# Cradle to Cradle[SM] Certification Program

prepared
by MBDC
June 2007

1001 E Market Street
Suite 101
Charlottesville, VA 22902
www.mbdc.com
434-295-1111
certification@mbdc.com

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# Forward

*Cradle to Cradle[SM] Design* is a revolutionary approach to the redesign of human industry based on the conviction that rigorous science and design can move human industry beyond simple concerns for "sustainability" (often seen as a form of maintenance of current levels of performance while limiting destruction) toward a new positive paradigm where growth is good – science provides the physical laws and the data and design serves as the signal of human intention - *Cradle to Cradle[SM] Design* mirrors the healthy, regenerative productivity of nature, and thereby creates industry that is continuously improving and sustaining life and growth.

Since 1995, McDonough Braungart Design Chemistry (MBDC) has been engaging with large and small companies with the challenge of industry to scientifically evaluate and design materials and products according to these principles. In response to industry demand, MBDC is now offering companies the chance to have their materials and products not only evaluated, but also certified according to the Cradle to Cradle[SM] Principles.

Companies receiving certification will have the opportunity to use the Cradle to Cradle[SM] branded certification mark. This mark will signify to customers that the company has chosen the chemicals, materials, and processes for health and perpetual recyclability, allowing them to purchase products that move us to a positive world of safe, healthy and fair economic enjoyment - worry and guilt-free - while meeting, and sometimes leading, the highest international regulatory and industry standards. Companies with Cradle to Cradle[SM] certified products would enjoy increased brand value by achieving product differentiation, building customer retention, facilitating transparency, reducing liability, and fostering innovation. In the US, these companies will also be able to offer their certified products as "environmentally-preferable," a current requirement for government purchases.[1] In the EU, products will meet the most rigorous upcoming standards for products yet produced on a global basis.

# Cradle to Cradle[SM] Design

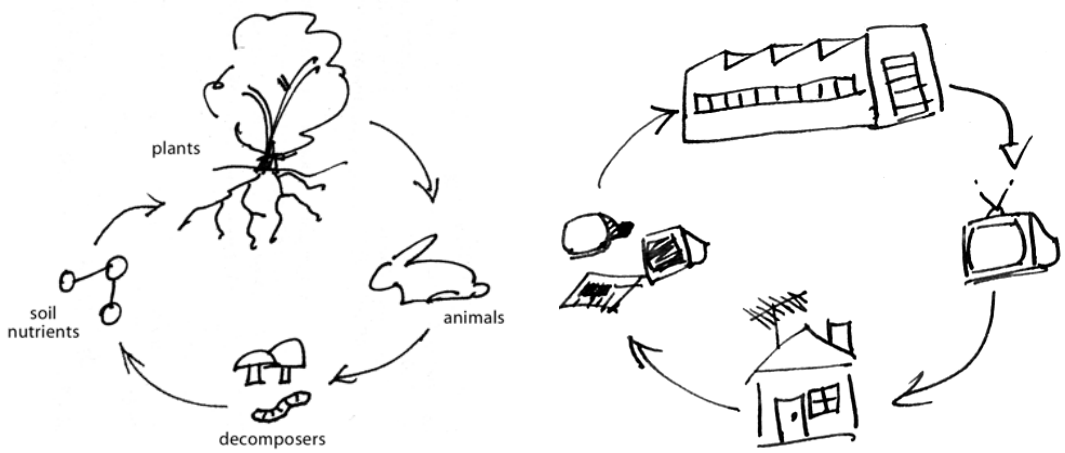
Cradle to Cradle[SM] Design draws on knowledge from the fields of environmental chemistry and material flows management (broadly termed Industrial Ecology), and the fields of industrial and architectural design. Cradle to Cradle[SM] Design is based on the *Intelligent Product System* (IPS) pioneered by chemist Dr. Michael Braungart in 1986. In the early 1990's, Dr. Braungart and architect Mr. William McDonough expanded IPS by identifying the principles of Cradle to Cradle[SM] Design.

Cradle to Cradle[SM] Design is a positive agenda, one that seeks a renewably powered world, full of safe and healthy materials that are economically, equitably, ecologically and elegantly deployed. It is an innovative approach to sustainability that models human industry on the integrated processes of nature's *biological metabolism* – its productive ecosystems – integrated with an equally effective *technical metabolism*, in which the materials of human industry safely and productively flow within the two metabolisms in a fully characterized and fully assessed way.

[1] On September 14, 1998 President Clinton signed Executive Order 13101 which outlined the Environmentally Preferable Purchasing (EPP) program for all Executive agencies. Under this program all Executive agencies are directed to purchase "Environmentally Preferable" products. "Environmentally Preferable" is defined in section 201 of EO 13101 as "products or services that have a lesser or reduced effect on human health and the environment when compared with competing products or services that serve the same purpose." Based on this definition, it is clear that a Cradle to Cradle certified product would qualify as "Environmentally Preferable" due to the fact that the Cradle to Cradle certification focuses in large part on optimizing the human and environmental health characteristics of the product requesting certification.

