cradle to cradle products innovation institute

CRADLE TO CRADLE CERTIFIED®

CERTIFICATION MANUAL SUPPLEMENT

Version 4.1

Product Circularity in Apparel and Textiles

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Foreword

The Cradle to Cradle Products Innovation Institute (C2CPII) is an independent, nonprofit organization dedicated to maximizing the positive impacts of products and materials. As the standard setting and certification body for the Cradle to Cradle Certified® Product Standard, C2CPII works closely with leading organizations worldwide to guide and validate their efforts to apply the principles of material health, product circularity, clean air and climate protection, water and soil stewardship, and social fairness to product design and manufacturing. The standard provides designers, manufacturers, and suppliers with a framework for continually improving what products are made of and how they are made. Cradle to Cradle Certified is a respected mark of products and materials made for the circular economy.

This version of the Cradle to Cradle Certified® Version 4.1 Certification Manual Supplement – Product Circularity in Apparel and Textiles was initially released on 27 May 2025.

Further information about C2CPII and the Cradle to Cradle Certified Product Standard is available at www.c2ccertified.org.

Inquiries regarding C2CPII and the Cradle to Cradle Certified Product Standard may be directed to info@c2ccertified.org.

1 // How to Use this Document

This document is designed to provide information and additional context to guide apparel and textile companies in implementing the Product Circularity requirements of The Cradle to Cradle Certified Product Standard (Full Scope), Version 4.1 and the C2C Certified Circularity Standard, Version 4.1. Material Health and Packaging requirements that are relevant to C2C Certified Circularity Standard are also mentioned.

Following an introduction to circularity in the apparel and textile sectors, an overview of the C2C Certified Product Circularity requirements is presented. Each aspect of Product Circularity is then explored, beginning with relevant excerpts from the C2C Certified Product Standard (Full Scope), Version 4.1, associated User Guidance, and addendums to the User Guidance, followed by further explanations relevant to the apparel and textile sectors. Portions of the standard not typically relevant to textiles and apparel have been truncated for this Certification Manual Supplement and marked with "...(truncated)". Excerpts from the Full Scope standard are presented in pink and green boxes, and excerpts from the User Guidance are presented in light purple boxes. Case studies and examples are presented in grey boxes. References to the relevant section in the Full Scope standard are always provided in red numbering (e.g., see Section 5.3).

This Certification Manual Supplement will be updated regularly to incorporate the fast-changing developments within the sector, including the textile and leather takeback, sorting, and cycling industry.

As noted, the Certification Manual Supplement contains only certain parts of the C2C Certified Product Standard (Full Scope), Version 4.1 document, associated User Guidance, and addendums to the User Guidance. This document aims to improve the understanding of C2C Certified in terms of textile and apparel products. When applying for a C2C Certified Full Scope certification, please refer to the C2C Certified Product Standard (Full Scope), Version 4.1 and associated User Guidance. For a C2C Certified Circularity certification, please refer to the C2C Certified Circularity Standard, Version 4.1 and the Full Scope User Guidance. The requirements and guidance as detailed in these documents take precedence over this Certificate Manual Supplement in case of any discrepancies.

C2C Certified Product Standard (Full Scope) and C2C Certified Circularity Standard: What is the Difference?
Applicants interested in certifying to a standard that includes circularity requirements can choose to certify to the C2C Certified Product Standard (Full Scope) or to the C2C Certified Circularity Standard.
The C2C Certified Product Standard (Full Scope) includes requirements in five key impact categories:

1. Material Health
2. Product Circularity
3. Clean Air & Climate Protection
4. Water & Soil Stewardship
5. Social Fairness

In addition to these five key categories, additional requirements address other important topics, including Environmental Policy & Management, Packaging, and Animal Welfare.

The C2C Certified Circularity Standard includes the following requirements from the C2C Certified Product Standard (Full Scope), Version 4.1:

1. The requirements in Section 3.1, Certification Compliance Assurance;
2. The Bronze level requirements in Sections 4.1 and 4.2, Material Health;
3. The requirements for the desired achievement level in Section 5, Product Circularity, and
4. The requirements for the desired achievement level in Section 9, Packaging for Certified Products, if applicable.

This C2C Certified Version 4.1 Certification Manual Supplement – Product Circularity in Apparel and Textiles focuses on the Product Circularity requirements, with a short explanation on Material Health in Section 4, and on Packaging in Section 5.

Note that additional requirements (beyond what is discussed in this document) may apply based on the type of certification and desired achievement level. Please reach out to C2CPII or a C2C Certified® Assessment Body for further information.

2 // Product Circularity in the Apparel and Textile Sectors

The European Union is aiming for an economy that is 100% circular by 2050. The textile and fashion industry needs to adapt quickly as related legislation is rapidly introduced and adopted.

Currently, less than 1%[1] of textile production is circular. As piles of discarded clothing are growing every day, produced with large amounts of water, energy and chemicals, there is unprecedented urgency to change sourcing models, design strategies and production and cycling systems in the Fashion, Apparel, and Textile sectors. C2C Certified provides the global standard on product circularity to help companies create future-proof collections and minimize their environmental impacts.

While consumers, investors, and policymakers have an important role to play in the way we produce and consume fashion, companies are expected to take center-stage and leverage powerful existing frameworks to elevate the circular economy.

Business models are steadily integrating new approaches where longevity and durability become essential qualities of a product. These new approaches require engagement with consumers, digital platforms and service providers, and the creation of new data driven business models like Recommerce and Renting and Product as a Service.

With this Cradle to Cradle Certified science-based standard for product circularity, companies (also referred to as "applicants" in this certification manual supplement) can publicly validate that their products are intentionally designed for the circular economy and confirms they are taking active steps to enable the intended (re)cycling pathways of their products at end of use.

The Product Circularity category helps companies address three core pillars of circularity:

- Circular Design (design for cycling)
- Circular Sourcing (use recycled or renewable materials)
- Circular Systems (close the loop)

2.1 Cycling Pathways

Cycling pathways can be technical or biological, and they relate to how a material is processed at the end of its use. In a **technical cycle,** a product's materials or parts are reprocessed for a new product use cycle via one or more of the R-Strategies: Reuse, Repair, Refurbish, Remanufacture, and Recycle. Conversely, in the **biological cycle**, materials or parts are released, and ideally reprocessed in the environment via composting, biodegradation, nutrient extraction, or other biological metabolic pathways. The C2C Certified Product Circularity requirements reference the R-Strategies as technical cycling pathways.

[1] EUA. Slow down, our planet can't keep up! Available here.

Rooted in the consideration that we should not allow products to go to waste quickly if they are still of value to the market, the R-Strategies of Reuse, Repair, Refurbish, Remanufacture and Recycle are woven throughout the C2C Certified Product Circularity requirements. Read more about R-Strategies on the C2CPII website.

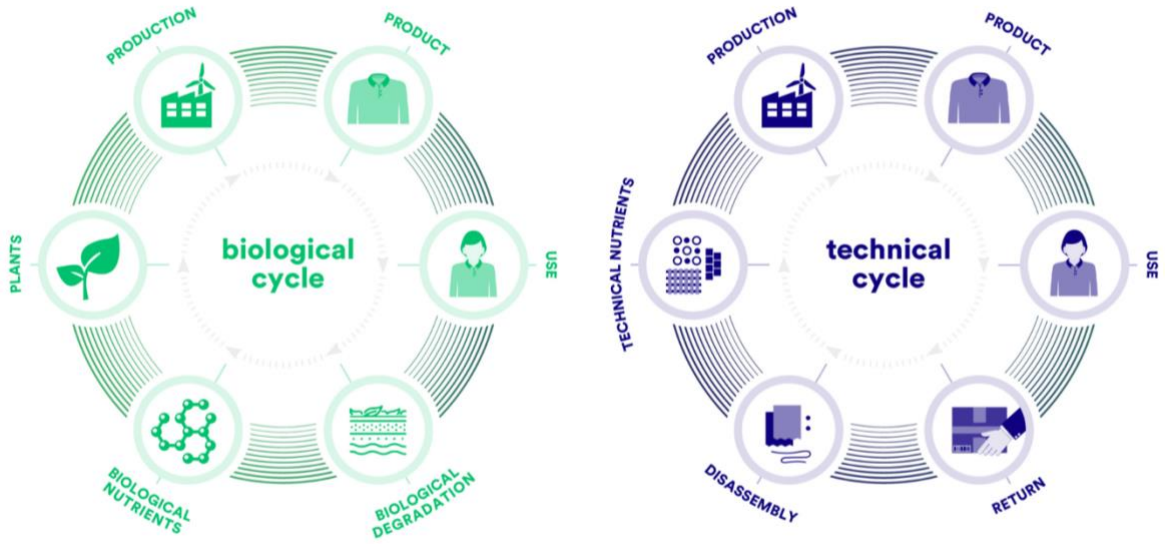

Figure – Cycling pathways

2.2 Recycling Challenges for Textiles and Apparel and the Role of the C2C Certified Product Circularity Requirements

The C2C Certified Product Circularity requirements requires that recycling is always one of the designated cycling pathways for materials intended for the technical cycle, because it is not possible to endlessly reuse and repair a product (see Section 3.1 in this document / Section 5.1 of the Full Scope standard document). However, current recycling systems mainly result in downcycled products, like apparel that ends up in textile waste bins to be recycled into fillings or cleaning cloths of lower value. The C2C Certified Product Circularity requirements ensures that higher quality cycling is possible (see Section 5.4 of the Full Scope standard document).

According to the European Commission's Joint Research Centre's (2021) publication Circular economy perspectives in the EU Textile sector, there is significant potential to reduce textile waste and ensure that it creates further value by boosting its preparation for reuse and recycling.

The EU Strategy for Sustainable and Circular Textiles is a prominent example of new legislative initiatives that specify requirements ranging from Ecodesign to Green claims; mandating Digital Product Passports, and Extended Producer Responsibility (EPR). The EPR laws will transform the landscape of textile collecting, sorting, and cycling. It holds producers accountable for the waste that their products create. The requirements entail separate collection of waste and its subsequent management in line with the waste hierarchy. The EPR also incentivizes product design that promotes circularity throughout the

material life cycle and takes account of the end of a product's life. The Ecodesign Regulation provides a framework to implement product-based requirements aligned with C2C Certified.

Preparing for Active Cycling

Several EU Member States, including the Netherlands, Hungary and France, have already introduced EPR requirements for textile companies, given the obligation under EU waste legislation to establish separate collection of textile waste by 1 January 2025. To fulfill the requirements on Preparing for Active Cycling (Section 3.2 of this document / Section 5.2 of the Full Scope standard document), applicants in Europe can make use of the implemented circular systems in the region, while applicants in other areas will likely need to establish partnerships to take back and cycle products. However, the ambitious and fast-changing regulatory landscape will progressively lead to collective cooperation and better facilitation for companies and consumers to cycle their products.

Incorporating Cycled and/or Renewable Content

To fulfill requirements on Incorporating Cycled and/or Renewable Content (Section 3.3 of this document / Section 5.3 of the Full Scope standard document), products must contain a minimum percentage of cycled and/or renewable content based on the desired achievement level (Bronze through to Platinum). Cycled content can be differentiated as "post-consumer" or "pre-consumer". Post-consumer cycled content is processed from material that has been owned and mostly used by consumers. This can be generated by end-users such as households, commercial, industrial, or institutional facilities. Pre-consumer cycled content consists of material or parts diverted from the waste stream during or after a manufacturing process.

Material Compatibility for Technical and/or Biological Cycles

The production of post-consumer material for textiles is generally challenging, since textile materials mainly consist of blends (a mix of raw materials) including labels and trims. Sorting technologies are developing, but not yet ready to identify and extract all the different processed (raw) materials. Most fiber-to fiber recycling systems depend on the input of clean cotton rich materials, free from coatings, prints, labels, and trims. This challenge is addressed by the design requirements of Material Compatibility for Technical and/or Biological Cycles (Section 3.4 of this document / Section 5.4 of the Full Scope standard document).

Material Health Assessments

It is difficult to know the exact chemical composition of the original post-consumer textile materials. Cycling content in which the source is not known poses the risk of introducing hazardous chemicals into the product cycle. Using safe materials is a prerequisite of the Cradle to Cradle Certified Material Health requirements, another core pillar of the Cradle to Cradle Certified Product Standard. Therefore, when the origin of the feedstock is unknown, recycled post-consumer materials require additional analytical testing to meet the Standard's Material Health requirements. Alternatively, knowing the sources, the raw materials, and the wet processing treatments makes it much easier to test and avoid such risk. Therefore, using chemically or mechanically recycled materials from controlled sources is an option to simplify the Cradle to Cradle Certified Material Health assessment (Section 4 of this document / Section 4 of the Full Scope standard document).

In the circular economy, the aim is to extend the lifetime of a product and, when it comes to the end of use, to cycle and reuse textile "waste" as actual nutrients, to create products of equal or greater value to the market. For example, from garment to garment, from plastic waste to shoe sole, from textile to table, or from button to brooch.

Circularity Data Reports

Cycling post-consumer material would undoubtedly benefit the circular economy but is still challenging in an era where tools such as tracking chips, blockchain, and digital product passports are not yet widely available to provide detailed information about the supply chain and processing history per item. However, we are seeing rapid progress towards this, with new technological and commercial developments as well as new legislative proposals. Both the C2C Certified Full Scope and C2C Certified Circularity certifications provide companies with a C2C Certified Circularity Data Report where important data is captured to enable the product's cycling (Section 3.5 of this document / Section 5.5 of the Full Scope standard document).

In conclusion, delivering smart design and high-quality durable and cyclable materials are essential to start the creation of a circular product. There is however an R missing in the R-strategy framework: to make the story complete and actionable on a larger scale, we need to "Re-organize" ourselves for active cycling. To make cycling happen, we need to close the loop. We need brands and retailers to team up with suppliers, customers as well as transport, repair, sorting, (re)cycle and composting partners. We need to better understand what current and emerging sorting techniques can do and what recyclers need in order to mechanically or chemically cycle products or components, for example, based on the minimum quality requirements of spinners, yarn- or fabric suppliers. This is all related to what we put into the system. That's where the product designer comes back in (see Sections 3.6 and 3.7 / Sections 5.6 and 5.7 of the Full Scope standard document), and a clear global standard on product circularity. The designer must be supported and driven by a holistic and equitable company strategy, which in turn needs the support of investors and policymakers. That is how we close the circle for full product circularity.

All actors inside and outside the value chain cycle are called on to proactively cooperate. The EU's Ecodesign requirements and Eco modulation fees will already be obligatory in the coming years, and change is needed now to meet the goals of full circularity by 2050. C2C Certified Product Circularity requirements, together with this certification manual supplement, is designed to support this transformation, to guide the Apparel and Textile Sectors towards full circularity, to protect the planet and the natural resources which sustain our industry, our businesses, and our lives.

3 // Product Circularity Requirements

Refers to Section 5 in the C2C Certified Product Standard (Full Scope), Version 4.1.

EXCERPT – Version 4.1 Product Standard

Product Circularity Requirements

Category Intent

Products are intentionally designed for their next use and are actively cycled in their intended cycling pathway(s).

Requirements Summary

To achieve a desired level within the category, the requirements at all lower levels must also be met.

Requirement	Bronze	Silver	Gold	Platinum
5.1: Intended cycling pathway(s) for the product and its materials are defined.	•	•	•	•
5.2: A plan has been created to address challenges with the cycling infrastructure at the end of the product's first use; potential cycling partners have been identified.	•	•	•	•
5.3: Select product and material types contain cycled and/or renewable content. Alternative: Limitations that prevent achievement of this requirement are publicly reported.	•	•	•	•
5.4: ≥ 50% of materials by weight are compatible with the intended cycling pathway(s) (i.e., recyclable, compostable, or biodegradable).	•	•	•	•
5.5: Circularity data and cycling instructions are publicly available.	•	•	•	•
5.2: Partnerships for cycling (recovery and processing) of the product have been initiated. If the product is intended for cycling via municipal systems, materials are compatible with those systems.		•	•	•
5.3: Percentage of cycled and/or renewable content, by weight, is equal to or higher than industry averages and/or is consistent with common practice. Alternative: Limitations that prevent achievement of this requirement are publicly reported.		•	•	•

5.4: ≥ 70% of materials by weight are compatible with the intended cycling pathway(s) (i.e., recyclable, compostable, or biodegradable).		•	•	•
A strategy for improving product circularity is developed including plans for: • 5.3: Increasing the amount of post-consumer recycled content and/or responsibly sourced renewable material, as relevant to the product type, • 5.6: Implementing a circular opportunity or innovation, and • 5.7: Improving the product's design for disassembly (if relevant).		•	•	•
5.2: Partnerships for cycling (recovery and processing) of the product according to all intended cycling pathways have been initiated.			•	•
5.3: Percentage of cycled and/or renewable content, by weight, is consistent with values achieved by industry leaders for the product type. Alternative: Limitations that prevent achievement of this requirement are publicly reported.			•	•
5.4: ≥ 90% of materials by weight are compatible with the intended cycling pathway(s) (i.e., recyclable, compostable, or biodegradable) and support high-value cycling. This means that the materials are of high quality and are likely to retain their value for subsequent use. 5.7: If relevant, parts containing these materials are designed for easy disassembly.			•	•
The strategy has been implemented including: 5.3: Increased use of post-consumer and/or responsibly sourced renewable material as relevant to the product type. Alternative: Limitations that prevent increased use are publicly reported. 5.7: A circular opportunity or innovation that increases product circularity.			•	•
5.8: The product is actively cycled (recovered and processed) and/or a program is implemented to increase the cycling rate or quality of the product's materials after use. (Both are required for short-use phase products and for products required to be cycled per leading regulations; one is required for long-use phase products.) For select single-use plastic products, a minimum cycling rate of 50% Is achieved.			•	•

5.1: At least two intended cycling pathways are defined for the product and its materials.				•
5.3: Percentage of cycled and/or renewable content, by weight, has reached the technically feasible maximum.				•
5.4: ≥ 99% of materials by weight are compatible with the intended cycling pathway(s) (i.e., recyclable, compostable, or biodegradable). 5.7: If relevant, parts containing these materials are designed for easy disassembly.				•
5.8: The product is actively cycled in an amount consistent with the product's use phase (the shorter the use phase, the higher the minimum Percentage required) and a program is implemented to increase the cycling rate or quality of the product's materials after use.				•
Cycling rates and quality are monitored over time, and an increase in cumulative cycling rate or quality is demonstrated.				•

EXCERPT – Version 4.1 User Guidance

Product Circularity – Framework

It is helpful to understand the conceptual framework of the Product Circularity category before reviewing the details of individual requirements. Product Circularity consists of three requirement focus areas: Circular Sourcing, Circular Design, and Circular Systems. The individual standard sections fit into the framework as follows.

Circular Sourcing:

- Section 5.3: Increasing Demand: Incorporating Cycled and/or Renewable Content

Circular Design:

- Section 5.1 Defining the Product's Technical and/or Biological Cycles
- Section 5.4 Material Compatibility for Technical and/or Biological Cycles
- Section 5.6 Circular Design Opportunities and Innovation
- Section 5.7 Product Designed for Disassembly

Circular Systems:

- Section 5.2 Preparing for Active Cycling
- Section 5.5 Circularity Data and Cycling Instructions
- Section 5.8 Active Cycling

3.1 Defining the Product's Technical and/or Biological Cycles

Refers to Section 5.1 in the Full Scope standard.

EXCERPT – Version 4.1 Product Standard

5.1 Defining the Product's Technical and/or Biological Cycles

Intended Outcome(s)

The applicant has designated all homogeneous materials subject to review in the product as either biological or technical and has identified appropriate cycling pathways for those materials once the product has reached the end of its current use cycle.

Applicable Achievement Level(s)

Bronze and Platinum

Requirement(s)

Bronze level: Designate all homogeneous materials subject to review in the product as being intended for technical and/or biological cycles and define the intended cycling pathway(s) for each material. **For materials designated for technical cycles, recycling must be one intended cycling pathway.**

Platinum level: Define at least two intended cycling pathway(s) for each homogeneous material subject to review in the product.

Exemption

Intermediate products *(...truncated)* are exempt from the Platinum level requirement.

C2C Certified Definitions

Biological cycle – The cycle by which materials or parts are released to, and ideally reprocessed in, the environment via composting, biodegradation, or other biological metabolic pathways.

Technical cycle – The cycle by which a product's materials or parts are reprocessed for a new product use cycle via recycling, repair, refurbishment, remanufacturing, or reuse.

Intermediate product – A product sold exclusively as an input to be used in another product and not sold to the general public. *

*Note: In textiles and leather, examples of intermediate products include pre-treatments, dyes, finishes, and trims.

Further Explanation – Apparel and Textiles

Textile and leather products are currently most likely to end up in a technical cycle through reuse or recycling pathways. The biological cycle is still very innovative in fashion and for materials or parts released to, and ideally reprocessed in, the environment via composting, biodegradation, or other biological metabolic pathways.

