Recycled Content Materials Assessment Methodology

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REVISION LOG

REVISION DATE	SECTION(S)	TYPE OF CHANGE	AUTHORIZED BY
May 2017	All	Information outlining the assessment of recycled content in the *Cradle to Cradle Certified Product Standard Version 3.0*, and the *Cradle to Cradle Certified Product Standard Material Health Assessment Methodology, Version 3.0*, both dated November 4, 2013, has been clarified and merged into this document so that all relevant information related to assigning material assessment ratings to these types of materials is located in one supplemental document. Note that the section numbers between the v3.0 document and this document do not correspond. Section numbers listed to the left within the SECTIONS column of this table are for this document.	S. Klosterhaus
May 2017	2.3 Recycled Content Types	Added clarification that Type 4 recycled content may only be certified up through the Bronze level.	S. Klosterhaus

1 OVERVIEW

1.1 Purpose and Content

This document describes the methodology used to assign an A, B, C, X, or GREY material assessment rating to recycled content materials subject to review in a finished product that is applying for Cradle to Cradle certification. Due to the often variable and unknown composition of these materials, assigning a material rating is more challenging and may require additional analytical testing. Recycled content materials in products being assessed for Cradle to Cradle certification are therefore assessed following this customized methodology, rather than the conventional Material Health Assessment Methodology alone.

1.2 Supporting Documents

The following documents are to be used in conjunction with this document:

- Cradle to Cradle Certified™ Product Standard
- Cradle to Cradle Certified™ Material Health Assessment Methodology
- Any additional supporting documents and guidance posted on the Cradle to Cradle Products Innovation Institute (C2CPII) website

Visit the C2CPII website to download the Standard documents and obtain the most current information regarding the product Standard (http://www.c2ccertified.org/product_certification/c2ccertified_product_standard).

2 ASSESSMENT OF RECYCLED CONTENT

2.1 Scope

This methodology applies to the assessment of all recycled content materials from post-consumer and post-industrial sources, with several exceptions. The exceptions are for recycled materials that are often fully defined via elemental analysis, as is true for metals and glass, and/or are identified and characterized via alloy grade specifications in the case of metals. Metals and glass containing recycled content that are fully defined via one or both of these methods may be assessed using the conventional Material Health Assessment Methodology. No additional analytical testing is required in these cases.

2.2 Recycled Content Types

The best possible assessment rating varies depending on the type of recycled content. For the purpose of this methodology, four types of recycled content have been identified. Types 1-3 may be "defined", while Type 4 is considered "undefined" as described below. A prerequisite for an A, B, or C assessment is that the material be from a defined source. Unless it is possible to designate a material as Type 1, 2, or 3, it will typically be necessary to designate it as a Type 4.

Type 1 – Post-industrial from a SINGLE DEFINED source
Type 1 recycled materials are those coming from a single known source, where the manufacturer name, trade name, and grade of the material are known and it is possible to obtain disclosures for the full material composition.

Type 1 recycled materials are considered to be fully defined. An A, B, or C rating is possible if the material meets the Banned List requirements and no x or grey assessed chemicals are present.

Type 2 – Post-industrial from MULTIPLE DEFINED sources
Type 2 recycled materials are those coming from multiple post-industrial sources, but are of a specific type or grade, and/or from a specific manufacturer. All inputs are defined, consistent, and pure, but the material may contain two or more different grades from known raw material manufacturers with the ability to obtain trade names and grades of the resins and additives used.

Type 2 recycled materials are considered to be fully defined. An A, B, or C rating is possible if the material meets the Banned List requirements and no x or grey assessed chemicals are present.

Type 3 – Post-consumer from a DEFINED source
Type 3 recycled materials are those from a post-consumer source, but segregation has limited the scope to a very consistent and narrow group of inputs of a single material type and variation. Some examples include 100% transparent high density polyethylene (HDPE) milk containers, 100% clear polyethylene terephthalate (PET) water bottles, 100% specific laundry detergent bottles, 100% specific food packaging containers, and 100% uncoated car bumpers from a specific car line.

Type 3 recycled materials as described above are considered to be fully defined. An A, B, or C rating is possible if the material meets the Banned List requirements and no x assessed chemicals are present.

The rating also depends on the following conditions: There must be a high sophistication of collection, separation, identification, and cleaning technologies for the material such that the recycler is able to guarantee that the input material will always be the same. The input stream must be highly consistent (e.g. clean transparent HDPE milk jugs only), there must be extremely low variation in chemical content from batch-to-batch, and the analytical testing regimen used must ensure that problematic chemicals are consistently captured and determined to be present below 100 ppm.