Products are developed for closed-loop systems in which every ingredient is safe and beneficial – either to biodegrade naturally and restore the soil, or to be fully recycled into high-quality materials for subsequent product generations, again and again. Utilizing *biological nutrient* and *technical nutrient* definition allows a company to virtually eliminate the concept of waste and recover value, rather than creating a future of solid waste liability and relinquishing material assets by simply delivering a physical product to a customer without a coherent relationship to the potential inherent in the product itself as a potential long term asset for the customer, nature, industry or the company itself. Cradle to Cradle[SM] Design turns contingent liabilities into assets.




Cradle to Cradle[SM] Design was founded on a recognition that a sustainable world cannot evolve from the minimizing approach of efficiency (less negative results - now "eco-efficiency") alone. Through intentional, effective decision making (more positive results - now "eco-effective" – a term characterized by MBDC) that focuses on the development of materials and products that are safe and suitable for recovery through technical or biological systems, many of the toxic legacies of the past designs can be transformed into healthful products and systems. Even rare and valuable, but toxic, materials such as cadmium, can be put into coherent technical flows in products that are infinitely characterized, designed to be safe and treated as a service that is in a defined chain of custody (eg. a solar collector vs. a small battery).

Cradle to Cradle[SM] Design is based on the living model for sustainability – nature. The flow and cycling of matter in nature does not lead to waste and pollution, but to a dynamic balance of growth and change within ecological systems. The fundamental elements of Cradle to Cradle[SM] Design are based on the principles that drive these systems in nature:

Waste equals food

- Design materials and products that are food for other systems. This means designing materials and products to be used over and over in either technical or biological systems.
- Design materials and products that are safe. Design materials and products whose life cycle leaves a beneficial legacy for human or ecological health.
- Create and participate in systems to collect and recover the value of these materials and products.

Use current solar income

- The quality of energy matters. Use renewable energy.

Celebrate diversity

- Water is vital for humans and all other organisms. Manage water use to maximize quality and promote healthy ecosystems while remaining respectful of the local impacts of water use.
- Use social responsibility to guide a company's operations and stakeholder relationships.

Unlike many other eco-efficiency oriented certification systems, Cradle to Cradle[SM] certification focuses on the characteristics of sustainable materials, products and systems. As a result, this process places a major emphasis on the human and ecological health impacts of a product's ingredients, as well as on the ability of that product to be truly recycled or safely composted. The quality of energy used to create a product, water quantity and quality, and social responsibility also are essential sustainability characteristics and focus areas in this certification process.

# 1 Scope

This document sets out the requirements for obtaining Cradle to Cradle[SM] certification. This certification program includes requirements for:

- Product/Material transparency and human/environmental health characteristics of materials
- Product/Material reutilization
- Production energy
- Water use at manufacturing facility
- Social fairness/corporate ethics

Cradle to Cradle[SM] certification is a four-tiered approach consisting of Basic, Silver, Gold, and Platinum levels to reflect continuing improvement along the cradle-to-cradle trajectory.

This certification program applies to materials, sub-assemblies and finished products. Special considerations will be given to certain classes of products (e.g., VOC emission standards will be applicable to indoor products only, reutilization criteria will be applied to the substrate, rather than the material, for paint and other coating products, etc.). In the case of technical nutrient based products where a take back system is in effect and there is a well-defined chain of custody, certain rare, high value, but potentially toxic substances (e.g., cadmium, silver, etc.) may be appropriate and effective substances as defined in use.

This program does not address all performance concerns associated with any and all products that qualify for Cradle to Cradle[SM] certification.

# 2 Terminology and Referenced Documents

## *2.1 Acronyms and Abbreviations*

ASTM – American Society for Testing and Materials
BoM – Bill of Materials
EPA – U.S. Environmental Protection Agency
IARC – International Agency for Research on Cancer
HAP – Hazardous Air Pollutant
IVOC – Individual volatile organic compound
LCA – Life cycle assessment
MAK – Maximum allowable concentration
TLV – Threshold limit value
TVOC – Total volatile organic compounds
VOC – Volatile organic compound

## *2.2 Definitions*

ALGAE TOXICITY
Several Genera and Species of Green Algae found in lakes, ponds, and streams that are responsible for aquatic oxygen balance and food sources for fish are tested for their reaction to chemical exposure. Chemicals that kill algae are considered dangerous to aquatic eco-systems due to the possible food chain effects and food source depletion. Algae Toxicity is a measure of a substance's toxicity when consumed by these various types of Algae. A common measuring tool is LC50 ("lethal concentration"), which is the concentration of a substance in the water required to kill fifty (50) percent of the algae test population. If LC50 < 10 mg/L, the substance is considered algae toxic.

BIOACCUMULATION
The process by which substances are stored and accumulated in the tissue or organs of humans or animals.