The design intent must be documented in the C2C Certified Circularity Data Report (Section 5.5 of the Full Scope standard document) that accompanies the certification, aiming to demonstrate the design intent for cycling, materials, and cycling instructions, ensuring products end up in the correct cycling pathway.

Designing for the Biological Cycle

Designing for the biological cycle is commendable since some textile fibers still end up in the environment even when technical cycling pathways are used. However, given the lack of infrastructure for industrial composting of textiles, which takes typically longer than acceptable composting timeframes, this option comes with many challenges. Even if a biological pathway is chosen, it is recommended to also design the product for reuse and recycling to ensure materials have the best chance of being cycled after use.

What does Biodegradable or Compostable Mean?

The terms "biodegradable" and "compostable" are often used interchangeably, but they have distinct meanings:

Biodegradable

- **Definition:** Biodegradable materials can be broken down by microorganisms (like bacteria and fungi) into natural elements such as water, carbon dioxide, and biomass.
- **Timeframe:** The time it takes for a material to biodegrade can vary widely, from a few days to several years, depending on the material and environmental conditions.
- **Conditions:** Biodegradation can occur in various environments, including landfills, but the process is often slower in low-oxygen conditions.

Compostable

- **Definition:** Compostable materials are a subset of biodegradable materials that break down into nutrient-rich compost under specific conditions, typically in a composting environment.
- **Timeframe:** Compostable materials are designed to break down within a specific timeframe, usually a few months, under composting conditions.
- **Conditions:** Composting requires a controlled environment with the right balance of heat, moisture, and oxygen to facilitate the breakdown process.

Key Differences

- **End Product:** Compostable materials turn into compost, which can enrich soil, while biodegradable materials simply break down into natural elements without necessarily providing soil benefits.

- **Environmental Impact**: Compostable materials are generally considered more environmentally friendly because they contribute to soil health, whereas biodegradable materials may not always break down completely or safely in all environments.

After the pre-treatment, dying, finishing, and printing of raw materials with many different chemical formulations, it becomes a challenge to certify apparel and textile products specifically for the biological cycle. But considering the large amount of textile products that end up as toxic waste, this indicates the vast potential of the development of biodegradable collections that could be transformed into valuable nutrients for the planet. A further benefit of biological collections would address the risk of microfiber release during the manufacturing phase and when garments are worn, washed, and dried, avoiding the potentially adverse effects on natural ecosystems[2].

Creating a biodegradable collection comes with some challenges, ranging from durability, functionality (for example the use of trims), quality issues, and the lack of infrastructure for biodegradation or composting. In the C2C Certified Product Circularity requirements, products designed for the biological cycle require systems for the intended cycling pathway (defined in Section 5.2 of the Full Scope standard document) and must undergo C2CPII-recognized tests (defined in Section 5.4). A list of currently recognized tests can be found here. This list is dynamic and may be revised according to new developments. Assessors or applicants may also propose new standardized testing methods for textile or leather products.

While testing continues to evolve, the C2CPII community can drive better solutions for industrial biodegradation and composting of textiles, as well as improved reuse, repair, and recycling systems.

Claiming 100% Biodegradable or Compostable

Legal (EU and national) green claim requirements are very strict about the use of the term "Biodegradable" and "Compostable" on textile and leather products, because there is doubt on the execution of it.

The infrastructure for industrial biodegradation routes, such as industrial composting, is mostly not yet adapted to textile waste, since municipal organizations focus on food and garden waste. As developments and innovation continue at pace, companies wishing to apply the standard must find out if the industrial composting facilities do allow compostable textile products in their respective markets/countries to receive credit in Section 5.2 of the Full Scope standard document, Silver level requirements. Companies should also check the applicable laws for claiming any form of biodegradability or compostability. In France, for example, it is not allowed to claim "industrially compostable" on a product, but "home compostable" is permitted. Reach out to national authorities and waste stream experts to find out what textile composability claims might be allowed in line with national laws and provided waste systems.

[2] Kwak et al. (2022). Critical review of environmental impacts of microfibers in different environmental matrices. Available here.

If products are tested for home composting, it is important to realize that home composting is rarely executed by end users. Clear instructions regarding how to compost the product (as required per Section 5.5 of the Full Scope standard document) must be provided.

EXCERPT – Version 4.1 User Guidance

Biological Cycling Pathways

If a material is designated for the biological cycle, one or more of the following must be selected as the intended cycling pathway(s):

- Nutrient extraction
- Anaerobic digestion
- Composting (Home)
- Composting (Industrial)
- Biodegradation (Soil)
- Biodegradation (Water)
- Biodegradation (Anaerobic)

Designing for the Technical Cycle

When products are designed for circularity in the fashion and textile sectors, most are designed for the technical cycle, meaning the materials are ready to be potentially Re-used, Repaired, Refurbished, Remanufactured, or Recycled – referred to as the technical cycling pathways.

If applicants design for the technical cycle, starting from the Bronze level, recycling must be included as the intended pathway. However, applicants can also design for reuse, repair, refurbishing, or remanufacturing in addition to recycling. Complimentary design strategies for the intended cycling pathway can be found in Section 5.6 of the Full Scope User Guidance.

EXCERPT – Version 4.1 User Guidance

Technical Cycling Pathways

If a material is designated for the technical cycle, one or more of the following must be selected as the intended cycling pathway(s), and one of these must be recycling. Recycling must always be a designated pathway because it is not possible to endlessly reuse, repair, refurbish, remanufacture, and/or repurpose.

- Reuse
- Repair
- Refurbish
- Remanufacture
  Repurpose
- **Recycling (mechanical or chemical).** *Must be one of the intended pathways as of Bronze certification for the technical cycle.

Notes: Incineration and waste-to-energy/energy recovery are not recycling and are therefore not accepted cycling pathways for the purposes of the Product Circularity requirements. Other "R-strategies" not listed above (refuse, rethink, and reduce) are addressed in other sections of the Product Circularity category, to the degree they relate to product design. For example, see Section 5.6 Circular Design Opportunities and Innovation where credit is given for refillable systems and durability (as examples).

Case Study – Designing for the Biological Cycle

Pratibha Syntex, one of India's largest sustainable apparel manufacturers, created cotton garments for the biological cycle (according to Standard V3.1 in 2024) and tested according to the best available standard for composting and biodegredation of textiles, originally meant for packaging (EN 13432 Requirements for Packaging Recoverable Through Composting and Biodegradation – Test Scheme and Evaluation Criteria for the Final Acceptance of Packaging). This standard is part of the C2CPII-recognized Compostability and Biodegradability Testing Methods, and therefore Pratibha Syntex could meet the requirements for this aspect.

The list of recognized testing methods will likely be extended as dedicated textile test methods emerge.

3.2 Preparing for Active Cycling

Refers to Section 5.2 in the Full Scope standard.

EXCERPT – Version 4.1 Product Standard

5.2 Preparing for Active Cycling

Intended Outcome(s)

The applicant has taken demonstrable steps toward addressing any barriers to material recovery and processing in order to actively cycle those materials for their next use.

Applicable Achievement Level(s)

Bronze, Silver and Gold

Requirement(s)

Bronze level: Develop a cycling plan to address challenge(s) inhibiting development of the cycling infrastructure for the product at the end of its first use and identify potential partners that are capable of recovering and processing the product. Report on progress made toward achieving the plan at recertification.

Silver level: Initiate partnerships for recovery and processing of the product according to its intended cycling pathway(s). If there is more than one intended pathway for individual materials, partnerships may focus on one of those pathways (e.g., reuse, repair, refurbish, remanufacture, or recycling for the technical cycle). If the product is intended for cycling via municipal systems, use materials that are compatible with those systems.

Gold level: Initiate a partnership for recovery and processing of the product according to all intended cycling pathway(s).

For the Bronze level, the cycling plan must include the following:

1. Discrete planned actions and an associated timeline.
2. Identification of potential partners or internal resources for product recovery and processing in accordance with the intended cycling pathway(s) in countries and/or states that cumulatively cover a region accounting for 60% or more of product sales (with one exception per #3 below). Products intended to be cycled via municipal systems or addressed by regional/national product stewardship laws are exempt from this requirement.

...(truncated).

At recertification, progress must be demonstrated on any planned actions.

For the Silver level, one or more of the following is required for at least one intended pathway in countries and/or states that cumulatively cover a region accounting for 60% or more of product end sales:

1. The applicant company or retail partner has initiated partnership(s) or dedicated internal resources for product recovery and processing. (Initiation of a partnership is defined as the applicant company having an active agreement or contract(s) with entities involved in the recovery and processing of the product for another use cycle.)
2. A product stewardship law or program for the product type is in place (e.g., California Carpet Stewardship Law).
3. If intended for cycling via municipal systems, materials are a type that is commonly recycled or composted via curbside pickup and the material is accepted by municipal recycling programs in the region(s) where the product is sold.

For the Gold level, the Silver level requirements must be applied to all additional intended pathways (if any).

Exemption

Products with a use phase greater than one year that have been on the market for less than their average use phase are exempt from the Silver level requirement at initial certification.

Intermediate products and liquid formulations are exempt from Silver level requirements in all cases.

C2C Certified Definitions

Cycling – The processing of material, parts, or whole products toward a new use cycle via a technical or biological cycling pathway that includes at least one of the following: reuse, remanufacturing, refurbishing, recycling, nutrient extraction/anaerobic digestion, composting, or biodegradation.

Further Explanation – Apparel and Textiles

Section 5.2 Silver and Gold level requirements of the Full Scope standard document can be achieved via three key pathways:

- **Pathway #1**: Dedicated internal resources or partnerships
- **Pathway #2**: The presence of Product Stewardship Laws in the market, such as Extended Producer Responsibility
- **Pathway #3**: Municipal cycling systems

60% or more of the product sales must be in regions with systems in place either with Pathway #1, #2, or #3.

In regions without existing cycling systems in place, applicants can either set-up their own systems for take-back and cycling (e.g., reuse, resell or repair) and/or work with cycling partners to set up these systems.

Receiving Credit for Partnerships or Dedicated Internal Resources (Pathway# 1)

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This is the only option for products for which there is no product stewardship or extended producer responsibility laws in place and/or no government funded (municipal) cycling infrastructure available. Partnerships may be newly and uniquely tailored to a specific certified product offering or involve voluntary participation in existing privately operated systems.

To receive credit, a partner must be capable of recovering and processing the product for its next use. For example, to receive credit for a partnership with a textile collection and recycling company if not using the municipal recycling route below), it must also be demonstrated that the company can process the product as made. Note that certain fiber blends and product characteristics may not be accepted or recycled by some potential textile recycling partners and parts of some product types may be cut out and removed. This will have to be determined on a case-by-case basis when depending on partners for product cycling.

For materials in technical cycles, Silver level maybe achieved with partnership(s) for reuse, repair, refurbish, remanufacture only. Recycling partnership(s) are then required in order to achieve Gold level certification.

Potential Partnerships in the Textile Sector: Collectors, Sorters, and Cyclers

Companies may partner up with service providers for take back, sorting, and cycling (recovering and processing). If applicants choose Pathway #1 to work with partners, the following databases might be of help:

- The Circular Fashion Solution Provider List (see Annex 3): This provides an overview of solution providers in various areas such as collecting, care and repair, sorting, recommerce, rental, recycling, and SaaS platforms for brands and retailers. Note that these are not pre-approved providers and the applicability to the product needs to be checked during certification.
- Open-source Textiles Sorting and Recycling database, provided by WRAP, maps out textile sorters, pre-processors, recyclers, and yarn spinners within the EU and UK.
- The recycler database from Fashion For Good and Circle Economy offers an overview of fiber-to-fiber mechanical and chemical recyclers globally.
- Sustain20, a solution directory for circular fashion solution providers.
- The World of Waste tool provides an overview of data points on waste quantities, types, compositions, and other insights, as well as links to the original studies. With information on waste attributes, data collection methodologies, organizations involved, and a lens on upcoming studies for a region, the tool empowers users of textile waste, as well as stakeholders looking to further the industry's knowledge base.

Case Study – Initiating Recycling Partnerships

Ralph Lauren's cashmere recycling program is developed as part of the Cradle to Cradle Certified® process. In partnership with Re-Verso™, a leading textile production company, customers in North America and Europe can ship their 100% cashmere items—from any brand—to Re-Verso™ in Prato, Italy, to be recycled.

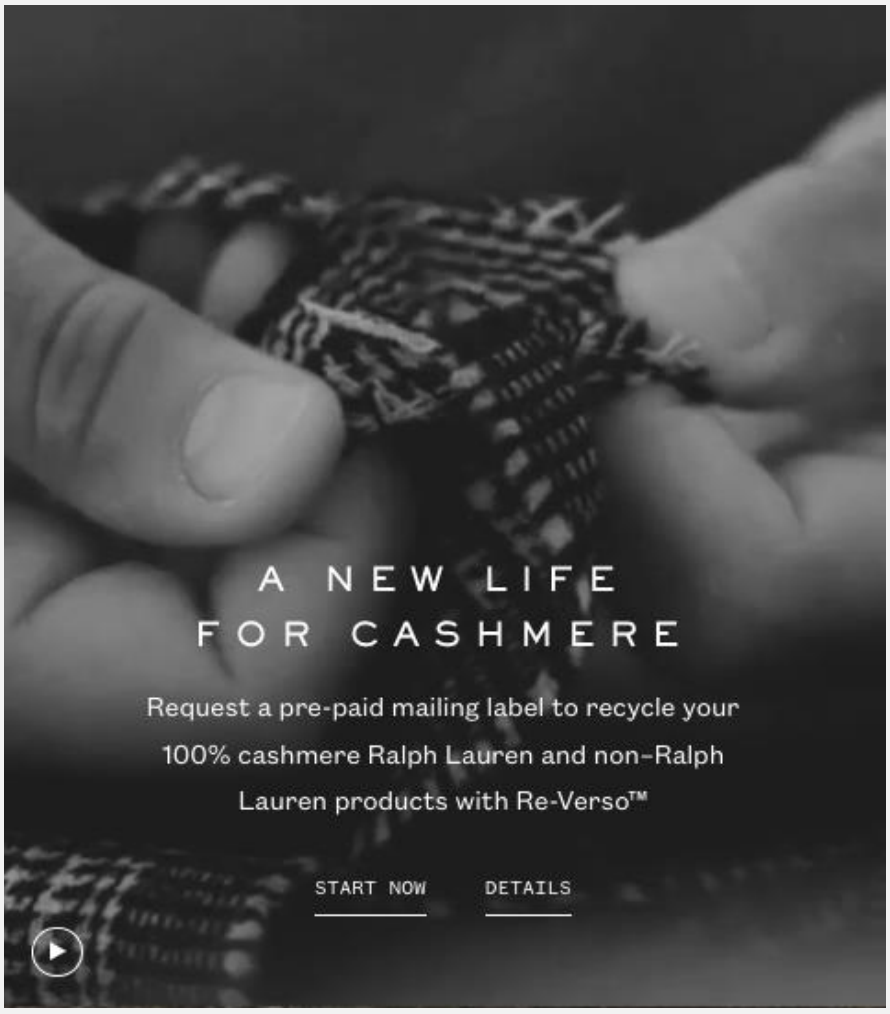

Image Credit: Ralph Lauren

Prolonging Products' Lifespans Through Repair

Prolonging the life of our pre-owned clothing, being mindful of how we launder them, and making repairs when needed are crucial steps in addressing the climate crisis. According to the Waste and Resources Action Programme (WRAP), extending a garment's life by just nine months can reduce its carbon, waste, and water footprints by 20-30%[3].

[3] Wrap. Valuing Our Clothes: The Cost Of UK Fashion. Available here.

Many consumers face challenges when trying to alter or repair their clothes, which contributes to the large volume of discarded garments in landfills. This scenario creates a valuable opportunity for brands that can provide affordable or free repair services and design their collections with repairability and circularity in mind from the outset. Repairing clothes or buying second-hand has become a stylish and sustainable choice, and significant investments are being made in start-ups focused on this area, while existing brands are increasingly offering repair services.

In France, companies can make use of a "Repair Bonus". Established by the AGEC Law (Anti-Waste for a Circular Economy), the Repair Bonus is a financial incentive designed to encourage the French public to repair their textiles and footwear once out of warranty, thereby extending their lifespan[4].

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Receiving Credit for Repair

To receive credit for repair as an intended pathway, it must be demonstrated that repair contributes to a longer use phase compared to the norm/most common for the product type. For example, repairing tires is common practice as part of normal use and is not expected to extend the use phase of a tire beyond the most common use phase time (i.e., mode). See the guidance in Section 5.6 Circular Design Opportunities and Innovation for determining the most common use phase time for the product type.

For textile and leather products, applicants are required to initiate a repair service (that might include care and refurbish) and illustrate by examples or testing results that this repair service will help to extend the product's lifespan.

[4] Re_Fashion. The Repair Fund newest obligations. Available here.

Case Study – Partnerships for Repair

G-Star has introduced a repair service called G-Star RAW Certified Tailors to help extend the life of their denim. Here's how it works:

Free Repairs: Customers can get G-Star jeans repaired for free by one of their certified tailors. This includes fixing broken zippers, repairing seams, restoring worn areas, and reattaching or replacing buttons.

Certified Tailors: G-Star has partnered with skilled tailors across various cities who are trained in the specifics of RAW denim, including stitching, 3D design, fit, and fabrics.

Service Points: Customers can drop off jeans at a service point in any G-Star store or take them directly to a certified tailor.

Sustainability Focus: This service is part of G-Star's commitment to reducing fashion waste and promoting sustainability by encouraging customers to repair and rewear their favorite jeans instead of discarding them.

Read more on G-Star.com/rawresponsibility

Image Credit: G-Star

Here are some of the most common repairs that applicants can perform as part of a service to extend the lifetime of a certified product line:

1. **Fixing holes:** Whether it's a small tear or a larger hole, mending these is a common task. Techniques include darning, patching, or using fusible interfacing.
2. **Replacing zippers**: Broken zippers can be replaced or repaired, which is especially useful for jackets, pants, and dresses.
3. **Hemming:** Adjusting the length of pants, skirts, or sleeves is a frequent alteration to ensure a better fit.
4. **Repairing seams:** Seams can come undone over time and resewing them is a straightforward fix.
5. **Button replacement:** Lost or broken buttons are easy to replace and can make a garment look new again. Always deliver a spare button with the product.
6. **Collar and cuff repairs:** These areas often wear out first, especially on shirts and jackets. They can be reinforced or replaced.

Luxury goods including leather products are more likely to be repaired. Leather products often require specific repairs to maintain their durability and appearance. Here are some common repairs for leather items to extend the lifetime:

1. **Fixing rips and tears:** Small rips and tears can be repaired using leather glue and patches.
2. **Repairing scratches and scuffs:** Minor scratches can often be buffed out with a leather conditioner. Deeper scratches might require leather filler and dye to blend the repair.
3. **Dealing with cracks:** Cracked leather can be treated with a leather conditioner to restore some flexibility. For severe cracks, a leather filler and dye might be necessary.
4. **Replacing zippers and hardware:** Just like with fabric garments, zippers and other hardware on leather items can be replaced if they break.
5. **Cleaning and conditioning:** Regular cleaning and conditioning can prevent many common issues like drying and cracking.
6. **Dyeing and recoloring:** Faded or discolored leather can be restored with leather dye. This process can also be used to change the color of the leather, but chemical safety must always be considered.

Receiving Credit for Product Stewardship Laws (Pathway #2)

In addition to the mandatory separate waste collection in Europe, the Extended Producer Responsibility (EPR) laws will enhance the infrastructure for cycling. As of 2024, mandatory systems for textiles are in place in France, Hungary, the Netherlands, and will be obligatory in the US (California) from 2028.

Read more in the following paragraph on Determining if 60% or More of Product Sales are Covered by Pathway #1, #2 or #3.

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Note: "Product Stewardship Laws" includes Extended Producer Responsibility (EPR) laws. These laws often provide funding for municipal cycling systems and so the two (i.e., the laws and municipal systems) are not necessarily mutually exclusive.

In the European Union, an Extended Producer Responsibility scheme is in place, covering:

- The following products sold on the EU market: Batteries, end-of-life vehicles, vehicle tires, waste electrical and electronic equipment (per the Waste from Electrical or Electronic Equipment (WEEE) Directive), and packaging.
- Textile and apparel products: Based on the EU Waste Framework Directive, all EU Member States must establish systems for the separate collection of textiles by 1 January 2025. This is considered municipal cycling for the purposes of the Cradle to Cradle Certified standard (although the actual funding and management structure may vary by member state). See the municipal cycling section below for additional information. In addition, the EU Waste Framework Directive is in revision to require mandatory and harmonized Extended Producer Responsibility (EPR) schemes for textiles in all EU Member States.
- In France: Mattresses, furnishings, printed paper, balloons, wet wipes, fishing gear, toys, sports and leisure articles, DIY and gardening products, construction materials and construction demolition waste.
- In the Netherlands: Balloons, wet wipes, tobacco products with filters, single-serve food packaging, disposable cups, bags and wrappers, light plastic carrier bags, beverage packaging (and fishing gear as of 2025).

