in LCA studies. There is little, if any, room for using anticipatory data or invoking a precautionary perspective. Therefore, data from known point sources are considered more heavily than emerging or inconsistently measured data. The preponderance of data also skews RA studies. The predictive value of these tools is low because they tend to confirm what we already know rather than help prevent future adverse impacts that are only now emerging within scientific knowledge and public perception.

- There is very little human health and ecological toxicity data available on cumulative or synergistic effects of existing chemicals, although one intuitively knows there are risks associated with cumulative exposures.

- We find LCA to be inadequate for factoring in or assigning value to other important measures of sustainability. For example, the inherent recyclability of a material is fundamental to creating a materials economy with sustainable flows. The lack of an adequate collection and recycling infrastructure is not the only reason why the recycling rates for PVC are so low. It is often seen as a primary contaminate in the recycling stream for other materials and its degradation by-products (e.g., HCl) are corrosive to many types of equipment.

Statement 2. Material hazards are important – LCA/RA are not efficient and effective tools for characterizing health and safety in building materials

Concern about the toxicity of chemicals and materials is not new, but today, dialogue is occurring across a great many stakeholders. Many of us in the sustainable design community are trying to draw attention to the alarming lack of publicly available toxicity information for the majority of chemicals used in industry.

- The National Academy of Sciences' National Research Council concluded in 1984 that 78% of the chemicals used in the U.S. in amounts greater than one million pounds per year lacked even "minimal toxicity information."[2]

- Awareness of this problem led to the development of the Chemical Right-to-Know initiative, followed by creation of EPA's High Production Volume Challenge Program which asks industry to provide basic toxicity test data for about 3,000 chemicals. However, compared to the estimated 80,000 chemicals in circulation in the U.S. today, the HPV data, while a promising start, is a drop in the bucket.

Product manufacturers and end-users are now beginning to understand they play a critical role in defining material palettes and their impacts. Avoiding or eliminating exposure risks by discontinuing use of problematic materials is preferable to minimizing exposure risks by limiting the use of such materials, which does not eliminate the risk of uncontrolled releases through incineration, landfilling, accidental spills or other mechanisms. Therefore, material selection criteria directly determine the type, relevance and magnitude of hazards we face throughout material life cycles.

The challenge is to employ a process that is capable of evaluating hundreds or thousands of materials, using publicly available data in a manner that is both cost and time effective. Which brings us to the question of whether LCA/RA is the best method for characterizing material health and safety. The amount of data necessary to perform a legitimate and effective LCA or RA study is enormous. In addition, we have witnessed the substantial lack of toxicity data for chemicals in our work. Combine the time and cost requirements for such an analysis with serious data gaps, which guarantee inconclusive results, and you have a tool that is not capable of providing efficient and effective material selection guidance. Therefore, we have little confidence that risk assessment is the only or best means of filtering or determining the hazards that materials may pose.

On the basis of material toxicity alone, we are perplexed by the results of the current LCA/RA for PVC, and observe how egregiously it has diluted some of the most significant concerns about the toxicity of PVC. When one researches the characteristics of PVC, the following statements can be made:

- Chlorine is a fundamental part of PVC (PVC is more than 50% chlorine by weight). Chlorine is acutely toxic via inhalation (the recent death of 8 people in South Carolina serves as an unfortunate reminder), is acutely toxic to aquatic organisms, is on EPA's list of Extremely Hazardous Substances, and is a necessary component for dioxin formation.

- PVC is a primary contributor, or carrier, of toxic compounds at every stage of its life cycle, many of which are persistent, bioaccumulative and toxic, including mercury, dioxins, hexachloroethane, hexachlorobenzene, hexachlorobutadiene, PCBs, lead, cadmium, problematic phthalates, organotins, and hydrogen chloride. Besides the study's statement regarding DEHP (although we strongly disagree with the characterization of risk for DEHP), we found little evidence that the risk assessment analysis addressed the very important relationship between PVC and releases of persistent, bioaccumulative, and toxic substances (PBTs) or persistent organic pollutants (POPs). Functionally, PVC is a carrier of other toxics into the environment throughout its life cycle.

- Relative to its volume of production and in spite of its ubiquitous presence in our lives, the amount of PVC that actually is recycled is abysmally low. If PVC is as recyclable as PVC-related interests claim, why isn't more PVC recycled? Because PVC it is a contaminate in

[2] Ibid.

the recycling stream for other materials and its degradation by-products (e.g., HCl) are corrosive to many types of equipment. Although PVC is a thermoplastic, it is less thermally stable than other thermoplastics and hydrogen chloride will cleave off at temperatures above 140°C potentially exposing fabricators and recycling workers.