BIOCONCENTRATION FACTOR (BCF)
A measure of the tendency for a chemical to accumulate. The ratio of the concentration of a substance in a living organism (mg/kg) to the concentration of that substance in the surrounding environment (mg/l for aquatic systems).

BIODEGRADATION
The process by which a substance or material is broken down (or decomposed) by microorganisms and reduced to organic or inorganic molecules which can be further utilized by living systems. Biodegradation can be aerobic, if oxygen is present, or anaerobic, if no oxygen is present.

BIOLOGICAL NUTRIENT
A material used by living organisms or cells to carry on life processes such as growth, cell division, synthesis of carbohydrates and other complex functions. Biological Nutrients are usually carbon-based compounds that can be safely composted and return to soil.

CARCINOGEN - POSSIBLE, OR SUSPECTED
A known animal carcinogen, but evidence of carcinogenicity in humans is non-existent, or there is limited evidence of carcinogenicity in humans and insufficient evidence of carcinogenicity in animals (MAK 3 or TLV A3 or IARC Group 2B).

CARCINOGEN - PROBABLE
A known animal carcinogen, but carcinogenicity in humans has not been definitely proven (MAK 2 or TLV A2 or IARC Group 2A).

CARCINOGEN - KNOWN
A causal relationship has been established between exposure to the agent and human cancer (MAK 1 or TLV A1 or IARC Group 1).

CAS NUMBER
Chemical Abstract Service number. This number uniquely identifies each pure chemical compound.

CHEMICAL PROFILE
The "score" or "ranking" given to a pure chemical based on its hazard characteristics for human and environmental health.

CLEARANCE TIME (CT)
The CT indicates the time needed to eliminate or biodegrade a substance to a certain percentage in an organism. For example, the $CT_{50}$ indicates the time needed to eliminate 50% of a certain substance, analogous to the half-life time measure $t_{1/2}$.

CLIMATIC RELEVANCE
This is a measure of the climate-influencing characteristics of the substance. All compounds that contribute to global warming are listed here. Examples include carbon dioxide, methane, CFCs, and sulfur hexafluoride.

CONTENT OF HALOGENATED ORGANIC COMPOUNDS
The column in the periodic chart of the elements that begins with Fluorine contains the halogens. These elements, when combined with organic compounds, form halogenated organic compounds. Most of these compounds are toxic, persistent, ozone depleting or bioaccumulative, or form hazardous substances during production and disposal (e.g., PVC).

DAPHNIA TOXICITY
Water fleas of the genus *Daphnia* can be found in most ponds and streams. They feed upon microscopic particles of organic matter and are in turn food for fish and other aquatic organisms. Daphnia Toxicity is a measure of a substance's toxicity when consumed by these water fleas. A common measuring tool for daphnia toxicity is $EC_{50}$ ("effective concentration"), which is the concentration of a substance in the water required to immobilize 50 percent of the test animals. If $EC_{50}$<10 mg/liter, the substance is named daphnia toxic.

DOWNCYCLING
The name for the practice of recycling a material in such a way that much of its inherent value is degraded (e.g. recycling plastic into park benches) revealing poor design of a life cycle and the related material flows.

EFFECT CONCENTRATION 50 ($EC_{50}$)
The median exposure concentration ($EC_{50}$) is the median concentration of a substance that causes some effect in 50 percent of the test animals.

ENDOCRINE DISRUPTOR
A substance that mimics, blocks, or interferes with hormones and their production, metabolism, and excretion causing malfunction of the endocrine system which can lead to malfunction of the reproductive, nervous, and immune systems.

FISH TOXICITY
Several Genera and Species of fish found in lakes, ponds, and streams that are part of the food chain are tested for their reaction to chemical exposure. Chemicals that kill fish are considered dangerous to aquatic eco-systems due to the possible food chain effects and food source depletion. Fish Toxicity is a measure of a substance's toxicity when consumed by these various types of fish. A common measuring tool is LC50 ("lethal concentration"), which is the concentration of a substance in the water required to kill fifty (50) percent of the fish test population. If LC50 < 10 mg/L, the substance is considered fish toxic.

HALF-LIFE (T1/2)
The amount of time it takes half of an initial concentration of substance to degrade in the environment.

HEAVY METAL
The term "Heavy Metals" is generally interpreted to include those metals from periodic table groups IIA through VIA. The semi-metallic elements: boron, arsenic, selenium, and tellurium are often included in this classification.

IN-SITU ASSESSMENT
The overall evaluation of a chemical that takes into account the chemical profile, as well as the intended use of that chemical in the ultimate material/product and any relevant routes of exposure to that chemical throughout the material/product's lifecycle.

IRRITATION OF SKIN/MUCOUS MEMBRANES
For the testing of skin irritation with the standard Draize test, rabbits are used. The chemical is applied to the rabbit skin and usually kept in contact for 4 h. The degree of skin irritation is scored for erythema, eschar and edema formation and corrosive action. These dermal irritation observations are repeated at various intervals after the chemical has been removed. Mucous membrane irritation is measured in a similar manner. Site-specific mechanical responses within the respiratory tract and eyes are measured, and a chemical is classified as an irritant based on the conclusions of these tests.