The stewardship law must include product end-of-use management and cycling requirements to receive credit. Laws that have passed, but that are not yet implemented, receive credit if implementation will occur within one year of application for certification and the median product use phase is greater than one year.

Receiving Credit for Municipal Cycling (Pathway #3)

As mentioned above, the EU Waste Framework Directive requires EU Member States to establish systems for the separate collection of textiles by 1 January 2025. This is considered municipal cycling. It may be assumed that textiles and apparel are (increasingly) accepted by separate textile collection programs in all EU Member States as this is required by law (per the Waste Framework Directive) by 2025.

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A municipal cycling system is a structured program managed by local governments to collect, sort, and process cyclable materials from households, businesses, and other sources.

Textiles are primarily collected by charitable and commercial collectors, with municipal waste companies increasingly playing a role in used textile collection. When the term "municipal cycling" is used it could involve charitable or commercial collectors, offering regional public collecting systems, like dedicated textile bins on the street, called "curbside pickup".

"Curbside pickup" includes pick up from recycling bins that are widely available at curbside and/or throughout a community. Curbside pickup also includes pickup directly from individual households (e.g., by recycling trucks).

Textiles and Apparel

It may be assumed that textiles and apparel are accepted by municipal recycling programs in all EU Member States as this is required by law (per the Waste Framework Directive) by 2025[i].

- Reuse may be assumed 'common' for all EU Member States given that separate collection is required by law as of 2025 and reuse rates are already high. As per Circular Economy Perspectives in the EU Textile sector, European Commission Joint Research Center, June 2021: "Reuse shares typically range between 50% and 75% depending on the country where the textiles were collected and how the collection was carried out."

Note: This is especially relevant to applicants for the Silver level because reuse may be the only intended cycling pathway for which cycling partnerships or systems are in place for achieving the Silver level in Section 5.2 Preparing for Active Cycling requirements. In other words, all EU countries may automatically be counted towards the required 60% at the Silver level for the reuse pathway.

- Textile and apparel items commonly sorted for reuse include outerwear, pullovers, t-shirts, shirts, pants and shorts, dresses, skirts, jackets, household textiles, shoes and accessories. Items that are not commonly sorted for reuse include workwear, socks, tights, and undergarments and cannot be considered accepted by municipal systems[ii].
- Recycling may also be assumed 'common' for all EU Member States given that separate collection is required by law as of 2025. This is unique for textiles as reuse (rewearable) is the current dominant pathway. After separate collection, recycling is usually considered only after the reusable fraction is sorted out. It should be noted however that most of the non-reusable material is downcycled[iii]. In EU countries with available data, recycling rates were greater than 10%. Companies must ensure proper textile waste instructions are publicly available (e.g., by using the Circularity Data Report) and make it clear for end-users to receive credit for this pathway. Please refer to Section 5.5 Circularity Data and Cycling Instructions.
- Industrial composting for textiles is not offered (yet) by municipal systems. Therefore, regional research is needed to find out if industrial composting facilities (per region) would allow textiles to be part of their composting system. Textiles do not get sorted for composting via municipal textile collection but may end up in industrial composting via the

organic waste collection for fruit, vegetables and garden waste. In France, it is not allowed to use the claim "Industrially Compostable" on a textile product.

Home composting could be a pathway for (home)compostable textile products but will not be executed on large scale. Home composting has different testing requirements compared to industrial composting. Companies must ensure home composting instructions are publicly available, e.g., by using the Circularity Data Report and make it clear for end-users to receive credit for this pathway. Please refer to Section 5.5 Circularity Data and Cycling Instructions. If companies wish to claim "home compostable", they should make sure the claim is allowed by the countries of sale.

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i. EEA. Management of used and waste textiles in Europe's circular economy. Available here
ii. Eurotex. Used Clothing Sorting Process. Available here
iii. Circle Economy, EigenDraads and Fashion for Good (2022). An Evaluation and Commercial Assessment of Textile Waste across Europe. Figure 5. Available here

Determining if 60% or More of Product Sales are Covered by Pathway #1, #2, or #3

Section 5.2 of the Full Scope standard document requires that potential partners or internal resources be identified in countries and/or states that cumulatively cover a region accounting for 60% or more of product sales. To determine if the required 60% has been achieved:

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Determining if 60% or More of Product Sales are Covered

- List the countries and/or (for the United States and other countries where appropriate) states/regions where the product is sold and where the cycling solutions as listed #1 to #3 for product recovery and processing (meaning collected and sorted for reuse or cycling) have also been identified.
- List the percentage of applicant product sales that occurs in each of these countries and/or states/ regions.
- Check that the sum of these percentages is 60% or higher.

Conclusion for Textile Products

Counting up to 60% of Sales: The Case of the Reuse and Recycling Pathway

As of 2025, it is expected that a large amount of textile products in the European Union will be reused or recycled, following mandatory legislation on separate textile collection. Once textiles are separately collected, current numbers show that more than 80%[5] gets reused or recycled due to economic and

[5] Fashion for Good, Circle Economy (2022). Sorting For Circularity Europe: An Evaluation And Commercial Assessment Of Textile Waste Across Europe. Available here.

charitable systems. Therefore, products intended to be cycled via these systems or addressed by regional/national product stewardship laws will receive credits for up to 60% of product sales (the requirement for certification for reuse and recycling- pathways 2 and 3).

In Europe, typically 55% of the collected textile waste arriving at sorting facilities can be reused, and around 26% of sorted textiles is recycled[6]. In addition to the mandatory separate waste collection in Europe, the Extended Producer Responsibility (EPR) laws will enhance the infrastructure for cycling (countries mentioned on page 25).

Voluntary collection and cycling systems (Pathway #1) are available in regions such as Flanders (Belgium), Australia, and Colombia.

While the EPR is expected to be widely adopted, the timeframe remains unclear. There is a proposal for Extended Producer Responsibility (EPR) legislation in New York (S6654/A08078 Kavanagh/Kelles). Applicants can become members of these voluntary systems and provide proof of participation during certification.

On January 22, 2025, European Producer Responsibility Organisations (PRO), undersigned the Textile PRO Forum, a unique voluntary initiative designed to harmonize and share best practices for effective and efficient implementation of the EPR for textiles and footwear across Europe, coordinated by Euratex.[7]

More information and data on European and USA textile waste systems can be found in Annex 1.

Voluntary EPR Systems

- Australia's EPR Scheme, Seamless Australia, has been designed as a voluntary scheme, currently in a piloting phase (since July 2024). As of the beginning of 2025, 60 brands are members of the scheme.
- Colombia is currently piloting EPR for textiles on a voluntary basis.
- Belgium has a voluntary EPR Scheme, Circletex. The scheme started out with a focus on corporate apparel, including linens, workwear, and protective clothing. This focus has since expanded to include all textiles of both private and professional use, including clothing, table linen, outdoor textiles, sportswear, and interior textiles such as bedding.

When selling in countries not covered by these legislations, applicants will need to initiate a partnership for takeback and sorting (recovery and processing) for the intended cycling pathway of the product (from Silver level and above). Potential take-back and recovery partners may be found in the list of databases provided under 'Potential Partnerships in the Textile Sector: Collectors, Sorters, and Cyclers' for Pathway #1.

[6] Fashion for Good, Circle Economy (2022). Sorting For Circularity Europe: An Evaluation And Commercial Assessment Of Textile Waste Across Europe. Available here.
[7] EURATEX. A Voluntary Textile Pro Forum to Harmonize Textiles EPR Implementation to Support Circular Economy in Europe. Available here.

For materials in technical cycles, Silver level may be achieved with partnership(s) for reuse, repair, refurbish, remanufacture only, when they are selected as the second intended cycling pathway (Pathway #2).

Recycling partnership(s) are then required to achieve the Gold level, since for Gold and above, partnerships for all cycling pathways are required.

For Suppliers of Textile Products that are not Directly Linked to the End User

Companies must make sure to collaborate on the set up of partnerships for taking back, sorting and cycling e.g., with solution providers or retail partners for at least 60% of the certified sold collection. Evidence (required when applying for certification) could be a written collaboration agreement or information on a take-back system of the applicant or retailers website.

During the certification period of three years, suppliers might find new customers (brands or retailers) for this certified collection. These new customers can make use of the private label certification to rebrand the collection with their own name and use the C2C Certified trademark. If the countries of sales are not yet defined, companies might use historical data to prove the available circular systems.

According to Section 11 Private Label Product Requirements, point 2 states that the private label certification holder needs to make a connection to the original equipment manufacturers (OEM) company's take-back program or to use other cycling initiatives in order for the product to be cycled. This might be the brands or retailers own take-back and cycling system.

Products designed for the biological cycle cannot typically use existing, regional or national collection systems for food and garden waste as these infrastructures are not yet meant for textile waste, unless evidence is provided that the country does provide systems for biodegradation/composting of textiles (like they do for food/garden waste). Find more, also on home composting opportunities in the text above, Pathway #3.

Example of a Calculation for Cycling Pathways

A global retailer sells a product line with a sales value of $1000,000, of C2C Certified products. 40% is sold in the US, 50% in the EU and 10 % in Asia. Reuse and Recycling are chosen as the two intended cycling pathways.

50% of sales worth $500,000 in the EU may be credited with having systems for reuse and recycling by 2025, due to the upcoming mandatory separate collection system (Pathway #2). But for at least $100,000 worth of products sold in Asia or US, where pathways #2 and #3 are not existing, there needs to be dedicated internal resources or partnerships (Pathway #1) for collecting, sorting and for a cycling system for at least one of the two intended cycling pathways for Silver. In other words, focusing on either Reuse or Recycling only is feasible for Silver. For Gold and above, dedicated internal resources, partnerships or municipal systems are required for all intended cycling pathways, including both Reuse and Recycling in this example.

Country / Region	Sales Value	Share of sales value (%)	5.2 Compliance pathway	Credit given
EU	$500,000	50%	#2 and #3 - Mandatory EPR Law that covers both **Reuse** and Recycling	50%
China	$300,000	30%	N/A	0%
India	$100,000	10%	#1 - Initiated partnership for the collection and processing for **Reuse**	10%
US - California	$50,000	5%	N/A	0%
US - Massachusetts	$50,000	5%	N/A	0%
Total	$1.000.000	100%		**60% = OK for Silver!**

Country / Region	Sales Value	Share of sales value (%)	5.2 Compliance pathway	Credit given
EU	$500,000	50%	#2 and #3 - Mandatory EPR Law that covers both **Reuse and Recycling**	50%
China	$300,000	30%	N/A	0%
India	$100,000	10%	#1 - Initiated partnership for the collection and processing for **Reuse & Recycling**	10%
US - California	$50,000	5%	N/A	0%
US - Massachusetts	$50,000	5%	N/A	0%
Total	$1.000.000	100%		**60% = OK for Gold!**

3.3 Increasing Demand: Incorporating Cycled and/or Renewable Content

Refers to Section 5.3 in the Full Scope standard.

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5.3 Increasing Demand: Incorporating Cycled and/or Renewable Content

Intended Outcome(s)

Demand for circularly sourced materials is increased as a result of the increased use of cycled or renewable materials in the product, helping to close the loop and advance the circular economy. Negative impacts of virgin material use are also minimized.

Applicable Achievement Level(s)

Bronze, Silver, Gold, and Platinum

Requirement(s)

Bronze level: For selecting commonly cycled product and material types, incorporate the required percentage of cycled and/or renewable content into the product using an approved method.

Alternatively, publicly disclose an explanation of the limitation(s) preventing achievement of the required minimums.

Silver level: Incorporate a percentage of cycled and/or renewable content into the product equal to or greater than industry averages and/or consistent with common practice. Develop a plan for increasing the use of post-consumer recycled and/or responsibly sourced renewable content, and demonstrate Further Explanation

Gold level: Incorporate a percentage of cycled and/or renewable content into the product that is consistent with industry leaders for the product type. Depending on material type, incorporate either post-consumer recycled or responsibly sourced renewable content. Alternatively, publicly disclose an explanation of the limitation(s) preventing achievement of the required percentage(s).

Platinum level: Incorporate the maximal technically feasible percentage of cycled and/or renewable content into the product.

For the Bronze through Platinum achievement levels, the required percentages of cycled and/ or renewable content are listed by homogeneous material and application type in the Cradle to Cradle Certified® Required percentages of Cycled and Renewable Content by Product and Material Type reference document. In general, the percentages increase with achievement level, but for products and materials where it is challenging to use cycled materials, the percentage may be zero at one or more levels. The required percentages must be met at the homogeneous material level or the product level as noted below and in the “Instructions for Use” tab in the Cradle to Cradle Certified®

Required percentage of Cycled and Renewable Content by Product and Material Type reference document.

...(truncated).

Approved methods

The required percentages may be achieved based on minimum content, average content, rolling average content, and/or via a credit method (i.e., mass balance) approach. Note: Credit method (i.e., mass balance, also referred to as mass balance allocation method) is as defined by ISO 22095.

The method(s) employed, and percentage(s) achieved must be reported publicly via the Cradle to Cradle Certified® Circularity Data Report (see Cradle to Cradle Certified® Circularity Data Report reference document). For chemical recycling, the technology pathway (e.g., depolymerization or pyrolysis followed by hydrocracking or solvent purification), available alternatives, rationale for selecting chemically recycled material over mechanically recycled, and a quantitative or qualitative description of the known and likely environmental and human health related impacts and trade-offs, must also be reported.

For the Bronze, Silver, Gold, and Platinum levels:

1. For cycled content to count toward the required percentages, the amount of cycled content must be verified based on chain of custody documentation (with the exception of steel and aluminum material that can be traced via specification).

   If applying the credit method (i.e., mass balance) approach, the material must be certified to a C2CPII-recognized cycled content standard. Recognized standards must not count fuel as recycled, and for relevant material types (e.g., single-use plastic), must apply methods aligned with the European Commission's implementation decision(s) applicable to mass balance accounting (i.e., (EU) 2023/2683 and any future related updates).
2. For biologically derived plastics and liquid formulations to count as renewable, the amount of biobased content must be determined based on:
   a. Established standards that quantify bio-based content using radiocarbon dating, or
   b. Chain of custody documentation.
3. For biological and biologically derived materials associated with extensive evidence of ecosystem destruction due to land conversion and/or poor management practices (e.g., palm oil, wood, peat) to count as renewable, the material must be certified to a C2CPII-recognized responsible sourcing standard, or an alternative equivalent to certification must be in place, that requires:
   a. Compliance with all applicable laws and regulations of the country in which farming or harvesting operations occur.
   b. Operations that respect land rights and land use rights, and are unlikely to cause displacement of food production.
   c. Planning, monitoring, management, and continuous impact assessment for the farming and/or harvesting of material.

d. Maintenance, conservation, or enhancement of biodiversity in the forest/vegetation or other ecosystem.
e. Maintenance or enhancement of the productive function of the forest/vegetation or other ecosystem area and efficient use of harvested materials (e.g., rate of harvest does not exceed rate of regrowth in the long term).
f. Maintenance or enhancement of the health and vitality of the forest/vegetation or other ecosystem and its protective systems (soil and water).

...(truncated).

For the Gold and Platinum levels:

1. For any type of biological material to count as renewable, the material must be certified to a C2CPII-recognized responsible sourcing standard, or an alternative equivalent to certification must be in place (see #3 above for required responsible sourcing program elements applicable at the Bronze level and above).
2. For recycled content to count toward the required percentages, at least some of the recycled content must be post-consumer (with specific percentages required for certain material and product types per the Cradle to Cradle Certified® Required percentages of Cycled and Renewable Content by Product and Material Type reference document).

Alternative to Meeting Required percentages of Cycled and/or Renewable Content: Feasibility Analysis

For the Bronze, Silver, and Gold levels: A feasibility analysis may be applied as an alternative to meeting required percentages of cycled and/or renewable content in any case where an applicant is unable to meet the required percentages, including post-consumer recycled and responsibly sourced content as relevant. This alternative may be used for one or more materials in a product and at any achievement level except for Platinum.

The following are required:

1. An explanation of the limitation(s) preventing the incorporation of the target amount of cycled or renewable content (including post-consumer or responsibly sourced as relevant) and how, based on these limitation(s), the amount of cycled or renewable content currently used represents the maximum that is currently feasible.
2. The explanation must be reported publicly.
3. A strategy for addressing the identified limitation(s) and increasing the amount of cycled and/or renewable content (including post-consumer or responsibly sourced as relevant) over time must be developed. The strategy must include discrete objectives and an associated timeline.
4. For recertification:
    a. The applicant must demonstrate progress toward achieving the objectives.

b. A description of progress made must be reported publicly.

...(truncated)

Further Explanation – Apparel and Textiles

The standard requires the use of renewable and/or cycled materials in increasing percentages for Bronze, Silver, Gold and Platinum levels. The required percentages of renewable and/or cycled content are available in the resource Certified Version 4.1 Required percentages of Cycled and Renewable Content by Product and Material Type. The relevant numbers for textiles and apparel have been extracted and shown in the table "**Product Circularity 5.3 – Responsible Sourcing Requirements per Achievement Level for Common Biological Materials**" later in this section. Each homogenous material present in the product is required to meet the minimum percentage of renewable and/or cycled content as specified in the table.

C2CPII-recognized standards and certifications for e.g., raw materials may be found here.

Annex 2, 'Textile and Leather: An overview of how raw materials fit into C2C Certified', provides an overview of the requirements related to textile and leather raw materials.

Renewable Materials: Using Biological Fibers/Natural Materials

Biological plant- and animal originated fibers and natural materials such as cotton, viscose, wool, silk, and leather are considered renewable. The standard requires evidence of responsibly sourced renewable materials for those with a high risk of ecosystem destruction – including **cotton, leather, and wood (for example, viscose, modal, lyocell)** – through C2CPII-recognized responsible sourcing programs (mainly certifications) as of Bronze level. For the Gold and Platinum levels, all renewable material is required to be certified as responsibly sourced. Please find the recognized standards and certifications in the link above.

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Bronze Level Responsible Sourcing Requirements

Materials that are associated with extensive evidence of ecosystem destruction that must be certified to a C2CPII-recognized responsible sourcing standard at the Bronze level currently include the following:

- **Wood**
- Oil palm
- Sugarcane
- Peat
- **Cotton**
- Soy and **leather** if sourced from de facto high-risk tropical regions, or if region unknown (de facto high risk is as defined in the Social Fairness category), and
- Materials sourced from fisheries (due to the risk of destructive fishing practices occurring).

At the time of publishing this document, the C2CPII-recognized programs for responsibly sourced renewable material are:

- Cotton Made in Africa (CmiA)
- Forest Stewardship Council (FSC)
- Global Organic Textile Standard (GOTS)
- Organic Content Standard (OCS)
- Programme for the Endorsement of Forest Certification (PEFC)
- Responsible Wool Standard (RWS)
- Better Cotton Initiative (BCI)

Recycled biological fibers or textiles that are certified using a C2CPII-recognized program (e.g., Global Recycled Standard (GRS) or Recycled Claim Standard (RCS)) are an alternative to responsibly sourced renewable material.

For high-risk materials, the standard requires evidence by recognized programs (mainly certifications) for the responsible source as of Bronze level and for all other materials, evidence is required as of Gold level. The preferred fiber matrix of Textile Exchange may support the selection of responsibly sourced fibers. If recognition of additional programs is necessary for a specific certification, please contact C2CPII early in the certification process to ensure sufficient time for program review for recognition. Applicants may also indicate that they work with another standard or certification and request that the standard setting organization apply for C2CPII recognition.

Table – Product Circularity 5.3: Responsible Sourcing Requirements per Achievement Level for Common Biological Materials

Material	Bronze	Silver	Gold	Platinum
Cotton	Required (GOTS, OCS, CmiA, BCI)	Required	Required	Required
Viscose/Rayon/Lyocell	Required for wood (FSC, PEFC, etc.)	Required	Required	Required
Leather	Required if sourced from a high-risk location	Required if sourced from a high-risk location	Required	Required
Wool	Not required	Not required	Required (RWS, etc)	Required

Table – Product Circularity 5.3: Minimum % Recycled Content Requirements per Achievement Level for Common Synthetic Materials

Note: pre- and/or post- consumer and renewable are accepted for achieving the totals except when post-consumer is explicitly required.

