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Vinyl Proven Compatible with Latest "Green" Building Trends

U.S. Green Building Council Draft Report Concludes No Excessive Environmental Impact from PVC

Few building materials have been subject to as much scrutiny or rigorous testing as vinyl. From its inception, PVC and, in later years, CPVC (chlorinated polyvinyl chloride), has drawn harsh criticism for its perceived adverse environmental and health effects. As a result, it was once recommended that builders should receive a credit whenever they excluded vinyl as part of the Leadership in Energy and Environmental Design (LEED) rating system – one of the most popular, fastest growing rating systems for green building in use today. The purpose of providing credits is to reduce the use of products containing toxic and/or hazardous substances and encourage use of comparable alternatives.

Environmental concerns relative to vinyl have been minimized in recent years by studies and reports conducted by third-party organizations that confirm that vinyl's environmental impact is actually similar to those of most competing materials. One of the most recent reports to support this belief came from the U.S. Green Building Council (USGBC) PVC Task Group. Although this was one of the most comprehensive research projects to date, having included the review of literally thousands of studies on vinyl and competing products, it is not the only one to support vinyl as a viable alternative in the growing green building industry. In fact, an earlier report from the European Commission entitled "Life Cycle Assessment of PVC and Principal Competing Materials" came to the same conclusion using a different research team and research methodology.

The multi-year environmental project for the USGBC began in 2002 when the PVC Task Group was first formed. The Group specifically chose to evaluate the environmental and health performance of vinyl as a building material in four product areas: drain/waste/vent pipe; windows; siding; and flooring. These areas were selected because of PVC's leading market share in each of them, which meant that an ample supply of research and testing could be documented. The four team members represented such unbiased organizations as Harvard School of Public Health, The Athena Institute and Building Green, Inc.

The Group's purpose was to assess the validity of draft credit language in the LEED Commercial Interiors rating system proposed back in 2000 to provide credit for the avoidance of PVC materials. The USGBC determined that further documentation was necessary to determine the soundness of this credit.

To compare the impacts of alternative materials choices there were two assessments completed – life cycle assessment (LCA) and a risk assessment. Specifically in the piping category, it was determined that PVC should be evaluated against ABS and cast iron, two other common materials used in this product category. These products were compared on the basis of the following functional unit – the service provided by one linear foot of schedule 40 or comparable pipe with a three-inch inner diameter over a 50-year period.

The delivery distance to the site (during the installation phase) was assumed to be 500 miles for all materials. The life span of the pipe products was assumed to be 50 years. For the categories outside of piping, other common materials were also studied, including aluminum, wood, fiber-cement, linoleum and cork.

Early on it was agreed by the members of the Task Group that "such assessments can never be better than the data used as inputs in the process". To assess the quantity and quality of the data publicly available on these topics, a Web-based relational database was created to map the available information resources onto a matrix representing the knowledge that would be needed to reach a conclusion regarding the charge. This database consisted of two main components: (1) a three-dimensional matrix of life cycle cells, in which each cell represents the intersection of a material, an impact category, and a life cycle state; and (2) a list of information sources, including stakeholder submissions, papers identified by literature searches, and sources provided by individual Task Group members.

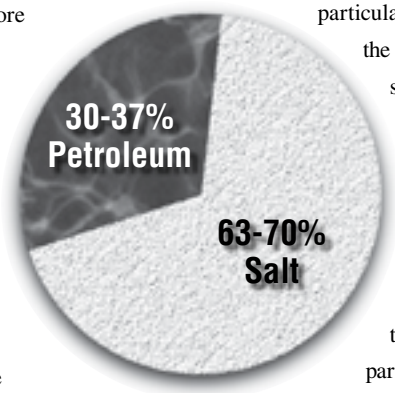
Each source was linked to any and all cells in the matrix to which it contributed information. The quality and nature of the knowledge conveyed is also characterized. A total of almost 2,500 references were reviewed as part of this analysis and are cited in the database. (The database is available on-line at www.pvc.buildinggreen.com.)

Assessing the Alternatives

The life cycle assessment endeavored to quantify and characterize all of the resources and pollution flows (inputs and outputs) associated with a particular material over its entire life cycle: from the harvesting or extraction of raw materials, through manufacture, installation, use, and reuse or disposal. Some of the specific impact categories addressed included acidification, ecotoxicity, eutrophication (reduction of dissolved oxygen in the atmosphere), fossil fuel depletion, ozone depletion, global warming, photochemical smog and even cancer.

CPVC performed well in this type of life cycle assessment. It is lightweight, is based on a relatively low petroleum content and is produced using a very energy-efficient process. Thus, the need for non-renewable energy sources (such as oil and coal) is low compared with more traditional materials.

In the risk assessment phase, the team members attempted to quantify potential risk for developing adverse health effects following exposure to environmental toxicants (compounds which have the potential for causing toxicity in living things). This quantification was done by comparing doses of the toxicants in a person (through inhaling, ingesting, or absorbing a compound through the skin) to a reference level or dose that a person can be exposed to on a daily basis with no anticipated adverse effects.



CPVC COMPOSITION

In order to determine occupational risks from exposure to compounds used or made in the manufacture of PVC and non-PVC building materials, a human health risk assessment was conducted for occupational workers involved in the manufacture of the building materials.

Conclusions

At the end of this comprehensive effort, The Task Group determined:

...the available evidence does not support a conclusion that PVC is consistently worse than alternative materials on a life cycle environmental and health basis.

...there are some impact categories in which each material performs poorly and others in which it performs well.

...Therefore, the current body of knowledge as analyzed in this report in Section 3 as it relates to the Task Group's charge from TSAC does not support a credit in the LEED rating system for eliminating PVC or any particular material. Further, with respect to a PVC-related credit, the available evidence indicates that for some product categories, such a simple credit could steer designers to use materials which performed worse over their life cycles with respect to the bulk of the impact categories.

From its conclusions, the Task Group also developed several policy recommendations that would build upon the analysis techniques developed in its report and help to fill the gaps in knowledge that had been identified. As part of its first recommendation, the Task Group recognized that the current body of literature is overwhelmingly PVC focused. As such, the group recommended that additional research be done on the risks associated with alternative materials to move towards comprehensive comparative analysis. Some of the more traditional materials, for example, may be assumed to be "safe" from an environmental and health standpoint. But the Task Group suggested that all building materials be subject to the same standards and testing requirements.

In the end, the Task Group agreed that available evidence does, in fact, show that vinyl products can contribute to the environmental performance of sustainable buildings. Whether it is the energy savings provided by vinyl windows or the resource conservation of durable products like pipe, vinyl has a place in "green" buildings.

To view a full copy of the USGBC Draft report, visit www.usgbc.org.