GLOBAL WARMING POTENTIAL
A scale used to relate a compound to the CO2 equivalents to measure the potential heating effects on the atmosphere.

LETHAL CONCENTRATION 50 ($LC_{50}$)
The inhalative median lethal concentration ($LC_{50}$) is the median concentration of a substance that causes death in 50 percent of the test animals.

LETHAL DOSE 50 ($LD_{50}$)
The median lethal dose ($LD_{50}$) is the statistically derived median dose of a substance that can be expected to cause death in 50 percent of the test animals.

MATERIAL
A group of one or more chemicals that together comprise a component or input to a finished product.

MUTAGEN
This is a substance that may cause hereditary disorders in the offspring due to mutations in the chromosomes of the male or female reproductive cells. These mutations can be alterations in the structure or number of chromosomes, or nucleotide substitutions known as point mutations.

OCTANOL-WATER PARTITIONING COEFFICIENT ($P_{ow}$)
A measure of the tendency of a chemical to partition between an aliphatic hydrocarbon system and an aqueous system. Often used as a predictor for bioaccumulation potential.

OZONE DEPLETION POTENTIAL
This is the measure of the ozone depleting characteristics of the substance. Ozone depletion in the upper atmosphere leads to an increase of UV-radiation on the earth and as a result, an increase in skin cancer. CFCs are included here.

PERSISTENCE
This is a measure of a substance's ability to remain as a discrete chemical entity in the environment for a prolonged period of time. A common measuring tool for persistence is "half-life" (t1/2), which is the amount of time required for half of the substance to breakdown. If half-life is greater than 30 days in the air, or if half-life is greater than 50 days in soil, water, or any other media the substance is considered to be persistent.

SKIN PENETRATION POTENTIAL
A measure of the ability of a compound to assist in the absorption of chemicals into the skin.

SENSITIZATION
The ability of a substance to induce an immunologically-mediated (allergic) response.

TECHNICAL NUTRIENT
A material of human artifice designed to circulate within technical metabolism (industrial cycles)—forever.

TERATOGEN
A substance shown to cause damage to the embryo or fetus through exposure by the mother (MAK-list: Pregnancy risk group, category A).

TERATOGEN - SUSPECTED
Currently available information indicates that a risk of damage to the embryo or fetus can be considered probable when the mother is exposed to this substance (MAK-list: Pregnancy risk group, category B).

TOXICITY - ACUTE
A measure of how poisonous or "deadly" a substance is during initial exposure. A common measuring tool for acute toxicity is $LD_{50}$ ("lethal dose"), which is the dose required to kill 50 percent of the test animals. If $LD_{50}$<200 mg/kg, the substance is named acutely toxic.

TOXICITY - CHRONIC
This is a measure of how poisonous a substance can become over time with repeated exposure. A substance may have low acute toxicity (i.e. little harmful effects from the initial exposure) but may become poisonous over time with repeated exposure. This may be due to accumulation of the substance or due to repeated minor damaging of target organs.

## *2.3 Referenced Documents*

The foundation of Cradle to Cradle[SM] Design was initially outlined in Dr. Braungart's publication of the "Intelligent Product System" and in McDonough's and Braungart's *The Hannover Principles: Design for Sustainability*, both published in 1992. In 1993 Dr. Braungart's Intelligent Product System (IPS) won Germany's prestigious Océ van der Grinten award for science in the service of environmental protection. The *Hannover Principles* were adopted by the World Congress of the International Union of Architects (UIA) in 1993, and are frequently cited as a seminal expression of sustainability.

# 3 Documentation

## *3.1 Requirements for Certification Consideration*

A complete bill of materials (BoM) is required before a proposal for certification can be generated. Once the proposal has been accepted the following information is required for consideration as a Cradle to Cradle[SM] Basic or Silver certified product:

- Complete ingredient formulations for all materials used in the product.
- Recycled content of all materials used in the product
- Annual energy required for manufacture of product and source(s) of that energy
- Water stewardship guidelines document
- Fair labor/corporate ethics guideline document

The following additional information is required for consideration as a Cradle to Cradle[SM] Gold certified product:

- IAQ emissions data
- Data demonstrating that product manufacture is at least 50% renewably powered
- A complete water audit
- Documentation that a 3rd party social accreditation exercise is underway, or documentation that an internal social audit has been done

The following additional information is required for consideration as a Cradle to Cradle[SM] Platinum certified product:

- Data demonstrating that product manufacture is at least 100% renewably powered and that the entire embodied energy footprint of the product is at least 50% renewably powered
- Documentation describing innovative strategies employed to greatly improve water discharge quality or greatly reduce water use
- Documentation that a 3rd party social accreditation has been completed

## *3.2 Requirements for Annual Recertification*

The following is required for annual recertification:

- Current BoM highlighting any changes to materials or suppliers
- Progress on phase out of problematic substances (if required)
- Current energy numbers (if different from initial submission)
- All additional documents required if applicant is seeking a higher certification level

# 4 Material Health

## *4.1 Material Transparency*

Required for Basic, Silver, Gold, and Platinum certification levels.