	Bronze	Silver	Gold		Platinum	
Material	Total	Total	Total	Post-consumer	Total	Post-consumer
Polypropylene	> 0	35	100	70	100	100
Polyethylene	0	> 0	20	> 0	30	> 0
Polyester	**> 0**	**25**	**50**	**50**	**100**	**100**
Polyamide	0	> 0	40	> 0	60	> 0
Elastane	0	> 0	50	> 0	75	> 0
Other	>0	> 0	20	> 0	30	> 0

Additional notes on the use of renewable materials:

Wood based man-made materials (Man Made Cellulosic Fibers- MMCF) such as viscose, modal, and lyocell are required to be certified per FCS or PEFC at the Bronze level as wood is associated with extensive evidence of ecosystem destruction. Preferred MMCF suppliers can be found here. **Cotton** must be responsibly sourced as of the Bronze level.

Leather must be responsibly sourced as of the Bronze level if sourced from de facto high-risk tropical regions, or if the region is unknown (de facto high risk is as defined in the Social Fairness category of the C2C Certified Product Standard (Full Scope)).

To meet the high-value cycling requirements in Section 5.4 Material Compatibility for Technical and/or Biological Cycles of the Full Scope standard document – relevant at the Gold level and above – only **cotton, linen, and wool** (when used in a high percentage of the total content in a fabric) are suitable for existing high-value (e.g., fiber-to-fiber) technologies. Alternatively, the applicant or its cycling partner(s) must implement a specific cycling pathway through which a product or material(s) of the same type or economic value is produced in an economically competitive way.

Cycled Materials: Using (Re)cycled Synthetic Materials

For textiles and apparel, the percentages of recycled content that are required to be used per raw material (e.g., polyester, elastane, and polyamide) and per achievement level (Bronze, Silver, etc.) are provided in the Apparel tab of the Cradle to Cradle Certified Required Percentages of Cycled and Renewable Content by Product and Material Type reference document. C2C Certified recognizes, for example, the Global Recycled Standard (GRS) and Recycled Content Standard (RCS) as validation for the recycled content (i.e., as valid chain of custody documentation). Mechanically recycled textiles are widely

available. Many are comprised of polyester, which is typically sourced from post-consumer PET bottles and not from textiles. The standard does not require the use of fiber-to-fiber recycled materials but does require the use of a minimum percentage of post-consumer materials at the Gold and Platinum levels.

As of the Bronze level, C2C Certified requires some (> 0%) recycled polyester. For polyamide and elastane, this is required for the Silver level. As noted, for the Gold level, the standard requires a minimum percentage of post-consumer content. However, applicants may use the alternative pathway of conducting a feasibility analysis and publicly disclosing the reasons why it is not possible to achieve the required percentages (e.g., it is not technically feasible to use cycled content due to quality issues).

To meet the high-value cycling requirements in Section 5.4 Material Compatibility for Technical and/or Biological Cycles – relevant for the technical cycle at the Gold level and above – only **100% polyester and polyamide** are suitable for existing upcycling (e.g., fiber-to-fiber) technologies (Pathway #3). Alternatively, the applicant or its cycling partners must implement a specific cycling pathway through which a product or material(s) of the same type or economic value is produced in an economically competitive way.

Elastane may only be present for a maximum of 5% of the total content of a fabric when choosing the municipal cycling pathway (#3).

Polyester and Recycled Polyester Containing Antimony

As polyester is the most popular fiber, more information specific to this fiber and the chemical risk related to it is provided below.

Antimony trioxide is commonly used as a catalyst in PET production and is classified as a category 2 carcinogen (i.e., suspected of being carcinogenic to humans). Residual catalyst is present in virgin polyester and is also present in recycled polyester.

Polyester and recycled polyester typically contain antimony trioxide in concentrations above 100 ppm and will thus be assessed as having significant risk (i.e., X-assessed, see **Figure – C2C Certified Material Health Assessment Methodology** in Section 4). This limits the product to the Bronze level of the C2C Certified Product Standard (Full Scope) and C2C Certified Material Health Standard (based on the Material Health requirements in Section 4.6 Using Optimized Materials). This restriction does not apply to the C2C Certified Circularity Standard. However, C2CPII strives for products to eventually achieve Full Scope certification and thus encourages companies to look into antimony-free polyester solutions. In addition, some products such as children's toys and personal care products have regulatory restrictions for antimony, which also apply to C2C Certified Circularity.

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A product may be certified at the Bronze level for a maximum of six years (i.e., two, three-year certification cycles), and must recertify at the Silver level or higher once the second, three-year Bronze certification has expired or it will be delisted from the program. Alternatively, in cases where technical, performance, or market barriers prevent the achievement of the Silver level in any standard category, the product may be recertified at the Bronze level if:

1. The applicant publicly discloses an explanation of the limitation(s) preventing achievement of the Silver level requirements,
2. On-going measurable improvement is achieved (see Section 3.3), and
3. The product meets the Silver achievement level in at least one other category by the end of the fourth year of Bronze level certification (i.e., the expiration date of the second two-year certification).

Chemically Recycled Materials

Chemically recycled materials are also on the market, but at smaller scale. An example is chemically recycled polyamide (nylon), which is used commonly in swimwear and for jackets.

For chemical recycling, additional disclosures on “available alternatives, rationale for selecting chemically recycled material over mechanically recycled, and a quantitative or qualitative description of the known and likely environmental and human health related impacts and trade-offs" are required. Also, when the recycled content of chemical recycling is attributed via mass balance, the recycled content is required to be verified via a C2CPII-recognized program.

Chemical recycling of post-consumer textiles can produce a consistent output, but this depends on several factors. Similar to mechanical recycling, the quality and consistency of the recycled fibers are influenced by the purity and type of the input materials, the specific recycling technology used, and the efficiency of the sorting and processing systems[8].

For example, advanced chemical recycling processes like depolymerization can break down synthetic fibers into their monomers, which can then be re-polymerized into high-quality fibers comparable to virgin materials. This method can handle multiple recycling rounds without significant degradation in quality[9]. However, achieving consistent output requires a steady supply of well-sorted textile waste and robust processing infrastructure[10].

[8] Fibre2Fashion. Advancing Post-Consumer Textile Recycling: Emerging Technologies Shaping Sustainable Fashion. Available here.
[9] Ibid.
[10] Circle Economy. Post-consumer textile collection is step one, but then what? Available here.

Denim Case – Finding Suitable Sewing Thread for C2C Certified Denim Jeans[i.]

Sewing thread is an important component in a garment from a quality and productivity standpoint. Polyester sewing thread is typically used in the production of jeans due to its strength and performance. However, as of Silver level of the C2C Certified Product Standard (Full Scope), polyester cannot be used due to the presence of antimony trioxide above 100 ppm. Antimony trioxide is a suspected carcinogen and a level above 100 ppm means that the product can only reach the Bronze achievement level. Initially, an organic cotton sewing thread was identified as the best option. Quality parameters were tested and met the required standard. When testing the thread in production conditions however, thread breakage became an issue, negatively impacting productivity. This created product delivery risks and as a result, a risk for timely in-store arrival. A lot of work went into improving the quality of the cotton sewing thread to reduce breakage. Strength was increased by using long staple fiber and adding a mercerizing treatment.

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i. Fashion For Good. Resources. Available here.

Considerations for Blended Fibers

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If a homogeneous material in the product is a blend of two or more materials, and the blend itself does not have required percentages indicated in the Required Percentages of Cycled and Renewable Content by Product and Material Type reference document, the applicant may choose to comply with the weighted average of the required percentages for the two or more material types contained in the hybrid material that are > 1% by weight. For example, the Gold level required percentage for a blended yarn that is 50% cotton (100% cycled/renewable content required in pure form) and 50% elastane (50% cycled content required in pure form) would be: 0.5*100% + 0.5*50% = 75%.

Note: Per the Methodology for Defining Homogeneous Materials, each fiber type within a blended textile is considered a separate homogeneous material. This example allows for an exception to the homogeneous material definition for blended textiles. For blended textiles, the applicant may alternatively choose to comply with the required percentages for each fiber type separately.

Calculating the Required % Renewable and/or Cycled Content for a Blended Article

Case: T-shirt using a blended yarn with 75% Cotton, 20% Polyester and 5% Elastane. Desired achievement level is Gold.

Pathway #1: Meeting the individual minimum renewable and/or cycled content for each individual material type.

The cotton material must be certified to a C2CPII-recognized responsible sourcing standard (see C2CPII-Recognized Certification Programs and Standards) and will be counted as meeting the percentages. The polyester part must have at least 50% post-consumer recycled content while the elastane part must have at least 50% recycled content and at least some (> 0%) post-consumer cycled content.

Pathway #2: Meeting the weighted average minimum renewable and/or cycled content for the blended fiber as a whole. The weighted average minimum content can be calculated as follows:

- Minimum cycled or renewable content = 0.75 (100%) + 0.2 (50%) + 0.05 (50%) = 87.5%
- Minimum post-consumer cycled content = 0.75 (0%) + 0.2 (50%) + 0.05 (> 0%) = > 10 %

Thus, using a blend with responsibly sourced cotton and 100% post-consumer recycled polyester will meet the requirements. The Elastane does not need to contain recycled content in this case.

- Cycled or renewable content = 0.75 (100%) + 0.2 (100%) + 0.05 (0%) = 95 % **> 87.5% OK!**
- Post-consumer cycled content = 0.75 (0%) + 0.2 (100%) + 0.05 (0%) = 20 % **> 10% OK!**

Considerations for Multi-Material Products

The standard states that at least 90% of the homogeneous materials (i.e., apparel parts) by weight must comply with the minimum percentages of renewable or cycled content at the Bronze and Silver levels. At the Gold and Platinum levels, at least 95% of the homogenous materials (i.e., apparel parts) must comply.

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The following are required for multi-material products (i.e., products containing more than one homogeneous material), with one exception as noted below:

1. For the Bronze and Silver levels, at least 90% of the homogeneous materials by weight that are subject to review (as defined for Material Health in Section 4.3) must meet the required percentages of cycled or renewable content.
2. For the Gold and Platinum levels, at least 95% of the homogeneous materials by weight that are subject to review must meet the required percentages of cycled or renewable content.

Exception: For multi-material products where there is only one percentage listed per achievement level, the percentages provided are product-level percentages that may be met in a variety of ways, as long as the finished product overall achieves the required percentage of cycled or renewable content by weight. In these cases, there are no minimum percentages required for individual materials in the product.

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Continuous Improvement in 5.3

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<u>Developing a Plan and Demonstrating Progress</u>

As of Silver level, it is required to Develop a plan for increasing the use of post-consumer recycled and/or responsibly sourced renewable content and demonstrate progress toward achieving the plan at recertification. At a minimum, the plan must include the type and source of content intended to be included or increased in the product, a timeline with targets for increasing the content, and a method for achieving these increases. A plan is also required at the Gold level, but not at the Platinum level, because the technically feasible maximum amount of cycled content is required at Platinum.

A progress report on achieving the plan must be provided at recertification, and action towards achieving it must have occurred. Ideally, this will have resulted in an increased amount of cycled or responsibly sourced renewable content in the product. However, other actions towards achieving that goal also receive credit.

Case Study – Responsible Sourcing of Renewable Materials

Roccamore works with responsible vegetable tanned leather with a transparent supply chain for its key material. The material is verified with ISO scientific tests for chemicals and is also tested for biodegradability. The tannery, Nuvolari, is verified by the Leather Working Group.

The process through which animal hides are turned into leather is referred to as tanning. Vegetable tanning is one of the main leather production methods in use today: approximately 10% of all leather is vegetable tanned. This technique involves using natural vegetable tannins to alter the protein structure of the hide, causing it to become leather. In essence, these organic substances serve three functions: preserving, strengthening and giving color to the hide without the use of hazardous chemicals.

Image credit: Roccamore

3.4 Material Compatibility for Technical and/or Biological Cycles

Refers to Section 5.4 in the Full Scope standard.

EXCERPT – Version 4.1 Product Standard

5.4 Material Compatibility for Technical and/or Biological Cycles

Intended Outcome(s)

Product materials with the highest capacity for biological and/or technical cycling have been intentionally selected, increasing the likelihood that such materials will retain their value and move through subsequent cycles of use.

Applicable Achievement Level(s)

Bronze, Silver, Gold, and Platinum

Requirements

Bronze level: For 50% of the product by weight, incorporate materials that are compatible with the intended cycling pathway(s).

Silver level: For 70% of the product by weight, incorporate materials that are compatible with the intended cycling pathway(s).

Gold level: For 90% of the product by weight, incorporate materials that are compatible with the intended cycling pathway(s) and have high-value technical or biological cycling potential.

Platinum level: For 99% of the product by weight, incorporate materials that are compatible with the intended cycling pathway(s).

For a material to count toward the percentage of materials compatible with the intended cycling pathway(s) the following conditions must be met:

1. Homogeneous materials that need to be separated in order to be cycled must be separable by the entity implementing the intended cycling pathway with given instructions and no additional special knowledge.
2. (...)
3. For products and materials intended for technical municipal cycling (i.e., municipal recycling), the product and/or material must be compatible for municipal cycling systems (e.g., painted plastics and plastic laminated paper are not currently compatible for municipal recycling).
4. For solid materials intended for the biological cycle, one of the following conditions must be met:

a. The material must biodegrade in the intended cycling pathway(s) within the time period and to the extent specified by a C2CPII-recognized compostability or biodegradability standard test.

b. For paper and biological materials with ≥ 99% unmodified organic material:

i. The material, at its maximum thickness and/or density, must disintegrate in the intended cycling pathway(s) within the time period and to the extent specified by a C2CPII-recognized compostability or biodegradability standard test, and

ii. If the intended cycling pathways include composting, a soil sample that is exposed to the material, after disintegration tests have been performed, must pass an ecotoxicity test demonstrating that the exposed soil sample is conducive to plant growth (OECD 208 or equivalent).

c. For plastic materials, biologically derived materials, and biological materials with < 99% unmodified organic material (including paper that is < 99% cellulose), all of the following conditions must be met:

i. The material must biodegrade in the intended cycling pathway(s) within the time period and to the extent specified by a C2CPII-recognized compostability standard test.

ii. For any individual organic additives (e.g., pigments, inks, colorants, scents, secondary polymers, glues) present at a concentration of ≥ 1%, the additive must biodegrade in the intended cycling pathway(s) within a specific time period and to the extent specified by:

1. A C2CPII-recognized biodegradability standard test, or
2. The available scientific literature and/or research studies.

iii. The material, at its maximum thickness and/or density, must disintegrate in the intended cycling pathway(s) within the time period and to the extent specified by a C2CPII-recognized compostability standard test, and

iv. A soil sample that is exposed to the material, after disintegration tests have been performed, must pass an ecotoxicity test demonstrating that the exposed soil sample is conducive to plant growth (OECD 208 or equivalent).

5. For materials with unavoidable release to the environment during product use (e.g., tires, **shoe soles**, brake pads, **apparel textile fibers**), the fraction of material that on average is likely to be released to the environment from the total product over its lifetime may not be counted as compatible with the intended cycling pathway, unless it is biodegradable in the likely environment where release occurs.

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For the Gold level: The use of materials with high-value cycling potential (i.e., high-quality material as defined in #1-2 below) is required.

1. For a material to count toward the required percentage (90%) of materials compatible with the intended cycling pathway(s), the following conditions must be met:
   a. Materials intended for technical cycles and solid materials intended for biological cycles:
      i. Must not contain additives or features that are likely to result in low-value (i.e., low-quality) reprocessed material, and
      ii. Must be able to substitute for virgin material without loss of essential product function or material durability or contain at least 80% renewable or post-consumer recycled content, or have at least two plausible next uses.
   b. Solid materials intended for biological cycles must be certified by a C2CPII-recognized compostability program. Analytical laboratories conducting required tests must be accredited or certified for the specific analysis per ISO 17025, DIN CERTCO approved, or equivalent.

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Analytical laboratories conducting required tests must be accredited or certified for the specific analysis per ISO 17025, DIN CERTCO approved, or equivalent.

Further Explanation – Apparel and Textiles

Bronze and Silver Level Compatibility Requirements – Technical Cycles

The technical cycling pathways:

- Reuse
- Repair
- Refurbish
- Remanufacture
- Repurpose
- Recycling* (mechanical or chemical)

*Must be one of the intended pathways as of Bronze

Recycling Technologies for Textiles

Mechanical Recycling[11]

The quality of the output material is highly dependent on the quality of the input, the feedstock. This is challenging for post-consumer textile or leather waste which is a mixture of compositions and colors.

Some mechanical recycling processes have limitations on processing woven textiles. Knitted textiles are made with yarns in which the fibers are more loosely intertwined meaning that the fibers are more easily salvageable in a mechanical recycling process. In contrast, woven textiles are made of more compacted

[11] Centexbel (2024). White Paper on Textile Fibre Recycling Technologies. Available here.

fibers causing the fibers to tear during the shredding process. This results in lower-quality yarns and reduced recycling efficiency.

Furthermore, the fiber length of recycled fibers is reduced by up to 40% compared to virgin fibers. Higher quality fibers can be achieved by blending recycled fibers with virgin fibers but also via technological innovations[12]. The recently developed "soft" mechanical recycling technology presented by e.g. Purfi is a process that uses a longer production line, more than ten times longer than a traditional shredding line, combined with a treatment that can better maintain the original fiber length. Likewise Recover™ proprietary technology and cutting-edge machinery for mechanical recycling of cotton results in longer fibers[13]. For example, RCotton from Recover is 100% recycled cotton, while RColour Blend from Recover is 52% recycled cotton and 48% recycled PET from bottles[14].

Another emerging innovation for effective lengthening and strengthening natural fibers is Clarus® from Natural Fiber Welding, which is based on increased intermolecular bonding in natural polymers. This is currently in pre-commercial stage[15].

Thermo-mechanical Recycling[16]

Although already established at the commercial stage for plastics such as PET bottles, thermo-mechanical recycling is still at the development stage for textiles consisting of thermoplastic materials such as polyethylene terephthalate (PET), polypropylene (PP), polyethylene (PE), or polylactic acid (PLA). The technology cannot be used for natural fibers or man-made cellulosic fibers[17].

Limitations affecting the technology include the viscosity of PET owning to polymer degradation, which is inherent to the thermal process, however the addition of chain extenders can mitigate the challenges posed by chain scission. A further limitation is with feedstock availability since the requirements for feedstock are currently very strict[18].

Chemical Recycling[19]

Chemical recycling technologies for textiles are rapidly emerging, and many companies are currently constructing pilot and commercial recycling plants for cellulosic as well as synthetic textiles.

Chemical recycling is a broad category of multiple distinct technologies that use chemical processes to break down fibers to the polymer or monomer level. The technologies that go back to the polymer level include a pulping process to recycle cotton and MMCF to a pulp similar to dissolving wood pulp (DWP), which can then be used to create MMCF. They also include solvent-based and hydrothermal processes

[12] McKinsey & Company (2022). Scaling textile recycling in Europe – turning waste into value. Available here.
[13] Ibid.
[14] Recover. Products. Available here.
[15] CLARUS®. Homepage. Available here.
[16] Centexbel (2024). White Paper on Textile Fibre Recycling Technologies. Available here.
[17] McKinsey & Company (2022) – see reference above.
[18] Ibid.
[19] Centexbel (2024) – see reference above.

that can recycle polyester and polycotton fiber back to PET melt (and cellulosic material) which can then be respun back to PET polyester fiber[20].

The technologies that go back to the monomer level (for example, methanolysis, glycolysis, hydrolysis, and enzymatic) focus on recycling polyester and polyamide. These recycling processes require additional processing to transition from the monomer level (for example, mono-ethylene glycol [MEG] and purified terephthalic acid [PTA]) back to the polymer level, such as PET, before they can be respun back to fibers.

Chemical recycling processes require more energy than mechanical recycling processes but have the core advantage of returning to (almost) virgin-quality fibers. On the whole, chemical recycling of textiles doesn't yet exist at commercial scale, but many companies are building up pilot and commercial plants for both cellulosic (for example, Lenzing, Södra, and Infinited Fiber) and synthetic (for instance, Eastman, Worn Again, Ambercycle, Gr3n, and Circ) recycling.

Chemical technologies are better suited for the treatment of textile material blends compared to (thermo-)mechanical technologies, as the recycled material can be purified and separated to obtain a pure, colorless polymer or monomer of virgin-like quality.

Generally, chemical recycling companies also request sorted and disassembled or separated input, albeit mostly for economic rather than technical reasons.

For Bronze Level (Compatibility 50% by Weight) and Silver level (Compatibility 70% by Weight)

In Europe, typically, 55% of the collected textiles are fit for the second-hand textiles market, 10% will be recycled as cleaning cloths, 14% will be downcycled, and about 2% are used for fiber-to-fiber recycling[21].

Recycling technologies require a certain level of purity which varies according to the type of process but is generally high. Fiber-to-fiber recycling process disruptors vary with the recycling process targeted. These disruptors include metal, plastic, fabric trims, embroidery, print, restricted substances, problematic chemicals (phthalates, PFAS), inks, dyes, coatings, laminations, anti-wrinkle agents, water repellents, fiber tracers, and more[22].