Note regarding recycled paper (i.e. re-pulped paper):
Although re-pulped paper is not from defined sources as described above, it may be designated as a Type 3 material. Note that paper typically has organohalogens present above 100 ppm and/or the bleaching process for virgin inputs is based on chlorine dioxide, which means that paper typically is not C-assessed. However, paper containing recycled content may in some cases be considered sufficiently well-defined to determine that carcinogens, mutagens, and reproductive toxicants (CMRs) are not present in the final product above the subject to review threshold, which means that there is potential for paper containing recycled content to be certified at the Silver level. This may be achieved through verifying compliance with the Banned List (as described below), obtaining full material disclosure, and assessment of all chemicals subject to review. If some inputs subject to review remain unidentified (e.g. because the supplier refuses to disclose), CMR declarations are to be obtained for those inputs when applying at the Silver level. An A, B, or C rating is possible if the material meets the Banned List requirements and no x assessed chemicals are present. Please see Section 3.4.2 of the *Cradle to Cradle Certified Product Standard, v3.1* for further guidance relevant to these material types.

Type 4 – Post-consumer from UNDEFINED sources
Type 4 recycled materials are those from a post-consumer source where there is low regard for separation, identification, and/or cleaning the materials to a higher level of purity. Examples include aggregation of various types of plastic that are simply molded into parts with heat, and untreated (i.e. not re-pulped) mixed post-consumer recycled paper.

Type 4 recycled materials are considered to be undefined, therefore an A, B, or C rating is generally not possible. Due to significant fluctuations in material chemistry, Type 4 materials typically receive an X or GREY assessment rating and thus are not allowed for use in Cradle to Cradle Certified Silver, Gold, or Platinum products since it is not possible to ensure that they do not contain CMRs or other x assessed chemicals.

2.3 Determining Compliance with the Banned List of Chemicals

Banned List Requirement

Homogeneous materials subject to review, including recycled content materials, may not contain any Banned List chemicals above the allowable thresholds. This requirement applies to products applying for certification at any level. See Appendix 15 of the *Cradle to Cradle Certified Product Standard, v3.1* for the complete list of banned chemicals. There are two separate banned lists, one applies to technical nutrients and the second applies to biological nutrients. Supplier declarations and/or analytical testing are required to ensure compliance with the Banned List of chemicals for recycled content materials as described below.

Supplier Declarations

Supplier declarations may be used to ensure compliance with the Banned List of chemicals for the intentional inputs to recycled content materials. Supplier declarations are also used to make statements regarding the concentration of contaminants known to be present above the subject to review threshold (these may be Banned List substances or not). For Type 1 and 2 materials, supplier declarations alone may be used to demonstrate Banned List compliance. Alternatively, if full material disclosure is obtained, as is possible for Types 1, 2 and 3 materials, supplier declarations do not necessarily have to be obtained. Instead, the assessor can review the data to determine if the material is in compliance with the banned list.

Analytical Testing Requirements

For recycled content materials from post-consumer sources and for which the applicant is not able to obtain the exact material formulation (i.e. Type 3 and 4 materials), analytical testing is required to ensure compliance with the Banned List of chemicals. Recycled content materials must at a minimum be tested for the toxic metals on the Banned List relevant to the nutrient type under review. Testing for organohalogen content is required in most cases as well. Additional testing may be required depending on material type and source. Section 3.3.1 of the *Cradle to Cradle Certified Product Standard, v3.1* provides analytical testing guidelines specific to the common types of recycled materials. This section of the standard also includes requirements for testing intervals, detection limits, laboratory selection, and documentation. Please refer to this section of the standard for further information.

2.4 Data Collection

Full Material Disclosure

Similar to other materials, it is necessary to obtain full composition disclosure from the manufacturer(s) of recycled content materials prior to completing an assessment. The goal is to identify all chemical substances present in each homogeneous material subject to review down to 100ppm (0.01%). Section 3.4.2 of the *Cradle to Cradle Certified Product Standard, v3.1* provides guidelines for the collection of chemical composition information specific to the major types of recycled materials. For homogeneous materials containing recycled content, composition data collected from the manufacturer(s) will vary from full to partial depending on recycled material type.

Recycling Process

In addition to gathering chemical composition information, the assessor is required to determine what type (i.e. Type 1-4) of recycled content is under review by gathering information from the

manufacturer and/or suppliers as relevant about the recycling process. In cases where the material will be A, B, or C assessed and/or used in Silver, Gold, or Platinum certified products, a complete description of the process must be available to the assessor. For Type 3 materials, this is to include a description of collection, separation, identification, and cleaning technologies, information on input stream variability, and a description of analytical testing regimens that are in place. Please see the Scope and Definitions section of this document for further information. Note that C2CPII may request information and/or documentation in support of a Type 1, 2, or 3 designation as part of the audit process.

2.5 Assessment Methodology

Once data collection and analytical testing have been completed as required, and it has been determined that the material is in compliance with the Banned List of chemicals, an assessment rating is assigned following the methodology summarized below by material type and within Table 1.