Applicant shall identify all materials, sub-assemblies, components, etc. present in the finished product. Applicant shall also identify all ingredients present in the materials, sub-assemblies, components by their Chemical Abstract Service (CAS) number and by their relative concentration in the overall material formulation (MBDC will sign Non-Disclosure Agreements to protect any proprietary formulation information). Extremely toxic substances are reported and evaluated at any concentration. LCAs and other certification programs typically only examine ingredients present at 5% (i.e. 50,000 ppm) or higher.

## *4.2 Defined as a Biological or Technical Nutrient*

Required for Basic, Silver, Gold, and Platinum certification levels.

Applicant shall define the product with respect to the appropriate cycle (i.e., technical or biological) and all components shall be defined as either biological or technical nutrients. If the product combines both technical and biological nutrients, they should be clearly marked and easily separable. This is more of a strategic criterion and therefore there is no calculation or metric associated with it.

## *4.3 Ingredient Characterization.*

Required for Basic, Silver, Gold, and Platinum certification levels.

All ingredients shall be characterized based on their impact on Human and Environmental Health. MBDC will perform this evaluation once all ingredients have been identified. The criteria listed on the next page are used in the evaluation of these two impact categories.

Based on the interpretation of the data for all criteria, chemicals and materials are “scored” for their impact upon human and environmental health. A key factor in this evaluation is the risk presented by the component/chemical, which is a combined measure of identified hazards and routes of exposure for specific chemicals and materials, and their intended use in the finished product. The “score” is illustrated by the following color scheme:

| | |
|---|---|
| **GREEN (A-B)** | Little to no risk associated with this substance. Preferred for use in its intended application. |
| **YELLOW (C)** | Low to moderate risk associated with this substance. Acceptable for continued use unless a GREEN alternative is available. |
| **RED (X)** | High hazard and risk associated with the use of this substance. Develop strategy for phase out. |
| **GREY** | Incomplete data. Cannot be characterized. |

For both the human and environmental health criteria, there are firmly established cutoff values for determining hazards. For example, in the case of Acute Toxicity (human health) any substance with an oral LD50 value less than 200 mg/kg (rat, mouse, guinea pig, etc) will be considered acutely toxic.

### 4.3.1 Human Health Criteria

The following is a list of the human health criteria used for substance evaluation by the MBDC Cradle to Cradle[SM] Design Protocol. The criteria are subdivided into Priority Criteria (most important from a toxicological and public perception perspective) and other Additional Criteria. Substances that do not pass the Priority criteria are automatically scored RED and recommended for phase-out/replacement.

| Criteria | Description |
|---|---|
| ***PRIORITY*** | |
| Carcinogenicity | Potential to cause cancer |
| Endocrine Disruption | Potential to negatively effect hormone function and impact development |
| Mutagenicity | Potential to damage DNA |
| Teratogenicity | Potential to harm fetus |
| Reproductive Toxicity | Potential to negatively impact reproductive system |

| | |
|---|---|
| ***ADDITIONAL*** | |
| Acute Toxicity | Potential to cause harm upon initial, short term exposure |
| Chronic Toxicity | Potential to cause harm upon repeated, long-term exposures |
| Irritation of Skin and Mucous Membranes | Potential to irritate eyes, skin, and respiratory system |
| Sensitization | Potential to cause allergic reaction upon exposure to skin or airways |
| Other | Any additional characteristic (e.g., flammability, skin penetration potential, etc.) relevant to the overall evaluation but not included in the previous criteria |

### 4.3.2 Environmental Health Criteria

The following is a list of the environmental health criteria used for substance evaluation by the MBDC Cradle to Cradle[SM] Design Protocol.

| Criteria | Description |
|---|---|
| Fish Toxicity | Measure of the acute toxicity to fish (both saltwater and freshwater) |
| Daphnia Toxicity | Measure of the acute toxicity to Daphnia (invertebrate aquatic organisms) |
| Algae Toxicity | Measure of the acute toxicity to aquatic plants |
| Persistence/ Biodegradation | Rate of degradation for a substance in the environment (air, soil, or water) |
| Bioaccumulation | Potential for a substance to accumulate in fatty tissue and magnify up the food chain |
| Climatic Relevance | Measure of the impact a substance has on the climate (e.g., ozone depletion, global warming, etc.) |
| Other | Any additional characteristic (e.g., soil organism toxicity, WGK water classification, etc.) relevant to the overall evaluation but not included in the previous criteria |

#### 4.3.3 Material Class Criteria

The following material classes are scored RED due to the concern that at some point in their life cycle they may have negative impacts on human and environmental health. In the case of organohalogens, they tend to be persistent, bioaccumulative, and toxic, or can form toxic by-products if incinerated.

| Criteria | Description |
|---|---|
| Organohalogen Content | Presence of a carbon – halogen (i.e., chlorine, bromine, or fluorine) bond |
| Heavy Metal Content | Presence of a toxic heavy metal (e.g., Antimony, Arsenic, Beryllium, Cadmium, Chromium, Cobalt, Lead, Mercury, Nickel, etc.) |

## *4.4 Material Avoidance*

Materials/Products that contain PVC (polyvinyl chloride or "vinyl"), Chloroprene, or any other polymer from the PVC "family tree", at any level, will not be considered for certification.