The minimum requirements for the Bronze and Silver levels are to ensure the garment is ready for cycling (either low-value or high-value), so that it will at least not be sorted for incineration or landfill, and to reduce use of the most problematic disruptors. At Gold level, the standard requires a design ready for high-value cycling.

It is recommended to use design strategies illustrated in Section 5.6 Circular Design Opportunities and Innovation of the Full Scope User Guidance, like design for mono-materials or for disassembly, to identify the best strategic solution for a textile or leather product. The compatibility of materials and constructions are detailed in **Table – Materials and blends that may be mechanically recycled using current fiber-to-fiber mechanical recycling technologies.**

[20] McKinsey & Company (2022). Scaling textile recycling in Europe – turning waste into value. Available here.
[21] Ellen MacArthur Foundation (2024). Pushing the boundaries of EPR policy for textiles. Available here.
[22] Fashion For Good (2024). Sorting for Circularity – USA. Available here.

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Below is a list of features (i.e., disruptors) that in nearly all cases will render a textile or apparel product as non-recyclable via the "municipal" and similar recycling systems that are currently used in the EU. These features cannot be used on **50% of the product by weight at the Bronze level** and **70% of the product by weight at the Silver level**, including the weight of the attached material.

Determining Compatibility for Technical Municipal Cycling Systems (Bronze and Silver Level)

The standard requires that:

> *3. For products and materials intended for technical municipal cycling (i.e., municipal recycling), the product and/or material must be compatible for municipal cycling systems (e.g., painted plastics and plastic laminated paper are not currently compatible for municipal recycling).*

To be considered "compatible for municipal cycling systems" as required per requirement #3, the material must meet the following requirements. (Note that there are additional requirements applicable to the Gold and Platinum levels.)

For textiles and apparel, the following disruptive features must not be considered compatible with municipal recycling, unless designed for disassembly per Section 5.7 Designed for Disassembly:

- Multi-layered items of different materials (e.g., as often used for jackets and coats).
- Complex fiber blends of three or more fiber/material types. (This means that mono-material fiber or blends with only two fiber/material types can be counted as compatible. Example: A cotton, polyester, elastane blend has three fiber types.) Applicants may submit proof that other compositions are being recycled through municipal cycling systems and similar (i.e., public separate collection) to C2CPII for consideration.
- Fiber blends with > 5% elastane (and similar stretch fibers).
- Blends containing metal (e.g., metallized threads).
- Textiles with coatings such as polyvinyl chloride (PVC), polyurethane, acrylic, or silicone that form a continuous layer over the fabric[i], flocking, and glue.
- Bonded textiles and leather (Textiles with adhesive layers) and lamination[ii].
- Heat transferred, silicone, and other non-water-based prints that are ≥ 10cm^2.
- Non-functional hard and soft parts including embellishments such as sequins, metallic or plastic beads, metal threads, embroidery, and other decorations made from hard or soft materials. Functional hard and soft parts added solely for aesthetic purposes are considered non-functional, such as zippers on sides of the jacket not involved in fastening and ribbons added for decoration. Excessive use of functional hard and soft parts, such as multiple buttons on a pocket where one button would suffice, is also considered non-functional. Note that soft parts made of the same material as the main fabric are considered compatible.
- Electronic components.

As noted, the design features listed above may be considered compatible with municipal cycling systems if they are designed for disassembly (i.e. designed for removal prior to recycling), see Section 5.7 Designed for Disassembly for more details. However, design for disassembly might not be possible for some of the disruptors listed above.

Compatibility of Functional Hard and Soft Parts

Functional hard and soft parts are essential for the functioning of the textile product. However, they are also disruptors to the mechanical recycling process and thus should be reduced. **For the Bronze and Silver levels, it is recommended (but not required) that functional hard and soft parts be designed for disassembly for the attached fabric to be considered compatible**.

For the Gold level, functional hard and soft parts must be designed for disassembly for the attached fabric to be considered compatible. "Cut-off" or trim removal strategies (i.e., strategic placement to facilitate removal and reduce material loss before recycling) is accepted as a design for disassembly feature. For example, if the functional hard and soft parts are visible and placed together on a placket, cuff, or collar so they can easily be removed (i.e., cut off) this receives credit as a design for disassembly. The weight of fabric lost due to trim removal must not be considered compatible. It may be calculated by considering the area occupied by the hard and soft parts and the fabric's weight per square meter (grammage).

Examples of functional hard and soft parts include:

- Hard parts such as buttons, zippers, and fasteners made from metal, plastic, and other materials.
- Soft parts that are made from a material different from the main material for functional reasons such as ribbon, sewing thread, pocketing fabric, and labels. Soft parts must be made using the same material as the main fabric, unless functional reasons are given for the use of a different material.

Percentage of Product Compatible for Cycling (Bronze and Silver Level)

The standard requires that *1. Homogeneous materials that need to be separated in order to be cycled must be separable by the entity implementing the intended cycling pathway with given instructions and no additional special knowledge.* For textiles and apparel that will be cycled via municipal and similar systems (as being implemented in the EU), this requirement is considered met for the sum of the parts that comply with the compatibility requirements above. Only the fabric blend weight (including dyes, finishes, and elastane) of the compatible parts is counted, excluding the weight of the incompatible prints, hard and soft parts, and the fabric these are removed with. As noted, the percentage compatible must be at least 50% and 70% for the Bronze and Silver levels respectively.

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i. Textile Coating

- **Process**: Involves applying a polymer or other material in a viscous form directly onto the fabric surface. This can be done using various techniques such as knife coating, roller coating, or spray coating.
- **Purpose**: Coatings can provide properties like water resistance, flame retardancy, or increased durability. The coating forms a continuous layer over the fabric, which can be on one or both sides.
- **Applications**: Commonly used in outdoor gear, protective clothing, and upholstery.

ii. Textile Lamination

- **Process**: Involves bonding a pre-prepared polymer film or membrane to the fabric using adhesives, heat, or pressure. This creates a composite material with multiple layers.
- **Purpose**: Laminates often provide breathability, waterproofing, and structural stability. They are typically used when a combination of properties is needed, such as in breathable waterproof fabrics.
- **Applications**: Used in high-performance sportswear, medical textiles, and blackout curtains.

Explanation and References on the Disruptors for Municipal Recycling

The purpose of the list applicable to the Bronze and Silver levels is to exclude only the most problematic features that may limit even downcycling, while the purpose of the list applicable to the Gold level requirements is to exclude materials, additives, and features that are likely to result in a lower value material.

Removal of multi-layered items[23,24, 25, 26]

Multi-layered items of different materials like jackets and coats currently cannot be used for (fiber-to-fiber) recycling as fiber identification is only possible if manually disassembled, which is currently not done as there is no business case for manual disassembly in Europe or the US. Furthermore, when shredded, these layers can still be stuck together and thus cannot be fully recycled.

Removal of complex fiber blends[27, 28, 29]

Multi-fiber materials present a challenge as their material composition cannot be easily recognized by existing near-infrared spectroscopy technologies (NIR). Complex fiber blends of three or more blended fibers in one fabric cause deviation in feedstock quality for (fiber-to-fiber) recycling.

Removal or limitation of elastane fabrics[30, 31, 32, 33]

Elastane poses a technical challenge for some recyclers and may be considered a prohibited fiber, even if present in low quantities, which elastane generally is. This complicates its identification by NIR scanners and makes it difficult to detect in the sorting process.

- Feedstock for cotton mechanical recycling ideally has 2% elastane, max 5% elastane

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[23] T-rex Project EU (2022). Criteria and specifications guidelines for collection to meet yarn needs for sport garments. Available here.
[24] Re_fashion (2022). Textile eco design guidelines to improve recyclability. Available here.
[25] Re_fashion (2023). Technical monitoring of optical sorting, recognition and disassembly technologies for textiles at European scale. Available here.
[26] Centexbel (2024). White Paper on Textile Fibre Recycling Technologies. Available here.
[27] T-rex Project EU (2022). Criteria and specifications guidelines for collection to meet yarn needs for sport garments. Available here.
[28] New Cotton Project (2024). Pioneering EU Funded New Cotton Project Celebrates Completion, Highlighting Key Insights and Learnings Towards a Circular Textiles Industry. Available here.
[29] Re_fashion (2023) – see reference above.
[30] Accelerating Circularity (2023). Textile-to-textile recycling primer. Available here.
[31] Fashion For Good (2024). Sorting for Circularity – USA. Available here.
[32] Ellen MacArthur Foundation (2021). The Jeans Redesign Guidelines. Available here.
[33] Re_Fashion (2023) – see reference above.

- Feedstock for polyester thermo-mechanical recycling cannot accept any elastane
- Feedstock for cellulosic chemical recycling cannot accept any elastane
- Feedstock for polyester chemical recycling can accept 2% elastane but is not counted as a municipal cycling pathway yet.

Removal of coatings and adhesive layers and the limitation of prints[34, 35, 36]

The majority of textiles with coatings and adhesive layers (e.g., transfer prints, synthetic glues, print paste, and surface treatments) end up in landfill or incinerated whether the coating is PVC, polyurethane, acrylic, or silicone as it acts as an impurity in the recycling process and prevents recycling unless the bulk material and the coating are made of the same polymer (i.e., unless it is a mono-material).

As feedstock for mechanical recycling is recycled by color, prints can affect the color of the output, so are less advisable. However, the output yarns can be bleached or overdyed if necessary.

In general, water-based prints are preferred. Coated or laminated prints and finishes are not suitable for mechanical recycling. Dissolution and chemical recycling can tolerate 'light' contamination of prints and certain finishes depending on technology, although water-based prints are preferred[37].

Bondings, heat transfers, and silicone prints are not recyclable, and must therefore be removed manually through cutting around them before the remaining fabric is processed. In some cases, they may prevent the garment's recyclability entirely, so are best avoided[38].

PVC must be avoided as it leads to the formation of hydrochloric acid during its degradation, and this corrodes the metal of the equipment and thereby can cause safety concerns; particularly in thermo-mechanical and chemical recycling[39].

Hard parts [40, 41, 42, 43]

The presence of hard parts or any other elements may create a disruption for recycling processes; particularly if they are non-removable. They are often removed by cutting; however, this can cause considerable waste at the recycling stage.

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[34] Decoat (2023). Recycling of coated and painted textile and plastic materials. Available here.
[35] Re_fashion (2023). Technical monitoring of optical sorting, recognition and disassembly technologies for textiles at European scale. Available here.
[36] Circular Fashion. Circular Design Kit. Available here.
[37] Wrap. Textiles 2030 Circular Design Toolkit (p65). Available here.
[38] Redress (2022). Design for recyclability guide. Available here.
[39] Centexbel (2024). White Paper on Textile Fibre Recycling Technologies. Available here.
[40] Re_Fashion (2023) – see reference above.
[41] Re_fashion (2022). Textile eco design guidelines to improve recyclability. Available here.
[42] Fashion For Good (2022). Sorting for Circularity Europe, Sorters handbook: how to conduct a sorting analysis using hand-held near infrared scanning technology. Available here.
[43] Centexbel (2024) – see reference above.

Table – Hard parts

Metal disruptors	Zip, button, rivet, hook, fasteners, buckle, snap button, eyelet, underwire (bra), carabiner, hook and eye, charm, etc.
Plastic disruptors	Button, fasteners, reflecting high-visibility band, zip, bead, epaulette, collar support, foam, buckle, sequins or strass, pearl, snap button, etc.
Electronic components	Lights, sensors, batteries etc.
Other	Wood, shells, etc.

For certain clothing, the use of metal parts is necessary for functional reasons. For example, metal buttons and zippers for jeans. However, some clothing uses metal parts for aesthetic purposes. In general, the more metal that is used in clothing, the higher the chance of a small piece of metal ending up in the clean material fraction. Thus, it is recommended that metal is only used where absolutely necessary or strictly limited to certain regions of the clothing and not distributed across the whole textile piece. This would also add the process of manual removal (cutting off) if the clothing were to be recycled in a country with typically higher rates of manual labor (e.g. Denim recycling in India)[44].

Even though metal separation machines can be installed, there is a risk of some metal contamination in the recycled output. Also, recyclable textile is rejected alongside the metal pieces meaning the overall yield of good fabric is reduced significantly. For example, rivets are difficult to remove and as a result, larger parts of the upper fabric of jeans are cut off and landfilled or incinerated[45].

Small hard plastic parts present a problem for downstream recycling or chemical recycling if the plastic type is different from the main fabric.

Certain clothes, like buttoned shirts, have a relatively high percentage of small hard plastic parts (e.g., plastic buttons). With these clothes there is a small chance that not all hard plastic will be completely removed from the textiles. For example, a button attached to a large and light piece of textile (which can act like a sail) may end up in the clean material fraction. These hard parts can present a problem for downstream material recycling (fiber pulling and spinning) or chemical recycling if the plastic type is different from the target textile[46].

Non-removable electronic components (including, for example, lights woven into Christmas jumpers or wearable sports technology sensors), cannot be recycled through existing infrastructure.

[44] Re_fashion (2022). Textile Design Guidelines to Improve Recyclability (p.7). Available here.
[45] Ellen MacArthur Foundation (2021). The Jeans Redesign Guidelines. Available here.
[46] Re_fashion (2022) – see reference above (p.8).

Soft parts [47, 48, 49]

Table – Soft parts

Textile disruptors	Elastic, string, ribbon, embroidery, pocketing fabric, insert, yoke, pompom, sewing thread, labels and patches, Lurex thread, inset/yoke etc.
Other materials	Leather, fur, flocking, PVC, thick prints, etc.

In cellulosic garments, sewing threads made from non-cellulosic materials might currently represent a problem for recyclers. As a result, entire seams are often cut off to prevent disrupting the recycling process.

No more than 2-5% of other fibers and materials can be accepted into the recycling process. This percentage also includes the yarn used for sewing the garment, bold prints, and other customary additions such as care labels, etc.

Example of Section 5.4 Compliance for Bronze and Silver

Case: Jacket with an outer layer (55% of product by weight, made from a blend of 90% responsibly sourced cotton and 10% Elastane) with functional metal buttons (5% of product by weight) and an inner lining (40% of product weight, made from 100% polyester). No other disrupters were identified.

Intended Cycling Pathway(s)	Features		Compatibility %	Level achievable
	Inner lining	**Elastane content in outer layer**		
Recycling only	Non-removable	10%	0% (Recycling)	Not eligible for certification
	Removable	10%	40% (Recycling)	Not eligible – 40% inner lining compatible since it is removable (not 50%)
	Removable	Change fabric composition in 96% cotton / 4% elastane	95% (Recycling)	Silver – 95% of the item compatible for recycling

[47] Ellen MacArthur Foundation (2021) – see reference above.
[48] Fashion For Good (2022). Sorting for Circularity Europe, Sorters handbook: how to conduct a sorting analysis using hand-held near infrared scanning technology. Available here.
[49] Centexbel (2024). White Paper on Textile Fibre Recycling Technologies. Available here.

Gold Level Requirements – Design for High-Value Cycling Requirement #1.a.i

There are similar but more extensive compatibility requirements at the Gold level compared to the Bronze and Silver levels. For Gold level and above, additional design requirements in #1.a.i and #1.a.ii are required to be met. Note that multiple compliance pathways are available for #1.a.i and #1.a.ii. The standard notes that:

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For the Gold level: The use of materials with high-value cycling potential (i.e., high-quality material as defined in #1-2 below) is required.

1. For a material to count toward the required percentage (90%) of materials compatible with the intended cycling pathway(s), the following conditions must be met:
   a. Materials intended for technical cycles and solid materials intended for biological cycles:
      i. Must not contain additives or features that are likely to result in low-value (i.e., low-quality) reprocessed material, and *…(truncated).*

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Pathway #1 for Achieving Requirement 1.a.i:

Additives or features that are likely to result in low-value (i.e., low quality) reprocessed material are listed below. Materials with these features do not meet requirement 1.a.i above. Textile and apparel that are intended to be recycled through municipal collection systems must follow pathway #1. Pathway #2 must be used for products recycled through dedicated internal resources or private partnerships.

Textiles and Apparel

The Bronze and Silver level requirements also apply at the Gold level. This means that the disruptors restricted at the Bronze and Silver levels and the attached material are not compatible with technical municipal cycling systems, unless they are designed for disassembly, see Section 5.7 Design for Disassembly.

Additionally, for the Gold level, the following elements are not compatible for high-value municipal (fiber-to-fiber) recycling, unless they are designed for disassembly, see Section 5.7 Design for Disassembly:

- Multi-colored fabrics (for mechanical recycling)
- Functional hard and soft parts. (Note: Soft parts made of the same material as the main fabric are considered compatible. Strategic placement to facilitate removal (i.e., "cut-off") and reduce material before recycling is accepted as a design for disassembly feature. For example, they are visible and placed together on a placket, cuff, or collar so they can easily be removed. See the Bronze and Silver level guidance box for additional Information on functional disruptors.)

Fabric and fabric blends must contain one of the following:

- ≥ 85% cotton when blended with cellulose-based fibers (if not at least 95% cotton)[i],

- ≥ 95% wool,
- ≥ 90% linen[ii],
- 100% polyester, or
- 100% polyamide.

This means that polyester and polyamide blends are not compatible for high-value recycling. 100% polyester and 100% polyamide fabrics that are not multi-colored and have only removable hard and soft parts are compatible for high-value cycling.

Applicants may submit proof that other compositions are being recycled through municipal cycling systems and similar (i.e., public separate collection) to C2CPII for consideration. Design for disassembly might not be possible for some of the disruptors listed.

The C2C Certified Circularity Data Report (Section 5.6) must be used to include design intent and cycling instructions.

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i. Wrap. Textiles 2030 Circular Design Toolkit (p63). Available here.
ii. Linen requirements based on PEFCR requirements for recycling.

Design Considerations to Facilitate High-Value Cycling (i.e., Textile-to-Textile Recycling)

Materials with a current recycling pathway (see **Table – Materials and blends that may be mechanically recycled using current fiber-to-fiber mechanical recycling technologies**) may be used to achieve the Gold level high-value cycling requirements. However, for emerging pathways, Gold level may be achieved only if there is a partnership for cycling via the emerging technology. As innovation continues at pace, evidence of new available recycling technologies must be submitted when making use of alternative material variations.

Current upstream design considerations should account for the following:

- Fiber composition (mono-materials preferred)
- Product construction (single-layer preferred)
- Color (important for mechanical recycling)
- Material construction (knit versus woven depending on preferred recycling treatment)
- Disruptors (fewer, removable, same fiber composition as primary product, non-toxic, restricted-substance compliant, and/or benign to the recycling process).

As technologies evolve and scale, it is hoped that their input specifications for target fiber content and their tolerance for non-target fibers, disruptors, and contaminants loosen so that more textiles can be recycled. Post-consumer textile waste is naturally heterogenous and contains a mix of product types, fiber blends, chemicals, and disruptors. At the same time, post-consumer textiles are one of the largest components of the textile waste stream.

Mono-material and mono-color garments can be more effectively recycled than those made from multiple material blends, or blends limited to two compositions and with low percentages of other raw materials. 85% or higher purity of target fibers (e.g., cotton, polyester, and nylon) is required based on current recycling systems, unless applicants find ways to recycle alternative textile compositions.

More design requirements are mentioned above in the context of the Bronze level requirements.

Case Study – Napapijri Circular Jacket Series (2022) – Mono-material Design for Better Recycling Compatibility

Napapijri designed a circular jacket series by making all fabric and trims from one material: Polyamide 6/nylon 6. Napapijri's material supplier, Aquafil, chemically recycles post-consumer polyamide including fishing nets into Econyl. Napapijri also organised a take-back program for the jackets to be returned and recycled into new fibers.

Image credit: Napapijri

The table shown below contains a list of materials and blends that can be used when relying on current fiber-to fiber mechanical cycling pathways. In addition, the WRAP report "Textiles 2030 Circular Design Toolkit" provides a quick reference to understand what materials can be recycled by emerging dissolution and chemical recycling technologies[50].

[50] Wrap. Textiles 2030 Circular Design Toolkit. Available here.

Table – Materials and blends that may be mechanically recycled using current and emerging fiber-to-fiber mechanical recycling technologies (non-exhaustive), based on WRAP[51] and Accelerating Circularity[52].

Fiber type	Materials and Blends	Compatibility	
		with current systems	with emerging systems
Cotton	100% Cotton	51, 52	-
	98% Cotton / 2% Other	51, 52	-
	95% Cotton / 5% Other	51	-
	85% Cotton / 10% MMCF / 5% Other	51	-
	90% Cotton / 10% Other	-	52
	60% Cotton / 40% Polyester	-	52
	60% Cotton / 40% Other	-	52
Polyester	100% Polyester	51, 52	
	98% Polyester / 2% Other	-	51
Polyamide (Nylon)	100% Polyamide	51	-
Wool	100% Wool	51	-
	95% Wool / 5% Other	51	-
	85% Wool / 15% Other	-	51

Feedstock for Mechanical Recycling

Mechanical recycling is still the most used method for textile recycling. The requirements on recyclable textile waste purity for open-loop applications are low (except for downcycling into cleaning cloths, which typically require more than 50% cotton).