Type 1 & 2 – Post-industrial from DEFINED sources
These materials are to be assessed in the same manner as virgin homogeneous materials following the conventional Material Health Assessment Methodology.

Type 3 – Post-consumer from a DEFINED source
The formulation information obtained from the manufacturer(s) relevant to the original source material is to be assessed following the conventional Material Health Assessment Methodology. Upon verification that the recycling process requirements for designation as a Type 3 material have been met, it may be assumed that the full formulation has been obtained for materials of this type. If any banned substances were determined to be present below the banned thresholds but above the subject to review threshold (either through the analytical testing or disclosure), these are to be assessed using the conventional Material Health Assessment Methodology as well. See the section below titled Assessing Banned Chemicals for further guidance. Note that designation as Type 3 does not ensure a C assessment. For example, a Type 3 PET will still likely be X assessed due to the presence of the CMR antimony trioxide above 100 ppm, in which case the material would be limited to the Bronze level (unless mixed with virgin PET made using a different catalyst, bringing the antimony concentration down below 100 ppm).

Type 4 – Post-consumer from UNDEFINED sources
If formulation information was obtained from the manufacturer(s), it is to be assessed following the conventional Material Health Assessment Methodology. However, it must be assumed that this is not complete formulation data. If any banned substances were determined to be present below the banned thresholds but above the subject to review threshold (either through the analytical testing or disclosure), these are to be assessed using the conventional Material Health Assessment Methodology as well. See the section below titled Assessing Banned Chemicals for further guidance. If a homogeneous material containing recycled content from variable and mixed sources does not contain Banned List chemicals above allowable thresholds or any x assessed

substances above the subject to review threshold, it will be assessed as GREY and thus will not count toward the total percentage assessed.

Assessing Banned Chemicals

When banned chemicals are present below the banned thresholds but above the subject to review threshold, they must be included in the assessment as indicated above. Note that banned chemicals that are also chemicals of regulatory concern, as defined within the *Supplemental Guidance for the Cradle to Cradle Certified Product Standard, v3.1,* may only receive an exposure assessment when present below the regulatory thresholds or when used in non-regulated applications.

The following points provide guidance for assessing the Banned List chemicals for which analytical testing is most commonly required.

1. Metals in technical nutrient materials: Arsenic, mercury, cadmium, and chromium VI are each banned at concentrations >1000 ppm, but typically receive an x assessment if present from 100-1000 ppm. See the Exposure Assessment Methodology (in draft at time of publication) for a list of exceptions to this rule.
2. Metals in biological nutrient materials: Arsenic, mercury, cadmium, chromium VI, and lead are each banned at concentrations >10 ppm for arsenic, 1 ppm for mercury, 2 ppm for cadmium, 100 ppm for chromium, and 90 ppm for lead (see Section 3.3 *Cradle to Cradle Certified Product Standard, v3.1*). Note: Solid biological nutrient materials with post-consumer recycled content may comply with toxic metal thresholds that are on average, among several batches of product, below the specific toxic metal thresholds for any given period of time where the material is supplied for use in a certified product. When present below these thresholds, these metals do not have to be included as part of the assessment.
3. Organohalogens: The banned organohalogen compounds must each be present at ⩽1000 ppm, but will receive an x assessment if present from 100-1000 ppm. This means that bromide, chloride, and fluoride are to each be present at ⩽1000 ppm based on the halogen screening test method. The screening method is slightly problematic in that it detects both elemental and organic halogens. This issue may lead to overestimates of content. If the results show halogen content to be above the 1000 ppm threshold, further testing will need to be conducted to determine the exact source (organic or inorganic and exact identity of halogenated organics). The exact source may be difficult to determine, however, as there are multiple possible sources and many different halogenated organics.
4. Other substances: Phthalates, alkylphenols, alkylphenol ethoxylates, and organotins are banned at concentrations >1000 ppm each, but will likely receive an x assessment if present from 100-1000 ppm. An x assessment is required when exposure is still of concern at these concentrations. In addition, as noted at the beginning of this section, banned chemicals that are also chemicals of regulatory concern may only receive an exposure assessment when present below the regulatory thresholds or when used in non-regulated applications.

Table 1 Recycled Content Material Assessment Criteria

A/B	Recycled content is defined to exact chemical composition and meets requirements of the A or B material assessment rating.
C	Recycled content is defined to exact chemical composition and meets requirements of the C material assessment rating. OR Recycled content meets the requirements for designation as Type 3 post-consumer from a defined source, the analytical testing requirements have been met, and all chemical components identified via full material disclosure and analytical testing are a, b or c assessed.
GREY	Recycled content cannot be assessed due to lack of chemical composition information.
X	Recycled content contains one or more x assessed substances.