The following table lists other substances that will only be allowed in products at the Basic level:

| Substance Name | Limit Value |
|---|---|
| Lead, Mercury, Cadmium, Chrome VI | Any intentionally added amount will limit the product to Basic at best unless substance is needed for technical performance and is kept in a closed loop of manufacture, use, and recovery. |
| Halogenated hydrocarbons | Any product containing a halogenated hydrocarbon at 1000ppm (0.1%) or higher will be limited to Basic. Exceptions to this rule include non-PBDE based brominated flame retardants required to meet current flammability standards. These products will be eligible for Silver certification assuming all other criteria are met. |

## *4.5 Optimization Strategy*

Required for Basic and Silver.

Once all problematic components have been identified (i.e. those substances assessed RED based on the criteria listed previously), the applicant must commit to the eventual phase-out/replacement of these substances. Applicant will have six (6) weeks to develop a strategy (in conjunction with MBDC or independently), complete with budget and timeline, for the phase out/optimization of these inputs. The implementation of this plan will be subject to an annual review to judge whether or not sufficient progress has been made to merit continued Cradle to Cradle[SM] certification.

## *4.6 Product Formulation Optimized*

Required for Gold and Platinum.

Applicant must demonstrate that all Red assessed materials/chemicals have been phased out of the formulation.

## *4.7 Cradle to Cradle[SM] Emission Standards*

Required for Gold and Platinum.

Applicant shall demonstrate compliance with the Cradle to Cradle[SM] emission standards, which are defined as the following:

- TVOC < 0.5 mg/$m^3$
- Individual VOCs < 0.1 TLV or MAK values (whichever is lower)
- No detectable VOCs that are considered known or suspected carcinogens, endocrine disruptors, mutagens, reproductive toxins, or teratogens. Based on the lab chosen to do the work what is considered "non-detect" may vary. For the purposes of this certification, anything below 2$\mu$g/$m^3$.
- Time Points – 7 days for TVOCs and IVOCs
- Loading Scenarios – BIFMA M7.1 for office furniture and California Department of Health Services (section 01350) for everything else.

Labs approved for testing include Berkeley Analytical Associates, MAS, AQS, Forintek, and Syracuse University. All testing is done according to ASTM D5116 for small chamber, ASTM D6670 for large chamber, and BIFMA MMM7.1 for office furniture.

## *4.8 Percentage of "Green" Components*

Required for Platinum certification only

Applicant shall demonstrate that material/product seeking certification is comprised of at least 25% "Green" assessed components.

# 5 Material Reutilization/Design for Environment

## *5.1 Defined Appropriate Cycle*

Required for Basic, Silver, Gold, and Platinum certification levels.

Applicant shall demonstrate that the product has successfully been designed as either a Technical or Biological Nutrient (or both if materials are easily separable); hence, the appropriate materials and chemical inputs have been intentionally selected to support the metabolism for which the product was designed. In addition, the manufacturer is in the process of developing a plan for end of life product recovery.

## *5.2 Well Defined Recovery Plan*

Required for Gold and Platinum certification levels.

Applicant shall demonstrate that there is a well-defined logistics and recovery system plan for this class of product. The elements of the plan include:

- Scope: how extensive the recovery effort will be
- Timeline: when the actual recovery will begin
- Budget: commitment of resources (e.g., dollars, labor, equipment, etc.)

The plan can include partners outside the traditional supply chain (e.g., recycling partners, recovery/transportation partners, etc.). This does not necessarily mean a product take-back program. That is one potential strategy for closing the loop on the materials/product but there are several other legitimate strategies as well. For example, utilizing design for disassembly (DfD) strategies along with third party regional recyclers may be more effective in recovering and reutilizing materials than a product take back program that requires potentially very disperse products to be sent back to the manufacturer.

## *5.3 Actively Closing the Loop*

Required for Platinum certification only.

Applicant shall demonstrate that the plan developed in 5.2 above has been implemented. As each manufacturing system varies, MBDC will judge the validity and efficacy of each applicants program on a case-by-case basis.

## *5.4 Nutrient Reutilization Score >= 50*

Required for Basic and Silver certification levels.