Closed-loop mechanical recycling is technically capable of treating almost any fiber composition, but the market demand for and acceptance of blended fibers is a key variable in determining the volume potential of mechanical recycling. A fiber purity of minimum 85% is currently accepted in closed-loop mechanical recycling. However, the demand for mechanically recycled blends is limited[53].

Feedstock for mechanical textile-textile recycling according to a survey of Accelerating Circularity[54]:

- 100% cotton
- 98% cotton / 2% elastane (max 5%)

[51] Wrap. Textiles 2030 Circular Design Toolkit. Available here.
[52] Accelerating Circularity (2023). Textile-to-textile recycling primer. Available here.
[53] McKinsey & Company (2022). Scaling textile recycling in Europe – turning waste into value. Available here.
[54] Accelerating Circularity (2023) – see reference above.

- 90% cotton / 10% other (if there is a confirmed buyer for the mixed fiber output)
- 60% cotton / 40% polyester (if there is a confirmed buyer for the mixed fiber output)
- 60% cotton / 40% other (if there is a confirmed buyer for the mixed fiber output)

Thermo-mechanical recycling

Thermo-mechanical recycling is limited in its volume potential as it targets high-purity fibers only. At present, 99% pure polyester or polyamide is required, with a strict no-elastane requirement. As technology develops, the purity requirement could reduce to around 95% fiber purity. So far, the technology has mostly been proven for non-textile waste (with a more predictable and stable input), thus causing some uncertainties on the forward-looking potential of this recycling method[55].

Feedstock for thermo-mechanical recycling[56]:

- 100% polyester

Chemical recycling

Chemical recycling targets a broad set of fiber types including cotton, man-made cellulosic fibers, and synthetic fibers like polyester. At this stage, the requirements for input purity create technical and economic limitations as all chemical recycling technologies are highly sensitive to elastane[57].

Feedstock for chemical cellulosic recycling[58, 59]

- 90% to 100% cotton
- 60% cotton / 40% polyester

Feedstock for chemical polyester recycling[60]

- 100% polyester
- 98% polyester / 2% elastane
- 80% polyester / 20% other

Feedstock for chemical nylon recycling[61]

- Smallest possible fraction of materials other than polyamide (e.g., cotton, polyester, and elastane).

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[55] Redress (2022). Design for recyclability guide. Available here.
[56] Accelerating Circularity (2023). Textile-to-textile recycling primer. Available here.
[57] Redress (2022) – see reference above.
[58] Accelerating Circularity (2023) – see reference above.
[59] Centexbel (2024). White Paper on Textile Fibre Recycling Technologies. Available here.
[60] Accelerating Circularity (2023) – see reference above.
[61] T-rex Project EU (2022). Criteria and specifications guidelines for collection to meet yarn needs for sport garments. Available here.

- Highest possible fraction of PA6 and lowest possible fraction of PA66 as PA66 is not recycled in the same process.

Thermo-chemical recycling (or the gasification of materials)
In principle this technology seeks to address 100% of textile waste, with no limitations on fiber composition[62]. This technology can process more complex, heterogeneous waste streams, including blends of fibers and fibers that cannot be recycled by any other technologies and is more tolerant to contaminants[63]. However, this technology requires some adaptation or development for the treatment of textile waste[64].

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Pathway #2 for achieving requirement 1.a.i:

A material is considered to not contain additives or features that are likely to result in low-value (i.e., low quality) reprocessed material when all three of the following conditions are met:

1. The product (or for products new to the market, a similar product) has achieved the Gold level Active Cycling requirements for short use phase products per Section 5.9: Actively cycle at least some (> 0%) of the product's materials and implement a program to increase the cycling rate or quality of the product for its next use. For the purposes of the Gold level compatibility requirements, this means that at least some (> 0%) of each material or part that will count towards the ≥ 90% of the product with 'high-value cycling potential' must be actively cycled. Note that per the Definitions section, cycling is defined as follows: The processing of material, parts, or whole products toward a new use cycle via a technical or biological cycling pathway that includes at least one of the following: reuse, remanufacturing, refurbishing, recycling, nutrient extraction/anaerobic digestion, composting, or biodegradation.
2. A product or material(s) of the same type or economic value can be produced in an economically competitive way using the cycled material by the applicant or applicant's cycling partner(s). The partners are those that were identified and engaged for achieving the requirements in standard Section 5.3 Preparing for Active Cycling. Same type means having the same function. Economically competitive means the product can be sold.
3. For products of a type similar to those that would typically be collected in a curbside recycle bin and recycled at a municipal facility (e.g., plastic water bottles that are not recyclable via municipal systems and so are achieving the requirements via this pathway instead), the applicant must take actions that aim to ensure the municipal recycle stream is not

[62] Redress (2022). Design for recyclability guide. Available here.
[63] Wrap. Textiles 2030 Circular Design Toolkit. Available here.
[64] McKinsey & Company (2022). Scaling textile recycling in Europe – turning waste into value. Available here.

contaminated by their product. This must include communicating directly on the product how it should be cycled (i.e., reused, remanufactured, refurbished, recycled, or made available for anaerobic digestion, composting, or biodegradation) and that it should not be placed in the curbside collection/recycle bin. This must go beyond use of the typical 'chasing arrow' recycling marks (e.g., #7 for plastics, which is misleading in most locations).

Bronze and Silver Level Compatibility Requirements – Biological Cycles

Design for the Biocycle and Textile Composting

For solid materials intended for composting, one of the following conditions must be met:

a. The material must biodegrade in the intended cycling pathway(s) within the time period and to the extent specified by a C2CPII-recognized compostability or biodegradability standard test, or
b. For materials that are ≥ 99% unmodified organic material, the material, at its maximum thickness and/or density, must disintegrate in the intended cycling pathway(s) within the time period and to the extent specified by a C2CPII-recognized compostability test. Additionally, a soil sample that is exposed to the material, after disintegration tests have been performed, must pass an ecotoxicity test demonstrating that the exposed soil sample is conducive to plant growth (OECD 208 or equivalent). Note that these are components of a full compostability test (as specified in the first option).

Textile and leather waste is a growing environmental concern, and composting may offer a promising solution for managing these waste streams sustainably. Both industrial and home composting of textiles are potential options, but each with specific conditions and limitations. Industrial composting of textile waste is not yet common practice and industrial composting facilities are unlikely to accept these materials. Home composting might be a solution when the product meets the stringent home composting testing requirements. However, relatively few consumers compost at home. Read more in Section 3.2 of this certification manual supplement on biodegradation and composting of textiles (Receiving Credit for Municipal Cycling (Pathway #3)) and standard EN 13432 in the user guidance box below.

Applicants must make sure that the compostable parts of the product can be detached from the other parts to meet the 50% (Bronze), 70% (Silver), 90% (Gold), or 99% (Platinum) compatibility requirements; that they are labelled correctly (use the Circular Data Report), and according to the law of the countries of sales. Also note that if composting requires that non-compostable parts be detached and this does not occur in practice, it may not be possible to achieve the Gold level in Section 5.8 Active Cycling requirements of the Full Scope standard document.

*Please note that testing for the biological cycle can take up to 10 months and product variations that contain conventional synthetic materials like elastane or polyester cannot be considered compostable or biodegradable.

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C2CPII-recognized Compostability and Biodegradability Testing Methods

C2CPII-recognized compostability and biodegradability testing methods currently include those in the list below. To receive credit, the test(s) employed must be applicable to the intended cycling pathway(s).

- **EN 13432 Packaging (used for textiles previously)** – Requirements for Packaging Recoverable Through Composting and Biodegradation – Test Scheme and Evaluation Criteria for the Final Acceptance of Packaging. This test is currently the most frequently used for textile products, but more applicable tests might be recommended in future.
- EN 14995 Plastics - Evaluation of Compostability - Test Scheme and Specifications.
- ISO 17088 Specifications for Compostable Plastics.
- ISO 18606 Packaging and the Environment — Organic Recycling.
- ASTM D6400 Test for Compostability. This specification covers plastics and products made from plastics that are designed to be composted in municipal and industrial aerobic composting facilities.
- ASTM D6868 Standard Specification for Labeling of End Items that Incorporate Plastics and Polymers as Coatings or Additives with Paper and Other Substrates Designed to be Aerobically Composted in Municipal or Industrial Facilities.
- AS 4736 Biodegradable Plastic-Biodegradable Plastics Suitable for Composting and Other Microbial Treatment - Australian Capital Territory.
- Standardized tests (e.g., ISO, ASTM) employed by the following certification programs (with certification encouraged but not required at the Bronze and Silver levels):
  - European Bioplastics: Seedling
  - DIN-Geprüft: Industrial Compostable
  - Biodegradable Products Institute (BPI)
  - TÜV AUSTRIA: OK Compost HOME, OK Compost INDUSTRIAL, OK biodegradable SOIL, WATER, and MARINE.
  - Renewable Energy Assurance Limited: Compostable Materials Certification Scheme (CMCS).

Additional testing methods may also be recognized and subsequently added to this list. Refer to Appendix 2 in this guidance document for requirements and the application process for recognition.

Gold Level Requirements: Design for High-Value Cycling

Biological and Technical Cycle – Requirement #1.a.ii

Biological Cycle – Gold requirements

For Bronze and Silver level, applicants can show testing results from any accredited lab with the recognized test methods. However, for Gold, a certificate is required. Some labs only provide test reports (which are acceptable for Bronze and Silver), while some labs (programs) provide certificates.

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The following are recognized compostability certification programs:

- European Bioplastics: Seedling
- DIN-Geprüft: Industrial Compostable
- Biodegradable Products Institute (BPI)
- TÜV AUSTRIA: OK Compost HOME, OK Compost INDUSTRIAL
- Renewable Energy Assurance Limited: Compostable Materials Certification Scheme (CMCS).

Please see C2CPII-Recognized Certification Programs and Standards for the current list of recognized standards.

Compatibility for Technical and Biological Cycle – Gold Requirements

In addition to requirements #1.a.i (i.e., no additives or features that are likely to result in low-value cycling) applicants must meet requirement #1.a.ii. There are three possible pathways to meet requirement #1.a.ii. The standard notes that:

EXCERPT – Version 4.1 Product Standard

For the Gold level: The use of materials with high-value cycling potential (i.e., high-quality material as defined in #1-2 below) is required.

1. For a material to count toward the required percentage (90%) of materials compatible with the intended cycling pathway(s), the following conditions must be met:

a. Materials intended for technical cycles and solid materials intended for biological cycles:

…(truncated).

ii. Must be able to:

1. Substitute for virgin material without loss of essential product function or material durability, or
2. Contain at least 80% renewable or post-consumer recycled content, or
3. Have at least two plausible next uses.

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Pathway #1: *Substitute for Virgin Material Without Loss of Essential Product Function or Material Durability*

Evaluating for Loss of Function and Durability

The following materials, after undergoing reprocessing, may be assumed to have similar properties (i.e., minimal to no loss in function or durability): glass, metal, clay, **chemically recycled polymers**.

For other materials, loss of function must be assumed if cycled material must be mixed with > 50% virgin material and other additives in the next use. Loss in material durability must be assumed if there is a > 10% change in one of the following physical indicators in the cycled material compared to virgin material (i.e., > 10% decrease for the parameters currently listed).

- Polymeric plastics
  - Decrease in ductility
  - Decrease in number, weight, or viscosity average molecular weight (g/mol)
  - Decrease in impact strength (kj/m2)
  - Decrease in tensile strength (MPa)
- Cellulosic fibers
  - Decrease in tensile strength
  - Decrease in bursting strength
  - Decrease in apparent density
- Textiles in general
  - Decrease in abrasion resistance
  - Decrease in tensile strength
  - Decrease in tear strength
  - Decrease in pilling resistance
  - Decrease in colorfastness

Additional indicators may be added upon request to C2CPII.

Further Explanation – Apparel and Textiles

Chemically recycled polymers like chemically recycled polyester (polyester chemical recycling back to monomer) or polyamide have a limited loss of function and durability and are excluded for testing.

It is difficult to quantify loss of function and durability for chemically recycled cotton, which becomes a man-made cellulosic fiber (MMCF) so the properties will be very different. It is also difficult to demonstrate < 10% change in material durability for mechanically recycled textiles as the strength does significantly decrease after fiber shredding. Therefore, the fabric is often blended with virgin materials. Pathways #1 or #2 may be more appropriate for these material types.

Examples of Innovations to Improve Quality and Durability of Recycled Fibers

As mentioned earlier, the fiber length of recycled fibers is reduced by up to 40% compared to virgin fibers. Higher quality fibers can be achieved by blending with virgin fibers but also via technological innovations.

The recently developed mechanical recycling technologies (also mentioned earlier) by Purfi, Natural Fiber Welding and Recover, for example, deliver high quality mechanically recycled fibers.

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Pathway #2: *Contain at Least 80% Renewable or Post-consumer Recycled Content*

Renewable or Post-consumer Recycled Content

- Renewable content: In alignment with standard Section 5.4 Increasing Demand, renewable content must be responsibly sourced to count as renewable. In addition, for the Gold level, the alternative compliance pathway (i.e., "Alternative to Meeting Required percentages of Cycled and/or Renewable Content: Feasibility Analysis") may be applied.
- Post-consumer recycled content: The verification requirements in the standard and guidance Section 5.4 Increasing Demand apply. The alternative compliance pathway may not be applied.

Further Explanation – Apparel and Textiles

In textiles and apparel, 80% renewable content is a reachable target when using renewable raw materials like cotton, viscose, or wool. 80% post-consumer recycled content is currently mainly feasible with chemical recycling technologies or recycled PET, due to the technical quality issues that comes with mechanically recycled post-consumer biological material.

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Pathway #3: *Have at Least Two Plausible Next Uses*

Plausible Next Uses

The standard requires *at least two plausible next uses*. This means two successive next uses (i.e., one after the other) rather than two different next uses. The two next uses must be within the intended pathway(s) as defined for achieving the requirements in Section 5.1. The two subsequent next uses may be the same use. For example, some metal alloys may be recycled back into the same metal alloy after the first use cycle, the second use cycle, etc.

A next use is plausible if there are existing examples (i.e., more than one example) of the next use occurring for that material in one or more similar products. Products are 'similar' when they have comparable characteristics of application/use, material composition, disassembly requirements, and end-of-use conditions. To receive credit as a plausible next use, the next use must also be part of the Active Cycling plan and implementation (per Sections 5.3 Preparing for Active Cycling and 5.9 Active Cycling).

Textiles and apparel: Textiles and apparel that have reuse and recycling as their intended pathway and meet all the Section 5 requirements can be assumed to meet this requirement. However, reuse cannot be assumed for textile and apparel items that are not commonly sorted for reuse via technical municipal collection systems such as socks, tights, undergarments, and workwear.

Further Explanation – Apparel and Textiles

Based on the data required for Section 5.2 requirements of the Full Scope standard document, applicants may illustrate the likelihood that textile products will get re-used (especially when offering a resale, rental, repair, or refurbish service) and recycled.

Textile and apparel products that have reuse (or other R-Strategies) and recycling as the intended cycling pathways, that are also commonly sorted for reuse in municipal systems (See Section 5.2), may be assumed to have two plausible next uses. Reuse by the municipal pathway cannot be assumed for workwear (e.g., police uniforms, fire fighter suits), socks, or underwear (although bras may be re-used when returned as new). Workwear typically is not intended for municipal systems for reuse, although might be reused via specialized reuse systems. Private reuse systems (potentially including care and reuse partnerships) are the primary option for these product types.

Example of Section 5.4 Compliance for Gold Level

Case: Jacket with an outer layer (55% of product by weight made from a blend of 90% responsibly sourced cotton and 10% Elastane) with functional metal buttons (5% of product by weight) and an inner lining (40% of product by weight, made from 100% polyester). No other disrupters were identified.

Requirements:

1. For a material to count toward the required percentage (90%) of materials compatible with the intended cycling pathway(s), the following conditions must be met:
   a. Materials intended for technical cycles and solid materials intended for biological cycles:
      i. Must not contain additives or features that are likely to result in low-value (i.e., low-quality) reprocessed material, and
      ii. Must be able to substitute for virgin material without loss of essential product function or material durability, contain at least 80% renewable or post-consumer recycled content, or have at least two plausible next uses.

Intended Cycling Pathway(s)	Requirement #1ai			Requirement #1aii	Compatibility percentage (%)	Level achievable
	Inner lining (polyester)	Metal buttons	Outer layer (cotton-elastane blend)			
Recycling only	Non-removable	Non-removable	10% elastane in the cotton blend (max =5% for recycling)	No (no post-consumer recycled polyester)	Bronze and Silver: 0% Gold: 0%	Not eligible for certification
	Removable	Non-removable	10% elastane in the cotton blend	No	Bronze and Silver: 40% Gold: 0%	Not eligible and high-value recycling requirements #1aii not met

	Removable	Removable	Change in composition to 2% elastane in the cotton blend	No	Bronze and Silver: 95% Gold: 0%	Silver – high-value recycling requirements #1aii not met
	Removable	Removable	10% elastane in the cotton blend	100% post-consumer recycled polyester used. At least 80% renewable or post-consumer cycled content met.	Bronze and Silver: 40% Gold: 40%	Not eligible – although 40% inner lining compatible with high-value recycling
	Removable	Removable	Change in composition to 2% elastane in the cotton blend	100% post-consumer recycled polyester used. At least 80% renewable or post-consumer cycled content met.	Bronze and Silver: 95% Gold: 95%	Gold – 40% inner lining and 55% outer layer compatible with high-value recycling
	Removable	Removable – number of buttons reduced to 1% by weight.	Change in composition to 2% elastane in the cotton blend	100% post-consumer recycled polyester used. At least 80% renewable or post-consumer cycled content met.	Bronze and Silver: 99% Gold: 99%	Platinum – 40% inner lining and 59% outer layer compatible with high-value recycling

Reuse and recycling	Non-removable	Non-removable	10% elastane in the cotton blend	Two plausible next uses met (reuse and recycling).	Bronze and Silver: 0% (Recycling); 100% (Reuse) Gold: 0% (Recycling & Reuse)	Not eligible for certification
	Removable	Removable	10% elastane in the cotton blend	Two plausible next uses met (reuse and recycling).	Bronze and Silver: 40% (Recycling); 100% (Reuse) Gold: 40% (Recycling & Reuse)	Not eligible for certification
	Removable	Removable	2% elastane in the cotton blend	Two plausible next uses met (reuse and recycling).	Bronze and Silver: 95% (Recycling); 100% (Reuse) Gold: 95% (Recycling & Reuse)	Gold – 40% inner lining and 55% outer layer compatible with high-value recycling
	Removable	Removable – number of buttons reduced to 1% by weight.	2% elastane in the cotton blend	Two plausible next uses met (reuse and recycling).	Bronze and Silver: 99% (Recycling); 100% (Reuse) Gold: 99% (Recycling & Reuse)	Platinum – 40% inner lining and 59% outer layer compatible with high-value recycling

3.5 Circularity Data and Cycling Instructions

Refers to Section 5.5 in the Full Scope standard.

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5.5 Circularity Data and Cycling Instructions

Intended Outcome(s)

Circularity information for proper end-of-use handling of the product is publicly available, increasing the likelihood that the product's materials will be actively recovered and processed for a next cycle of use.

Applicable Achievement Level(s)

Bronze

Requirement(s)

Make data to support cycling of the product in its intended pathway(s) and instructions for how to cycle the product publicly available.

The applicant must make data to support cycling of the product in its intended pathway(s) publicly available. The data may be reported via the Cradle to Cradle Certified® Circularity Data Report (see Cradle to Cradle Certified® Circularity Data Report reference document) or a C2CPII-recognized circularity reporting standard.

When applicable, the applicant must make instructions for how to cycle the product publicly available. The instructions must include how to identify the materials for cycling, any required product maintenance, and how to recover, reprocess, or recycle the product (see Cycling Instructions Section in the Cradle to Cradle Certified® Circularity Data Report reference document).

Further Explanation – Apparel and Textiles

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The product circularity data and cycling instructions that are required to be made publicly available are listed in the Cradle to Cradle Certified® Circularity Data reference document.

Publicly available means freely and openly available without restriction. Posting circularity data via databases or other services that charge a fee or have other limitations on access (other than a registration function) does not receive credit. Circularity data and cycling instructions are not considered to be publicly available if it is necessary to email or otherwise contact the applicant (e.g., via a website messaging function) to request this information. Data may be made publicly available by completing the Cradle to Cradle Certified® Circularity Data form. The information provided in the form must be verified (rather than self-reported by the applicant). These data will be made publicly available on C2CPII's web registry.

