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# Cradle to Cradle® Brings "Technical Metabolism" to Manufacturing LEED-Certified Products

If you'd like to raise the hackles of someone on the advocacy side of green building use that phrase. Building products have to be marketed in order to get into the built environment and so it isn't surprising that over the years manufacturers have occasionally described their environmentally-friendly products in that manner. The problem of course is that LEED isn't a product certification system

One of the hurdles facing manufacturers that genuinely try to make products that add to a project's sustainability and that are manufactured in an environmentally responsible way is that there has been little in the way of a green product rating mechanism and lots in the way of "greenwashing."

Green building pioneer William McDonough, and German chemist Michael Braungart collaborated on the book *Cradle to Cradle: Remaking How We Make Things in 2002*. They have developed and trademarked Cradle to Cradle (C2C) certification as a way to recognize responsible producers and create a framework for driving the industrial process towards complete sustainability. Cradle to Cradle design begins with changing the focus of manufacturing from eco-efficiency – or doing less damage to the environment – to eco-effectiveness – a process of engaging an entire organization in a strategy for having a completely positive impact on the planet. An organization that succeeded would create no waste, use no more energy than it generates, manage water usage completely and foster environmental responsibility throughout its entire supply and distribution chain.

The two formed McDonough Braungart Design Chemistry (MBDC) to help rework how humans manufacture by using nature's ecosystems as a model.

MBDC identifies the processes in nature that allow for the environment to organically replenish its resources and feed itself. They refer to this complex cycle of food-to-waste-to-food as 'biological metabolism.' A parallel system, which MBDC calls 'technical metabolism,' can be developed in the industrial environment to allow products to be made using natural and synthetic materials that can be reused, recycled or recaptured without degrading their value in a perpetually closed loop. Technology simply doesn't exist at this time for complete technical metabolism but C2C certification intends to encourage manufacturers to push for continuous improvement in progress towards that result.

To achieve C2C certification – which can be achieved in ascending levels of basic, silver, gold and platinum – a manufacturer submits a product to a rigorous evaluation of its complete list of ingredients, including those of subcomponents from its supply chain. Ingredients are evaluated for their impact on human and environmental health and categorized as biological nutrients that come from the earth as can biodegrade into healthy soil, or as technical nutrients that can be recycled or reclaimed for use in other products without a decline in quality. To

continue with C2C a manufacturer would establish systems for continuously recovering materials from its waste or end-of-life cycle products.

Evaluating ingredients is an enormously painstaking and time-consuming endeavor, especially for products with greater complexity and a deeper supply chain. The disposition of biological nutrients is straightforward. For technical nutrients, however, the evaluation involves the determination of the toxicity or negative impact to human life, including evaluation of the detriment from the base chemical and the chemical in its situational use in the product. After defining if a chemical may be used without harming life, a manufacturer will be left with a list of product ingredients that cannot be recycled or re-used safely as technical nutrients. The first option in C2C design would be to seek replacement of those ingredients with those that can be re-used.

This identification of product ingredients for their metabolic characteristics allows for the achievement of the first leg of the C2C framework, which is the elimination of waste. In C2C parlance, waste equals food. The Cradle to Cradle manufacturer would, in the ideal state, return organic waste to the earth to become micro-organic food and recover synthetic or mineral waste within the manufacturing system to recycle or reuse in the manufacture of other products.

MBDC is clear in its own literature that this step is as far as C2C certification has been applied as yet, a fact that should underline the difficulty of the task.

The second leg of the framework is the optimization of energy use. As with zero energy buildings, this involves the use of renewable sources of power generation like solar or wind to offset the amount of energy needed to manufacture. C2C manufacturers also re-engineer the production process to reduce the energy required. At optimization the manufacturer will use 100 percent renewable energy, produced on site or purchased directly from utilities with renewable energy credits.

Respect for human and natural systems is the third tenet of Cradle to Cradle design. C2C certified manufacturers and their vendors should ensure they are using as little water as possible and ideally keeping that water within closed loops. In addition, water released to the environment should be of at least the same quality as before it was removed from a water source, to promote ecosystem and watershed health. C2C involves management to promote healthy ecosystems and respect the impact of local communities. A significant component of this leg is the respect for social responsibility, including payment of fair wages to workers, embracing diversity and fair play, and pushing these values down through the supply chain.

These key sustainable values are assessed as five criteria in MBDC's C2C certification process are:

1. Material Health. This assesses the chemical composition of the materials that make up the product to judge the hazard to life.

2. Material Reutilization. This criterion is about recovery and recycling at the end of product life.

3. Energy. For the highest level of certification energy needs to be based at least 50% on solar for all parts and subassemblies.

4. Water. Water usage and discharge quality are assessed

5. Social Responsibility. The fifth criterion judges fair labor practices of the manufacturer, its suppliers, and the manner in which the company relates to the larger community.

C2C certification is granted on a product-by-product basis. Within the region, PPG Industries' architectural glass has been C2C certified and a total of 14 different roofing, siding and flooring products of CENTRIA have been C2C certified. The certification is part of the cultural change at both companies and there is certainly sustainable credibility conferred upon these manufacturers that has marketing value. Cradle to Cradle re-design also has real cost benefits when the processes are viewed properly. The reduction of waste, the elimination of outsourced energy and water supplies and the emphasis on reducing energy and water usage can result in significantly lower cost structures for products.

Ford Motors has been re-designing its River Rouge Center towards Cradle to Cradle goals. The company spent $18 million on a bioretention and filtration system for rainwater, which included planting native grasses on assembly plant roofs. The planted roofs cool the plant significantly but the investment in rainwater treatment saves Ford $50 million that would spent on chemical/mechanical water treatment.

For the time being Cradle to Cradle is a proprietary certification system, privately owned by MBDC. Proponents of sustainable manufacturing who would like to see McDonough's and Braungart's vision of the future fulfilled criticize the proprietary nature of C2C as limiting competition and hindering the concept from being fully realized. Most critics of C2C downplay the chances of practical implementation of C2C on a large scale or are skeptical of claims of full compostability or reclamation potential of C2C products.

MBDC for its part does not claim that anything close to full adoption of the C2C framework exists in any industrial setting at present. Their most persuasive argument for Cradle to Cradle design is that it forces manufacturers to pursue optimization rather than minimization. McDonough and Braungart see optimizing the sustainability of an industrial process as enabling expansion for the business and see C2C as advancing the vision of industrial success. Cradle to Cradle raises the concept of what is good design above measures of cost or performance, challenging manufacturers to expand their definition of quality to include social and environmental responsibility.