As one alternative to LCA/RA, a cradle-to-cradle material assessment method examines the inherent human and environmental health characteristics of ingredient chemicals and evaluates the relevance of those characteristics across the material's full life cycle. Due to the profound lack of publicly available data on materials' health impacts, especially for specific formulations from different suppliers, we must profile materials using the ingredient data that is available.

MBDC's assessment process begins by identifying chemical hazards. The second stage is a cursory exposure assessment that evaluates the context for how the material is used at various points in its life cycle (i.e., manufacturing; use; various end-of-life scenarios). Our methodology is designed to help companies accomplish the following:

- Quickly identify potentially problematic substances in their materials. As a result, managers increase their understanding of their product ingredients and can reformulate their materials palettes to maximize the use of preferred materials.

- Educate suppliers about the types of materials they want to purchase and include in their products. Once a supplier is aware of a problematic substance, they can search for preferred alternatives.

Statement 3. The sustainability movement is partially about the democratization of information – transparency is difficult with LCAs

There seems to be an implicit belief that tools such as life cycle analysis and risk assessment are immune from the vagaries of scientific or political bias or even simple error. The average professional with an engineering or scientific background is overwhelmed by the immense amounts of data and complex calculations that attempt to isolate, define, "accurately" calculate and then summarize the risk of harm to humans and the environment.

By their very nature, LCA studies obscure information because few people have the knowledge to understand and practice the underlying discipline. There is very little attempt made to convert LCA/RA results into a manageable form for the primary users of the information –(in this case, the architecture and design community). In practical terms, the parameters of a profession's debate about which materials are appropriate to specify and use will be limited to the high priests of the discipline. The majority of the design community will have to trust the assumptions, selection of data (e.g., validity of data sources; how data gaps are treated), selection of impact categories, and weighting of results have been determined in a completely transparent, consistent and responsible manner. Critical evaluation of a study's structure and findings would necessitate input from an experienced LCA/RA consultant...

Knowledge is empowering, if it is accessible, and too much information can be paralyzing. The USGBC should consider the implications of adopting LCA or RA as the preferred method for reviewing and comparing material and product information to identify the "safest" or most "sustainable" choice.

Statement 4. Issues for future USGBC material evaluations

Material selection: mission and values

- The debate about whether to create a credit for non-PVC materials is clouding the essential question that the Council was created to address: What is our value system and how does it help us define a sustainable material, so we can assist architects, designers and purchasers who share similar values? If the USGBC seeks to provide guidance in the form of LCA/RA analyses, it could jeopardize its status as a resource for information about sustainability and the built environment.

- Whose value system will the USGBC employ? Apparently, it will be predicated on measuring the relative risks of harmful materials versus attempting to create consensus about positively defining the characteristics of safe materials for use in the design industry.
- What is the USGBC's mission with regard to material selection? How will the USGBC stimulate changes in the marketplace to promote alternative choices if it is subject to special interests that seek to protect the status quo and existing market conditions? What incentives will manufacturers have to innovate new, healthier materials if life cycle analysis and risk assessment tools obscure such significant and proven toxicity concerns about PVC?
- Is one to believe that the results of this LCA/RA demonstrate that PVC is a green material because, in relative terms, it is no worse than the other materials studied? Shouldn't the USGBC be an authority on identifying a preferred material instead of discounting professional and stakeholder concerns about a problematic material?

Methodology: internal oversight

- Who at the USGBC will evaluate LCA and RA studies to determine if they were conducted in a valid manner? Will they be subjected to an expert review committee or peer review? What authority will make a final judgment if there are conflicting findings?
- Who will dissect and summarize the mass of often-conflicting data and translate the conclusions into useful guidance for the design community?

Costs versus benefits

- The USGBC is setting a precedent that it cannot support in the future. Even if there was consensus that LCA and RA are the best evaluation tools available, there is not enough time and money to consistently use these methodologies to evaluate hundreds or thousands of building and interior furnishing materials.
- From a cost-benefit perspective, can the USGBC practically employ LCA/RA as a tool to award credits for alternative materials? Is this the most cost-effective means of determining which materials are suitable alternatives? Who will pay to have these costly analyses done?

Conclusion

The TSAC report concludes that when using its LCA/RA methodology to review and compare *existing* data, PVC is not proven to be consistently worse than the chosen alternatives. In fact, the study demonstrates that each material performs well or poorly relative to the impact category being studied. So what is the take away message of this? Industry would say that it proves there is not reason to discriminate against the use of PVC. We would say that the study did nothing to prove that PVC is a healthy material and the type of material we want flowing through the world. In none of the applications was PVC found to be the best alternative. Is that the same as saying it is a desirable or intelligent material? If we take the TSAC conclusions at face value (i.e., PVC is no worse or no better than commonly used alternatives within the constraints of their analysis), then we would choose the alternatives. The life cycle of PVC is responsible for the generation and release of a large number of persistent, bioaccumulative, and toxic materials that cannot be considered safe or healthy.