For textile and apparel products, C2CPII recommends including labels that state the correct fabric blend information with the product. Note that this is not yet an official Cradle to Cradle Certified® standard requirement but will be considered by C2CPII in the next standard update. The labels should be durable and not wash out over time. This facilitates the sorting of textile and apparel products into the correct recycling streams.

In regions such as the EU and the US, there are regulations concerning the labelling of textile and apparel products:

- In the EU, Regulation (EU) No 1007/2011 regulates textile fiber names and the labelling of textile products.
- In the US, the corresponding regulation is the Textile Fiber Rule (16 CFR Part 303).

Please always ensure that the product conforms to the labelling regulations in the regions of sale.

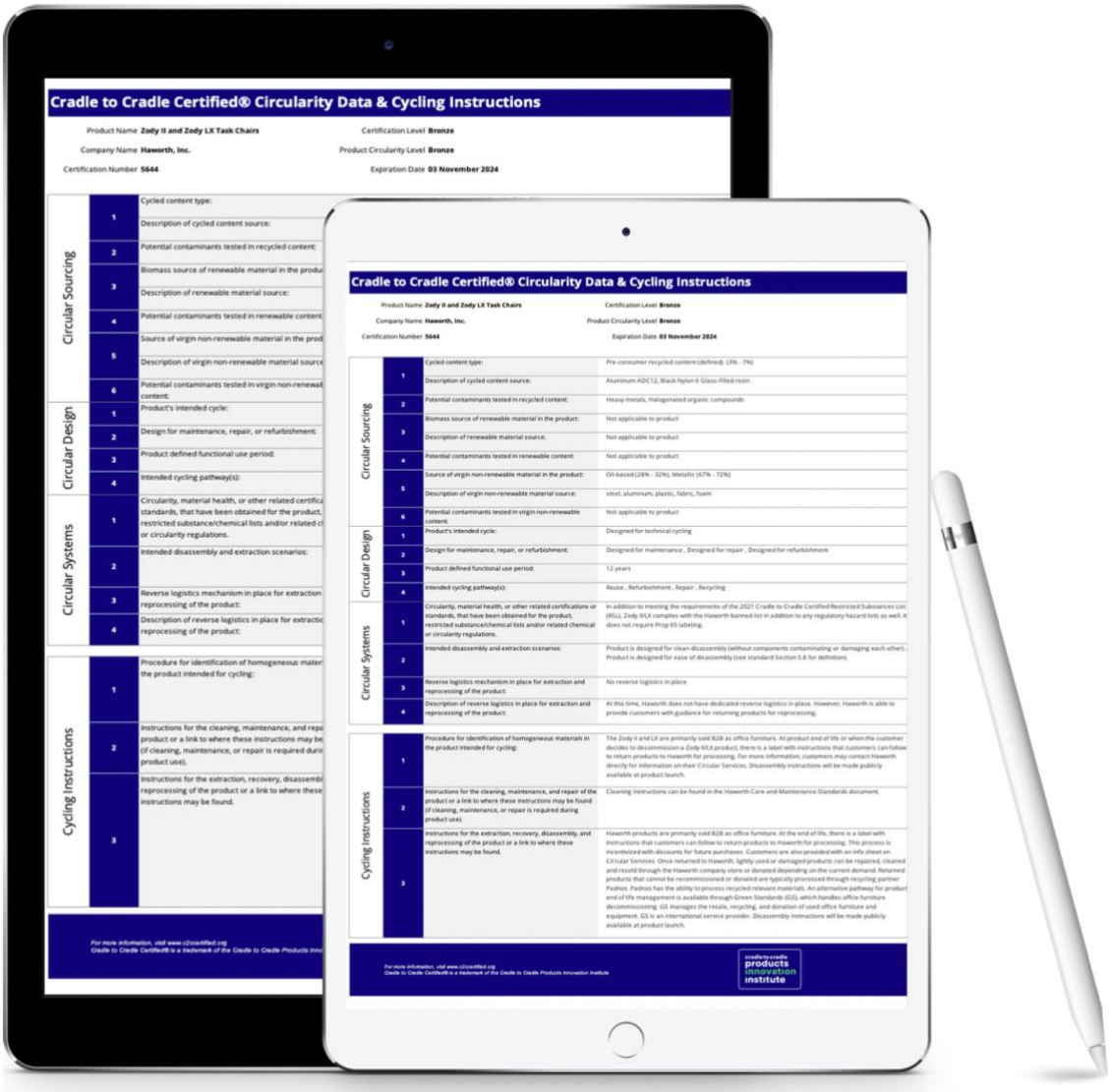

Figure – Example of Cradle to Cradle Certified® Circularity Data Report

3.6 Circular Design Opportunities and Innovation

Refers to Section 5.6 in the Full Scope standard.

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5.6 Circular Design Opportunities and Innovation

Intended Outcome(s)

The product is designed in a way that creates more end-of-use cycling opportunities.

Applicable Achievement Level(s)

Silver and Gold

Requirement(s)

Silver level: Develop a plan for implementing a circular design opportunity or innovation that increases product circularity; demonstrate progress toward achieving the plan at recertification.

Gold level: Implement a circular design opportunity or innovation.

For the Gold level, circular design opportunities and innovations receiving credit are those that are commonly known and/or can be demonstrated to contribute to one or more of the following:

1. Increased end-of-use cycling.
2. Greater engagement with users for end-of-use cycling.
3. Prolonged use of the product.
4. Decreased need to extract and produce virgin materials.

For intermediate and wet-applied products, the applicant company must communicate how to implement the circular design opportunity to finished product manufacturer(s) or the customers of the wet-applied material, respectively.

Further Explanation – Apparel and Textiles

EXCERPT – Version 4.1 User Guidance

Implementing a Circular Design Opportunity or Innovation

In general, the intent of the requirements in this section is to encourage intentional product design that results in greater product cycling. Therefore, projects that receive credit are those that require that specific design decisions be made. This may include a decision to specify different input materials (e.g., from an industrial symbiosis) or a design decision to specify inputs from the product itself (e.g., when recovered via a take-back system). Projects that focus on cycling infrastructure separate from product design decisions are not in scope here. The latter receive credit through other sections of the standard (e.g., Section 5.3 Preparing for Active Cycling).

Choose at least one of the circular design opportunities or innovations below to meet this requirement. The work to implement the design opportunity or innovation may have occurred at any time in the past, as part of the initial product design process or following initial product launch.

Circular Design Opportunities or Innovations:

1. **Designed to Minimize Material Weight**
   Description: Any product design strategy that will lead to or has led to at least a 10% decrease in material weight, resulting in a product with the same or better performance and durability. Alternatively, the product requires at least 10% less material than the average product of the same type.
   Examples of acceptable progress for Silver level recertification: Any work that has been done toward decreasing material weight in the product or establishing partnerships that will allow for decreasing material weight.

2. **Design Strategy for Prolonging the Use Phase of the Product**
   Description: Any product design strategy used by the manufacturer to extend the use of the product beyond the most common use phase time (i.e., mode) for the product type.
   Examples of acceptable progress for Silver level recertification:

   a. Any work that has been done toward prolonging the use phase time of the product or establishing partnerships that will allow for prolonging the use phase time.
   b. Market research to identify methods of encouraging product users to purchase a product with a longer use phase.

   For the Gold level, determining what is a longer than the most common (i.e., mode) product use phase time: The length of the use phase for any given product may be derived from warranties, public marketing claims, quality tests that address common failure modes, or another data source (if a logical rationale for using the other data source is provided). The product use phase time must be compared to available data on the most common (i.e., mode) use phase time for the product type. The most common use phase times for many product types are available in the International Living Future Institute's (ILFI) Product Life Database, If data on the most common (i.e., mode) use phase time (i.e., 'lifetime' per the database) for the product type is not available in the ILFI reference, the applicant must submit an alternative appropriate source of data and an explanation of how the data were derived.

3. **Designed for Product as a Service**
   Description: A product that is designed to be rented/leased or shared among customers of the product.

Examples of acceptable progress for Silver level recertification: Any work that has been done toward implementing a product as a service business model or establishing partnerships that will allow for implementing a product as a service business model.

4. **Designed for Modularity or Upgradability**

   Description: A product that is designed with parts that are replaceable, and replacement of these parts can be used toward the maintenance, upgrade, or expansion of the product.
   Examples of acceptable progress for Silver level recertification: Any work that has been done toward implementing a modular or upgradable product design or partnerships that will allow for implementing a modular or upgradable product design.

5. **Designed for Maintenance, Repair, or Refurbishment Services**

   Description: A product that is designed for maintenance, repair, or refurbishing services that are offered by the manufacturer at low cost (i.e., less than the cost of the product) to help maintain or prolong the use phase of the product.

   Examples of acceptable progress for Silver level recertification: Any work that has been done toward establishing a process or program for maintenance, repair, or refurbishing services, or partnerships that will allow for maintenance, repair, or refurbishing services.

6. **. Designed for Manufacturer Recovery and Reuse**

   Description: A product that is designed for a company take-back program or other company-based recovery initiative aimed at reusing the product.
   Examples of acceptable progress for Silver level recertification: Any work that has been done toward establishing a take-back program or partnerships that will allow for a company take-back program.

7. **Designed for Product Compatibility**

   Description: A product that is designed for standardization or compatibility with other parts or products, enabling extension of the use phase of the product.
   Examples of acceptable progress for Silver level recertification: Any work that has been done toward designing the product for standardization or compatibility with other parts or products, or establishing partnerships that will allow for standardization or compatibility with other products.

8. **Designed for Remanufacturing**

   Description: A product that has been designed for manufacturer recovery and can have components re-used for other product applications.

Examples of acceptable progress for Silver level recertification: Any work that has been done toward implementing a remanufacturing program for the product or establishing partnerships that will allow for remanufacturing of the product.

9. **Designed for Industrial Symbiosis**

Description: A product that is designed to utilize waste material from a local and different manufacturing process (within 160 km or 100 miles). Note that industrial symbioses are commonly understood to be between different industries.

Examples of acceptable progress for Silver level recertification: Any work that has been done toward establishing an industrial symbiosis business plan or partnerships that will allow for industrial symbiosis.

10. **Designed for Extending Resource Value**

Description: A product that is designed to incorporate the residual value of otherwise "wasted" materials or resources.

Examples of acceptable progress for Silver level recertification: Any work that has been done toward prolonging the residual value of wasted materials or establishing partnerships that will allow for prolonging the residual value of wasted materials.

11. **Designed for Other Innovation**

Description: A product that is designed in a way that contributes meaningfully to its increased circularity.

Examples of acceptable progress for Silver level recertification: Any work that has been done toward implementing the plan or establishing partnerships that will allow for the plan to succeed.

Design Strategy for Prolonging the Use Phase of the Product

Design Considerations to Facilitate Durability

Recyclability is not the solution itself but a means to an end. The end goal is to lower the environmental impact and work towards a positive one. The assumption can be made that increasing the durability of textile products and footwear can generally have a less negative impact on the environment compared to recycling. Here are a few key points to consider:

1. **Durability and Longevity**: Durable products that last longer reduce the need for frequent replacements, which in turn lowers the overall environmental impact. This includes reducing the resources and energy required for production, transportation, and disposal[65].
2. **Life Cycle Assessments (LCAs):** Studies using LCAs have shown that extending the lifespan of clothing and footwear significantly reduces their environmental footprint. For example, a study found that using second-hand clothing instead of new items can lead to up to 42% lower impacts for climate change and cumulative energy demand[66].
3. **Recycling Limitations**: While recycling is beneficial, it might come with limitations such as the quality degradation of recycled materials and the energy-intensive processes involved. Additionally, not all materials are easily recyclable, and the infrastructure for textile recycling is still developing[67].
4. **Consumer Behavior:** The way consumers use and care for their products also plays a crucial role. Durable products that are well-maintained can significantly reduce environmental impacts compared to frequently replaced, lower-quality items[68].

In summary, while both durability and recyclability are important for reducing environmental impacts, focusing on the durability and longevity of products can lead to substantial environmental benefits.

At the Silver level, to receive credit for a design strategy for prolonging the use phase, applicants are required to submit an implementation plan including potential partners, a description on how the design opportunity or innovation is expected to increase product circularity, and a timeline with concrete next steps. For Silver level recertification, applicants can meet the requirements by demonstrating:

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i. Any work that has been done toward prolonging the use phase time of the product or establishing partnerships that will allow for prolonging the use phase time.
ii. Market research to identify methods of encouraging product users to purchase a product with a longer use phase.

The Ecodesign for Sustainable Products Regulation aims to set binding requirements on product design, including durability and repairability for apparel, textiles, and footwear. C2CPII follows the developments of this regulation closely to align where applicable.

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[65] Klooster et al (2023). Do We Save the Environment by Buying Second-Hand Clothes? The Environmental Impacts of Second-Hand Textile Fashion and the Influence of Consumer Choices. Available here.
[66] Ibid.
[67] Laitala et al (2018). Does Use Matter? Comparison of Environmental Impacts of Clothing Based on Fiber Type. Available here.
[68] Ibid.

Extending the Length of a Use Phase: Durability Testing of Textile Products – Gold Level

At Gold level, applicants are required to demonstrate that their circular design opportunity or innovation has been implemented. To demonstrate implementation of a strategy to prolong the use phase, it must be shown that the use phase has been extended beyond the mode for that product type.

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The length of the use phase for any given product may be derived from warranties, public marketing claims, quality tests that address common failure modes, or another data source (if a logical rationale for using the other data source is provided). The product use phase time must be compared to available data on the most common (i.e., mode) use phase time for the product type. The most common use phase times for many product types are available in the International Living Future Institute's (ILFI) Product Life Database. If data on the most common (i.e., mode) use phase time (i.e., 'lifetime' per the database) for the product type is not available in the ILFI reference, the applicant must submit an alternative appropriate source of data and an explanation of how the data were derived.

Durability is a critical factor in overall life cycle assessments, which evaluate the environmental impact of a product from raw material extraction through to end-of-life disposal. A more durable product typically has a lower environmental impact over its lifecycle.

Product durability can be demonstrated by quality tests based on the number of wears and washes that a product can withstand without the loss of color or strength. The standard recognizes third-party testing based on ISO, EN, and ASTM quality tests for the proof of durability and functionality after an applicable number of washes. Below you will find an example of quality and durability assessments and required tests that C2C Certified approves for durability testing.

Note: Textile Products and footwear may be tested on durability based on the Product Environmental Footprint (PEF) Durability Requirements.

The Product Environmental Footprint (PEF) methodology seeks to harmonise the measurement of sustainability within the EU market. While adopting a lifecycle approach (similar to LCAs), it incorporates additional product-specific requirements.

Product Category Rules (PEFCRs): These rules provide specific guidelines for different product categories, ensuring consistency and comparability in durability assessments. For example, the PEFCR for apparel and footwear outlines detailed requirements for testing the durability of garments and shoes[69].

When published, applicants may use test results by an ISO 17025 accredited lab on "moderate, or aspiration level" after an applicable amount of care cycles (now set on 15 cycles for machine wash) to

[69] Deckers et al (2024). ETC CE Report 2024/5 Textile waste management in Europe's circular economy. Available here.

prove durability and functionality of apparel and footwear (physical durability assessment tables can be found in the PEFCR, Annex V, Part II)[70].

Durability requirements for textiles, particularly those that need to withstand a large number of wears and washes, typically involve several key tests to ensure the fabric maintains its integrity and appearance over time.

Like the PEFCR, and based on the Higg Product Module, C2CPII aims to reflect the real-life Duration of Service (DoS) of apparel and footwear as closely as possible.

Product lifetime may be estimated by assessing[71]:

a. The intrinsic durability of a product – product-specific attributes that contribute to its potential lifetime (e.g., physical toughness and design features).
b. Extrinsic durability attributes – external factors that influence the likelihood of a product reaching its potential lifetime.
c. The repairability potential of the product (this is also addressed under the paragraph on choosing the repair pathway in Section 5.1 of the Full Scope standard document and providing services in Section 5.2).

Repairability (reference to point 5 'Designed for Maintenance, Repair, or Refurbishment Services' in the User Guidance excerpt above):

The PEFCR also considers the ease with which a product can be repaired. This includes the availability of repair services and the design of the product to facilitate repairs (e.g., replaceable buttons, zippers)[72]. The costs of the repair in relation to the price of the product determines the likelihood of the repair. Applicants may use this as well for point 5.

The table below illustrates the estimated number of uses per product duration of service.

Table – Default product duration of service per product sub-category, data based on the Higg Product Module Methodology[73,74])

Product category	Number of uses throughout a product's lifetime
T-shirts	45
Shirts and blouses	40

[70] PEFApparelFootwear. Product Environmental Footprint Category Rules (PEFCR) Apparel And Footwear. Available here. (scroll down to download, p.22).
[71] Ibid.
[72] PEFApparelFootwear. The apparel & footwear PEFCR in more detail. Available here.
[73] PEFApparelFootwear. Product Environmental Footprint Category Rules (PEFCR) Apparel And Footwear. Available here. (scroll down to download, p.22).
[74] Casale (2020). Higg Product Module Methodology.

Sweaters and mid-layers	85
Jackets and coats	100
Pants and shorts	70
Dresses, skirts and jumpsuits	70
Leggings, stockings, tights and socks	55 (70 for legging/thighs, 50 for hosiery, 50 for socks)
Underwear	60
Swimwear	30
Apparel accessories	100
Open-toed shoes	50
Closed-toed shoes	100
Boots	100

The table is based on the Higg Product Module[75], and is also used by Quantis in the PEFCR (2025) Product Environmental Footprint Category Rules (PEFCR) Apparel and Footwear[76,77].

Below are the main aspects that need to be considered for testing after the applicable amount of care cycles.

In the PEFCR, 15 care cycles are considered according to ISO 15487 before durability tests can be performed. The appearance evaluated includes color change, pilling, fuzzing, matting appearance of fabrics, smoothness appearance of flat fabric and seams, and the retention of pressed-in creases in garments and other textile products, damage of components like buttons, press fasteners, slide fasteners, etc.:

1. **Physical Durability:** This involves testing the fabric's ability to withstand wear and tear over time. Common tests include:

   - **Abrasion Resistance:** Evaluates how well the fabric can resist surface wear caused by rubbing.
   - **Tensile Strength:** Measures the force required to break the fabric by pulling it apart.
   - **Tear Strength**: Assesses the fabric's resistance to tearing[78].

[75] Higg Index. Completing Duration of Service (#14). Available here.
[76] PEFApparelFootwear. Product Environmental Footprint Category Rules (PEFCR) Apparel And Footwear. Available here.
[77] "Duration of service" (DoS) from the Higg Product Module 516 (PM) methodology is used where the duration of service is defined as "the lifetime of the 517 product with appropriate use for its intended function".
[78] PEFAppaelFootwear. The apparel & footwear PEFCR in more detail. Available here.

2. **Appearance Retention:** This includes tests to ensure the fabric maintains its appearance after repeated use and washing. Key tests are:

- **Pilling Resistance:** Checks how likely the fabric is to form small balls of fiber on its surface.
- **Colorfastness:** Measures the fabric's resistance to fading or bleeding during washing[79].

Applicants may use a risk assessment on the loss of quality or use the weighting of PEFCR to decide the critical tests per product group after an applicable number of washes.

These are examples of specific test methods used to test textile product durability after 15 care cycles (according to ISO 15487- based on the PEFCR, Annex V):

Product Deformation:

- ISO 6330/ISO 5077: Determination of dimensional change after washing and drying (%)

For woven pants, the following test might also be used:

- ISO 20932-1: Determination of the elasticity of fabrics
  - Part 1: Strip tests – Method A (min. recovery %)
- ISO 16322-3: Determination of spirality after laundering - Part 3: Woven and knitted garments (%)

Fabric Strength:

- EN ISO 12947-2: Determination of the abrasion resistance of fabrics by the Martindale method - Part 2: Determination of specimen breakdown (cycles)
- ISO 13934-2: Tensile properties of fabrics - Part 2: Determination of maximum force using the grab method (N)*
- ISO 13937-1: Tear properties of fabrics - Part 1: Determination of tear force using ballistic pendulum method (Elmendorf) (N)

*(N) = Newton

Fabric Aspect Damage:

- ISO 15487: Method for assessing appearance of apparel and other textile end products after domestic washing and drying - Collar appearance: Curled or blistered aspect (not applicable for woven pants)
- ISO 15487: Method for assessing appearance of apparel and other textile end products after domestic washing and drying - Product aspect: Holes or broken yarn
- ISO 15487: Method for assessing appearance of apparel and other textile end products after domestic washing and drying - Pilling and fuzzing

[79] PEFAppaelFootwear. The apparel & footwear PEFCR in more detail. Available here.