Applicant shall demonstrate a Nutrient Reutilization Score of 50 or higher. MBDC will calculate this score as follows:

The **Nutrient Reutilization Score** is a combination of the recyclability/compostability and recycled/renewable content of the product and is calculated as follows:

$$\frac{(\%\text{ of the product considered Recyclable or Compostable}) * 3 + (\%\text{ Recycled or Rapidly Renewable Content})}{4} * 100$$

Example – Product X is made up of components that are 80% recyclable and it contains 40% recycled content

$$\text{Nutrient Reutilization Score} = \frac{[(0.80) * 3] + [(0.40) * 1]}{4} * 100 = 70$$

Note: For the purposes of this certification, recycled content is only counted if it positively defined (e.g., recycled content of Red assessed materials will not count). In addition, a material must be easily separable to be considered recyclable. For example, if two different materials, each easily recyclable by itself, are irreversibly joined together neither one will be considered recyclable.

The term "recyclable" is also a somewhat subjective term. MBDC judges the inherent qualities in a material to determine recyclability even if an infrastructure for the recovery of this material has not yet been created.

### *5.5 Nutrient Reutilization Score >= 70*

Required for Gold certification levels.

Applicant shall demonstrate a Nutrient Reutilization Score (as calculated above) of 70 or higher.

### *5.6 Nutrient Reutilization Score >= 85*

Required for Platinum certification only.

Applicant shall demonstrate a Nutrient Reutilization Score (as calculated above) of 85 or higher.

# 6 Energy

## *6.1 Characterization of Energy*

Required for Basic, Silver, Gold, and Platinum certification levels.

Applicant shall supply data describing the amount of energy (both quantity and quality) for product manufacture/assembly.

## *6.2 Strategy Developed to Use Renewable Energy*

Required for Basic, Silver, Gold, and Platinum certification levels.

The ultimate goal of Cradle to Cradle[SM] Design is to have all energy inputs come from what we term "current solar income". Forms of current solar income include wind, biomass, hydro (in certain circumstances – to be determined on a case-by- case basis) and of course solar. Once the manufacturing/assembly energy has been quantified in 6.1 above, applicant shall present a strategy to supply that energy via current solar income. The strategy should contain a timeline as well as measurable goals and milestones.

## *6.3 Use of Renewable Energy for Manufacture*

Required for Gold and Platinum certification levels.

Applicant shall demonstrate the strategy developed in 6.2 is underway. At least fifty (50) percent of the energy required to manufacture/assemble the product must come from current solar income. This may be accomplished through the active use of energy sources derived from current solar income (as listed above) or through the purchase of Green-e certified renewable energy certificates to offset the energy used to manufacture/assemble the product. Examples of organizations offering Green-e certified renewable energy certificates include: Sterling Planet, Wind Current, Bonneville Environmental Trust, 3 Phases Energy Services, and EAD Environmental**.**

Note: Only Green-e certified (or equivalent in other countries) renewable energy certificates will be accepted.

## *6.4 Use of Renewable Energy for Entire Product*

Required for Platinum certification level only.

Applicant shall demonstrate that at least fifty (50) percent of the energy required to manufacture the entire product comes from current solar income. This includes not only the energy used to manufacture/assemble the final product, but the energy used to manufacture the components as well. In addition, the energy required for final manufacture/assembly must come entirely from current solar income. Once again this is accomplished through the supply chain's active use of renewable energy, the supply chain's purchase of renewable energy credits, or through the purchase of renewable energy credits by the final manufacturer/assembler equal to fifty (50) percent of the total energy used to produce the components.

# 7 Water

## *7.1 Water Stewardship Guidelines*

Required for Basic, Silver, Gold, and Platinum certification levels.

Applicant shall create or adopt a set of principles or guidelines that will inform the facility's future strategies for protecting and preserving the quality and supply of water resources. Examples include:

- World Business Council for Sustainable Development – Water Principles (http://www.wbcsd.ch/web/publications/sinkorswim.pdf) pg 11
- Hannover Principles: Design for Sustainability – Water (http://www.gemi.org/water/resources/hannover.htm)
- Water Management Principles of the Ministry of Water, Land and Air Protection from the Government of British Columbia (http://wlapwww.gov.bc.ca/wat/wtr_cons_strategy/basics.html)

## *7.2 Water Audit*

Required Gold and Platinum certification levels.

Applicant shall perform a water audit for the manufacturing facility. This means that all water flows associated with product manufacture/assembly are fully characterized. This includes characterizing water source(s), water usage, and quality of water discharges according to the following:

Water Source(s):

- Describe the types of water sources the facility(ies) relies upon.
- Determine whether or not the facility is located within or adjacent to a RAMSAR listed wetland (http://www.ramsar.org/index_list.htm).
- Define the watershed. Locate and report the watershed within which the facility operates (http://cfpub.epa.gov/surf/locate/index.cfm). Document the following information:
  - See "Assessment of Watershed Health." Does the facility withdraw or discharge effluent to a water source that is listed as impaired by the EPA, state or local authorities? What are the water concerns for the area and how does the facility impact these concerns? For more information on Source Water, see the EPA website: http://www.epa.gov/safewater/protect/sitemap.html.
  - Ask the local or regional water authority whether the facility is considered a major or minor user of water relative to other users in the watershed region.
- In view of the global nature of this certification program, specific methodological adaptations in other countries might be applicable.

Water Usage:

- How much water is used per unit product produced?
- What measures have been taken to conserve water resources?

Water Discharges:

- Meets or exceeds EPA and state water quality regulations as required under EPA's National Pollution Discharge Elimination System (NPDES).
  - Major facilities: Cannot be listed as being in Significant Noncompliance (SNC).
  - Minor facility(ies): Cannot be listed by states as being in violation of NPDES permits using the same definition as that of SNC violators. (each state will use its own term for "non-major' violators).
  - Any facility(ies) documents that they have not been designated as SNC or as a non-major chronic violator by its state for a period of two years prior to application date.
- List permit # and name of designated water coordinator for the facility(ies).
- List SIC/NAICS – both primary and secondary.
- In view of the global nature of this certification program, specific methodological adaptations in other countries might be applicable.

## *7.3 Innovative Conservation Measures*

Required Platinum certification level only.

Applicant shall demonstrate that the facility responsible for final assembly/manufacture has implemented and provided documentation of conservation measures taken in last five years to reduce consumption of domestic and sanitary water (express as units liters/kg or gal/lb of all finished product).

## *7.4 Innovative Discharge Measures*

Required Platinum certification level only.

Applicant shall demonstrate that the facility responsible for final assembly/manufacture has implemented innovative projects for reclaiming, recycling or preserving the quality of water resources. Document any novel methods or processes employed for improving the quality of water resources (e.g., constructed wetlands, green roofs, and composting toilets).

# 8 Social Responsibility

## *8.1 Corporate Ethics/Fair Labor Statement*

Required for Basic, Silver, Gold, and Platinum certification levels.

Applicant shall demonstrate that the organization has adopted and made publicly available one or more statements regarding their social and ethical performance goals, which have the following characteristics:

- Addresses fair labor practices, corporate and personal ethics (e.g., supplier relationships, competitive behavior, integrity), customer service, and local community.
- Signed by the Chairman/CEO, either formally or in effect.
- Internally developed within the company or adopted as a set of principles from another organization, such as the UN Global Compact (www.unglobalcompact.org) or Global Sullivan Principles (www.thegsp.org).

## *8.2 Begin Social Accreditation Process*

Required Gold and Platinum certification levels.

Applicant shall demonstrate that the organization has begun the process of obtaining a third party social accreditation or is beginning a self-assessment by internally collecting data for workplace certification criteria adopted from a third party assessment, certification, or accreditation system with the following attributes:

- Internationally accepted.
- Intra-industry or inter-industry framework.
- At a minimum, the following components of labor practices are evaluated using explicit criteria:
  - Child labor
  - Forced labor
  - Health and safety
  - Freedom of association and collective bargaining
  - Discrimination
  - Discipline/harassment
  - Working hours
  - Compensation

Suggested certification systems include, but are not limited to, the following:

- SA8000 (Social Accountability International) (www.cepaa.org)
- Fair Labor Association (www.fairlabor.org)
- WRAP (Worldwide Responsible Apparel Production) (www.wrapapparel.org)

Applicant shall report existing data to MBDC. Note that data is tracked for all facilities in which the finished product seeking MBDC Cradle to Cradle[SM] certification is manufactured or assembled.

Finally, applicant shall demonstrate that the organization trains all company employees and workers in any contract assembly plants on the company's standards for corporate and personal ethics.

## *8.3 Third Party Accreditation*

Required Platinum certification level only.

Applicant shall demonstrate that the organization satisfies certification requirements for the program identified in the previous step at all facilities where the finished product seeking MBDC Cradle to Cradle[SM] certification is manufactured or assembled. In addition, applicant shall provide proof that company suppliers have adopted statements regarding their social and ethical performance goals, as well as implement any necessary workplace improvements. This is the equivalent of all members of the supply chain meeting the Silver criteria for social responsibility.

# Certification Disclaimer

MBDC WARRANTS ONLY THAT ANY PRODUCT WHICH HAS BEEN CERTIFIED AS BASIC, SILVER, GOLD OR PLATINUM MEETS MBDC CRADLE TO CRADLE[SM] CERTIFICATION PROGRAM CRITERIA FOR SUCH CERTIFICATION AND EXCEPT AS EXPRESSLY SET FORTH HEREIN:

(A) MBDC MAKES NO WARRANTY, EXPRESS OR IMPLIED AS TO ANY PRODUCT WHICH HAS BEEN CERTIFIED UNDER THE MBDC CRADLE TO CRADLE[SM] CERTIFICATION PROGRAM, **INCLUDING ANY WARRANTY AS TO MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE** AND MBDC HEREBY EXPRESSLY DISCLAIMS ALL OTHER WARRANTIES;

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