Seam Aspect Damage:

- ISO 13936-2: Determination of the slippage resistance of yarns at a seam in woven fabrics - Part 2: Fixed load method (mm): Main fabric

Accessories Aspect Damage:

- ISO 15487: Method for assessing appearance of apparel and other textile end products after domestic washing and drying - Handling of functional accessories
- ISO 15487: Method for assessing appearance of apparel and other textile end products after domestic washing and drying - Trims and accessories appearance

Color Damage:

- ISO 15487: Method for assessing appearance of apparel and other textile end products after domestic washing and drying - Color change: Prints & embroideries
- ISO 15487: Method for assessing appearance of apparel and other textile end products after domestic washing and drying - Color change: Main fabric

Example of durability testing for footwear (non-sport, adult multipurpose):

- Whole Shoe Flexion ISO 24266 A: Outsole/upper unbonding, Breakage of the upper in flexion area, Outsole breakage
- Martindale Abrasion ISO 17704: Upper
- Outsole Abrasion ISO20871:2018: Tread Loss
- Zipper Failure EN 16732
- Accessories Attachment: ISO 24263 Buckle and Straps
- Bond Strength ISO 17708: Outsole and Midsole Separation

3.7 Product Designed for Disassembly

Refers to Section 5.7 in the Full Scope standard.

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5.7 Product Designed for Disassembly

Intended Outcome(s)

The product may be easily disassembled into discrete materials compatible for its intended cycling pathway(s) making it more likely that a large percentage of the materials in the product will be cycled.

Applicable Achievement Level(s)

Silver and Gold and Platinum

Requirement(s)

Silver level: For products with multiple materials requiring separation for cycling in the intended pathway, develop a plan for increasing the ease of product disassembly into discrete materials for intended cycling pathway(s).

Gold level: For products with multiple materials requiring separation for cycling in the intended pathway, and for 90% of materials by weight, intentionally design the product for ease of disassembly.

Platinum level: For products with multiple materials requiring separation for cycling in the intended pathway, and for 99% of materials by weight, intentionally design the product for ease of disassembly.

For the Silver level, the plan for increasing the ease of product disassembly must include at least one of the design or communication elements required at the Gold level.

For the Gold and Platinum levels, the following design and communications elements define "ease of disassembly" and are required as applicable for ≥ 90% (for Gold) and ≥ 99% (for Platinum) of materials by weight:

1. The product includes at least one design feature that improves the ease of disassembly compared to a commonly or previously used alternative product.
2. Processes that result in the loss of specific materials in the product in order to recover other materials (e.g., burning plastics to recover metals) must be avoided.
3. If disassembly operations are conducted by an entity other than the applicant company, comprehensive disassembly instructions must be publicly available and accessible to the party(ies) involved in disassembly.

4. If disassembly operations are conducted by the general public, components must be separable using common tools (e.g., hammer, screwdriver, pliers) with minimal technical experience and instruction.
5. For products with ≥ 30 homogeneous materials and/or if disassembly is performed by an entity other than the product user, the disassembly process:
   a. Must be at least semi-automated (e.g., for electronics), or
   b. Can occur in a reliably consistent manner with clear instructions (e.g., via a Standard Operating Procedure, or another standardized process for training those who are disassembling the product).

For the Platinum level, the design and communications elements above are required as applicable for ≥ 99% of materials by weight.

Further Explanation – Apparel and Textiles

Design Features that Improve the Ease of Disassembly

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Design Features that Improve Ease of Disassembly

Requirement #1 is that: The product includes at least one design feature that improves the ease of disassembly compared to a commonly or previously used alternative product.

One or more of the following design features (a non-exhaustive list) may be used toward fulfillment of this requirement:

- Does not require any disassembly to be cycled under the intended cycling pathway.
- Uses fewer fasteners.
- Decreased number of disassembly operations.
- Elimination of destructive processes.
- Minimized the tools needed to disassemble the product.
- Use of detachable/resolvable fasteners.
- Full accessibility to critical parts.
- Increased automation of disassembly and/or improved other mechanisms for material separation that minimize loss of material.

Alternatively, an example of a different design feature (not listed above) may be provided along with evidence supporting its contribution to improved ease of disassembly.

For textiles and apparel: The listed disruptors in *Section 5.4, Further Explanation: Determining Compatibility for Technical Municipal Cycling Systems,* are considered compatible with municipal technical recycling, if design for disassembly enables the easy removal of the disruptor. The municipal technical recycling facility (or similar) should be considered the implementing entity in cases where the collected textile or apparel products are first sorted for reuse before recycling. This ensures disassembly does not hinder product reuse.

For functional hard and soft parts, strategic placement of the parts to facilitate removal and reduce material loss (e.g., "cut off" or trim removal strategy) before recycling is accepted as a design for disassembly feature. For example, disruptors are visible and placed together on a placket, cuff, or collar so they can easily be removed. C2CPII will consider similar strategies that facilitate trim removal. The report Synthesis on optical sorting and recognition technologies, sorting and disassembly of textile materials, Refashion and Terra, provide insights on the state of the art of trim removal.

Requirements for Disassembly Instructions

Requirement #3 is that: If disassembly operations are conducted by an entity other than the applicant company, comprehensive disassembly instructions must be publicly available and accessible to the party/parties) involved in disassembly.

If disassembly instructions are required, they must include the following elements:

- A description of each step in the disassembly operation.
- Identification of parts and components.
- The type of connectors involved.
- How to access components and parts.
- Tools required for each step.
- Accompanying audio or visual instructions or diagrams (e.g., disassembly precedence graph, disassembly tree, state diagram, hypergraph).

Textile Case for Disassembly

It is important that design considerations factor in recyclability. Designing products to be compatible with existing and planned near-term sorting and recycling infrastructure is a best practice.

Current upstream design considerations should account for:

- Fiber composition (mono-materials preferred),
- Product construction (single-layer preferred),
- Color (important for mechanical recycling),
- Material construction (knit versus woven depending on preferred recycling treatment) and
- Disruptors (fewer, removable, same fiber composition as primary product, non-toxic, restricted-substance compliant, and/or benign to the recycling process)[80].

Ensure any components added to the fabric are easy to disassemble. Removable disruptors should be favored, provided that their disassembly instructions are clearly provided on the garment to enable an efficient process with minimal or no fabric loss[81].

[80] Fashion For Good (2024). Sorting for Circularity – USA. Available here.
[81] Ellen MacArthur Foundation (2021). The Jeans Redesign Guidelines. Available here.

Removable buttons[82]
Use buttons that can be disassembled without the need to cut any fabric e.g., screw-based buttons.

Removable sewing threads [83, 84]
Use threads that can be dissolved to prevent cutting off of seam that creates significant amounts of fabric waste. Examples include:

- Thermal disassembly: Resortecs
- Disassembly using microwaves: Wear2go

Removable zippers[85]
Further innovation is required to ensure design strategies allow fastenings, including zips to be disassembled for reuse or recycling. Zippers can be avoided by the use of removable buttons.

It is important to communicate disassembly instructions in the C2C Certified Circularity Data Report.

[82] Ellen MacArthur Foundation (2021). The Jeans Redesign Guidelines. Available here.
[83] Re_Fashion (2023). Technical monitoring of optical sorting, recognition and disassembly technologies for textiles at European scale. Available here.
[84] Ellen MacArthur Foundation (2021) – see reference above.
[85] Ibid.

3.8 Active Cycling

Refers to Section 5.8 in the Full Scope standard.

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5.8 Active Cycling

Intended Outcome(s)

The product's materials are actively being recovered and processed for their next use via the intended cycles and/or the product manufacturer is demonstrably invested in a program that will lead to higher product and material cycling rates and/or a higher quality of materials available for cycling.

Applicable Achievement Level(s)

Gold and Platinum

Requirement(s)

Gold level: For select single-use plastic products and single-use plastic packaging (when certified as a separate product), actively cycle ≥ 50% of the product's materials and implement a program to increase the cycling rate or quality of the product for its next use.

For other short-use phase products, and for any product that is required to be cycled per leading regulations (e.g., electronics, apparel), actively cycle at least some (> 0%) of the product's materials and implement a program to increase the cycling rate or quality of the product for its next use.

For long-use phase products, actively cycle at least some (> 0%) of the product's materials or implement a program to increase the cycling rate or quality of the product for its next use.

Note: Per the Definitions (Section 12), a short-use phase product is a product with a use phase time that is typically less than 4 years.

Platinum level: For long-use phase products, actively cycle the product's materials and implement a program to increase the cycling rate or quality of the product for its next use.

Monitor cycling rates and quality over time, and demonstrate an increase in either cumulative cycling rate or quality.

Actively cycle a minimum percentage of the product's materials based on the duration of the product's use phase.

Active cycling includes both recovery and processing of the product's materials for their next use.

Requirements for a material or product to be considered high quality or have high-value cycling potential are provided in Section 5.4 for the Gold level.

...(truncated).

For the Platinum level:

1. If demonstrating an increase in cumulative cycling rate, the increase must be via one or more intended cycling pathway(s).
2. The minimum required percentage of actively cycled product is a function of the product's use phase duration or the average use phase duration for the product type (the shorter the use phase, the higher the minimum percentage required). This minimum required percentage is calculated as follows:
   100/(2+L)
   where L is the product use phase time (in years) or the average use phase time for the product type (in years). If using the use phase time for the product, lifetime warranties may not be used for its derivation.

Exemptions

Long-use phase products that have been on the market for a time period less than the product's average use phase are exempt from the Platinum level requirement.

Intermediate products and liquid formulations are exempt from all requirements in this section.

Further Explanation – Apparel and Textiles

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Products Required to be Cycled Per Leading Regulations

The EU and some U.S. States (e.g., California, New York) are currently considered to have leading regulations that require product cycling. At the time of publishing this guidance, the product types listed below are considered to be subject to leading regulations and therefore active cycling is required at the Gold level. Note that active cycling is required in all cases at the Gold level for these product types, including when the product(s) are sold in any other region and/or have a use phase of more than four years.

- **Apparel**
- Electronics
- Carpets
- Mattresses
- Batteries
- Tires/Tyres

For textiles and apparel products it is required to have evidence of active cycling beginning at the Gold level.

Providing Evidence of Active Cycling

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Determining the Percentage of the Product that is Actively Cycled

The percentage of the product that is actively cycled must be calculated at the Gold level for 'select' single-use plastic products and single-use plastic packaging (e.g., beverage cups and bottles as indicated above in Section 5.8 and at the Platinum level for all other product types.

For product types other than the 'select' single-use plastic products and single-use plastic packaging listed above, evidence of active cycling (> 0%) may be provided at the Gold level. The actual cycling rate does not have to be determined. Further, **it is not required to have the ability to trace the specific product through the applicable cycling system. Evidence of successful cycling of the same type of product occurring via the relevant system and evidence demonstrating that it is highly likely that the product will enter the relevant system is accepted for the Gold level.** This approach is also accepted for products new to the market that are not yet able to be cycled because none have yet reached the end-of-use phase.

The percentage of actively cycled (%AC) of the product is calculated as follows:

$$\%AC = \frac{\text{total weight of the product or its components and materials cycled in a recent reference year}}{\text{total weight of products sold in (reference year – L)}}$$

Where:

- Total weight of the product or its components and materials cycled = the weight of all components and materials that are cycled pre-processing (after collecting and sorting), not the weight of recovered material. Note that weight is used instead of the number of products since components or materials are usually cycled rather than whole products.
- Recent reference year = the most recent full calendar or fiscal year for which data are available (e.g., the calendar year prior to the certification application), and
- L = the product's estimated average use phase time as described above (e.g., based on warranties, public marketing claims, or quality tests).

If possible, representative sales and recovery (i.e., pre-processing) weights should be obtained for every region in which the product is sold. At a minimum, the applicant must use representative data for regions representing at least 60% of sales, where 'region' is defined as an individual state/region (e.g., in the United States) or an individual country.

Applying Municipal Cycling Rates

For products that are cycled via municipal systems, the percentage of the product that is actively cycled may be determined using data on cycling rates for the product type in the regions where the product is sold, in combination with the product's sales weight in each region in which data are available. For example, if the product is a PET bottle sold in California, the cycling rate for PET bottles in California is 50%, and if 60% of the product's manufactured weight is sold in California, the % actively cycled for the product may be assumed to be at least 30% (i.e., 50% x 60%).

For apparel and textile products, the information in 3.2 and Annex 1 might help to provide evidence of separate collection and active cycling.

For 5.8 Active Cycling requirements of the Full Scope standard document, Gold level, applicants are required to provide numerical evidence of active cycling. Alternatively, "Evidence of successful cycling of the same type of product occurring via the relevant system and evidence demonstrating that it is highly likely that the product will enter the relevant system is accepted for the Gold level." This means that applicants must show that the applicable partners or relevant systems (addressed in Section 5.2) can cycle the product(s) or (at minimum) can cycle the same type of product.

Active cycling data will vary with circular system and may apply to:

1. The countries of sales with a mandatory separate waste collection system,
2. The countries of sales with a mandatory EPR system,
3. Applicable voluntary collection, sorting, and cycling systems in the countries of sales, and/or
4. Partnerships for take-back, sorting, and cycling in specific regions.

Cycling may include reuse, repair, refurbishing, remanufacturing, recycling, composting or biodegradation.

Further considerations for the biological cycle:

There are several ways to facilitate active cycling in the biological cycle. If home composting is the chosen pathway, applicants may partner with organizations that facilitate this. Consumers are accepted as partners for home composting if detailed instructions explaining how to compost the product are publicly available, as per Section 5.5 of the Full Scope standard document. Applicants may use the Circularity Data Report for this purpose. Examples of evidence that could demonstrate active cycling of textile products by end-users via home composting include news reports or market or consumer surveys. For the industrial composting pathway, applicants are required to provide instructions to the end-user explaining how to ensure the product does end up in an industrial composting facility Evidence that the applicable composting facilities do accept textile products is also required. As noted in earlier sections of this document, composting of textiles is not common practice and industrial composting facilities typically do not accept textile materials. In addition, home composting may not reach the necessary (high) temperatures to ensure biodegradation does occur in the required time.

Example – Calculating Percentage Actively Cycled

Country / Region	Share of sales value (%)	5.2 Compliance pathway	Active cycling rates (after collection and sorting) *	Credit given
EU	50%	#2 and #3 - Mandatory EPR Law that covers both **Reuse and Recycling**	Reuse = 10% Recycling = 1%	50% * (10%+1%) = 5.5%
China	30%	N/A	-	0%
India	10%	#1 - Initiated partnership for the collection and processing for **Reuse & Recycling**	Reuse = 50 % Recycling = 10 %	10% * (50%+10%) = 6 %
US - California	5%	N/A	-	0%
US - Massachusetts	5%	N/A	-	0%
Total	100%			**11.5% > 0% = OK for Gold!**

*Examples only, numbers used for certification must have reliable sources.

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Programs to Increase Cycling Rate or Quality

For the Gold level, programs to increase cycling rate or quality are required for short-use phase products and are optional for long-use phase products (with the alternative for long-use phase products at the Gold level to actively cycle at least some of the product).

Increasing Cycling Rates

The following are examples of acceptable programs to increase the cycling rate or quality of the product:

- Circular accounting: To receive credit, the applicant must have invested in a system that facilitates tracking of product cycling. Examples include:
  - Using RFID or similar tracking technology.
  - Targeting waste management inefficiencies in the recycling stream. Examples include Recycle Track Systems.
  - Implementing a system for tracking take-back rates of products in the company's take-back program. Examples include retrievr.com, previously 'Curb my Clutter'.

    - Implementing a leasing program where products are tracked by leasing ownership.
- Circular incentives: To receive credit, the applicant must contribute monetarily to incentivize cycling by the user of the product, or must contribute to a program that encourages increased adoption of cycling activity of their product. Examples include:
    - Providing a monetary incentive to customers to cycle the product.
    - Developing a product-as-a-service program.
- Other programs that increase cycling rates:
    - Increasing the scale of the cycling program (e.g., through TerraCycle).
    - Initiating an additional partnership for take-back.
    - Increasing engagement with partners involved in cycling.

Improving Cycling Quality

To receive credit, the program must lead to a measurable improvement in cycling quality with the requirements for high-value cycling per standard and guidance Section 5.5 Material Compatibility for Technical and/or Biological Cycles as the baseline. In other words, the program implemented for achieving the requirement in Section 5.8 is expected to go beyond what has already been done to achieve the high-value cycling requirements in Section 5.4. For example, this could include work to improve cycling quality for the other 10% of the product's materials that are not already in scope for achieving the Gold level in Section 5.4 or achieving more than one of the Section 5.4 Gold level requirements in #2.a.ii Must be able to substitute for virgin material without loss of essential product function or material durability, contain at least 80% renewable or post-consumer recycled content, or have at least two plausible next uses. Using a material that is 100% responsibly sourced renewable (rather than 80%) also receives credit.

Platinum Level: Calculating the Minimum Required Percentage Actively Cycled: 100/(2+L)

For the Platinum level, the following is required: Actively cycle a minimum percentage of the product's materials based on the duration of the product's use phase. As noted previously, the use phase time or average use phase time (i.e., duration) for any given product may be derived from warranties, public marketing claims, and/or quality tests that address common failure modes. Note that average use phase time in this calculation refers to the average for the specific product, not the average for all products of this type on the market.

Short use phase products and products required to be cycled per leading regulations are subject to the Platinum requirements, including when they are new to the market. However, note that it is not required to have the ability to trace the specific product through the applicable cycling system. Platinum level may be achieved by demonstrating (1) the minimum required percentage of active cycling is occurring for similar product(s) with the same expected use phase duration via the relevant system, and (2) that it is highly likely for the product to enter the relevant system. Cycling rates that are available for third-party cycling systems may be employed in the calculations, similar to the approach for municipal cycling described in the Gold level Further Explanation Box above.

Example: Assuming an average lifetime of four years, a total active cycling rate of at least 16.7% is required for Platinum level.

4 // Material Health Requirements

Refers to Section 4 in the Full Scope standard.

The requirements table in the green box below provides a summary of the Material Health (MH) requirements of the C2C Certified Product Standard (Full Scope), Version 4.1. The table is followed by a diagram summarizing the Material Health Assessment Methodology for chemicals, which is required to be applied to both Full Scope certification and C2C Certified Material Health.

Products certified to the C2C Certified Circularity Standard are required to meet the Bronze level chemical restrictions in Sections 4.1 and 4.2 of the Full Scope standard. These restrictions apply to the materials and chemicals present within the final textile product. The other Material Health requirements do not apply to C2C Certified Circularity.

EXCERPT – Version 4.1 Product Standard

Category Intent

Chemicals and materials used in the product are selected to prioritize the protection of human health and the environment, generating a positive impact on the quality of materials available for future use and cycling.

Requirements Summary

To achieve a desired level within the category, the requirements at all lower levels must also be met.

Requirement	Bronze	Silver	Gold	Platinum
4.1: Product is in compliance with leading chemical regulations.	●	●	●	●
4.2: Product does not contain organohalogen substances of special concern, or functionally related, non-halogenated classes of equivalent concern, above relevant thresholds.	●	●	●	●
4.3: Product is 100% characterized by generic material.	●	●	●	●
4.3 and 4.4: Product is ≥ 75% assessed (complete formulation information collected for 100% of materials released directly into the biosphere).	●	●	●	●
4.5: Strategy developed to phase-out or optimize all x-assessed or grey-rated chemicals.	●	●	●	●

4.3 and 4.4: Product is ≥ 95% assessed (complete formulation information collected for 100% of materials released directly into the biosphere).		●	●	●
4.2: Product does not contain materials with > 1% carbon-bonded halogens by weight, or recognized PBTs or vPvBs. Product does not contain EU CLP Cat.1 and 2 CMRs or substances causing an equivalent level of concern, or exposure is unlikely or expected to be negligible.		●	●	●
4.7: Product has low VOC emissions (required for products permanently installed in buildings).		●	●	●
4.8: Product complies with VOC content limits (required for liquid and aerosol consumer and construction products).		●	●	●
4.3 and 4.4: 100% of homogeneous materials subject to review are assessed (i.e., none have a grey rating due to insufficient data).			●	●
4.6: Product is optimized for Material Health (i.e., all x-assessed chemicals replaced or phased out).			●	●
4.5: Strategy developed to either increase the percentage of preferred (A/a and/or B/b assessed) materials and chemicals in the product or optimize the chemistry in the supply chain.			●	●
4.7: Product has very low VOC emissions or is inherently non-emitting (required for products permanently installed in buildings).			●	●
4.4 and 4.6: All product-relevant process chemicals are assessed (i.e., none have a grey rating due to insufficient data) and no x-assessed chemicals are used.				●
4.6: > 50% of the product is assessed as A/a or B/b.				●

4.9: ≥ 75% of the product's input materials or chemicals have a C2C Certified Material Health Certificate at the Gold or Platinum level or ≥ 50% of the product's input materials or chemicals are Cradle to Cradle Certified at the Gold or Platinum level or equivalent. A strategy is developed to increase percentages over time. OR Environmental health impact hotspot analysis based on life cycle assessment completed, emissions and resource use hotspots that impact human and environmental health are identified, and Material Health optimization strategy is developed based on the results.				●

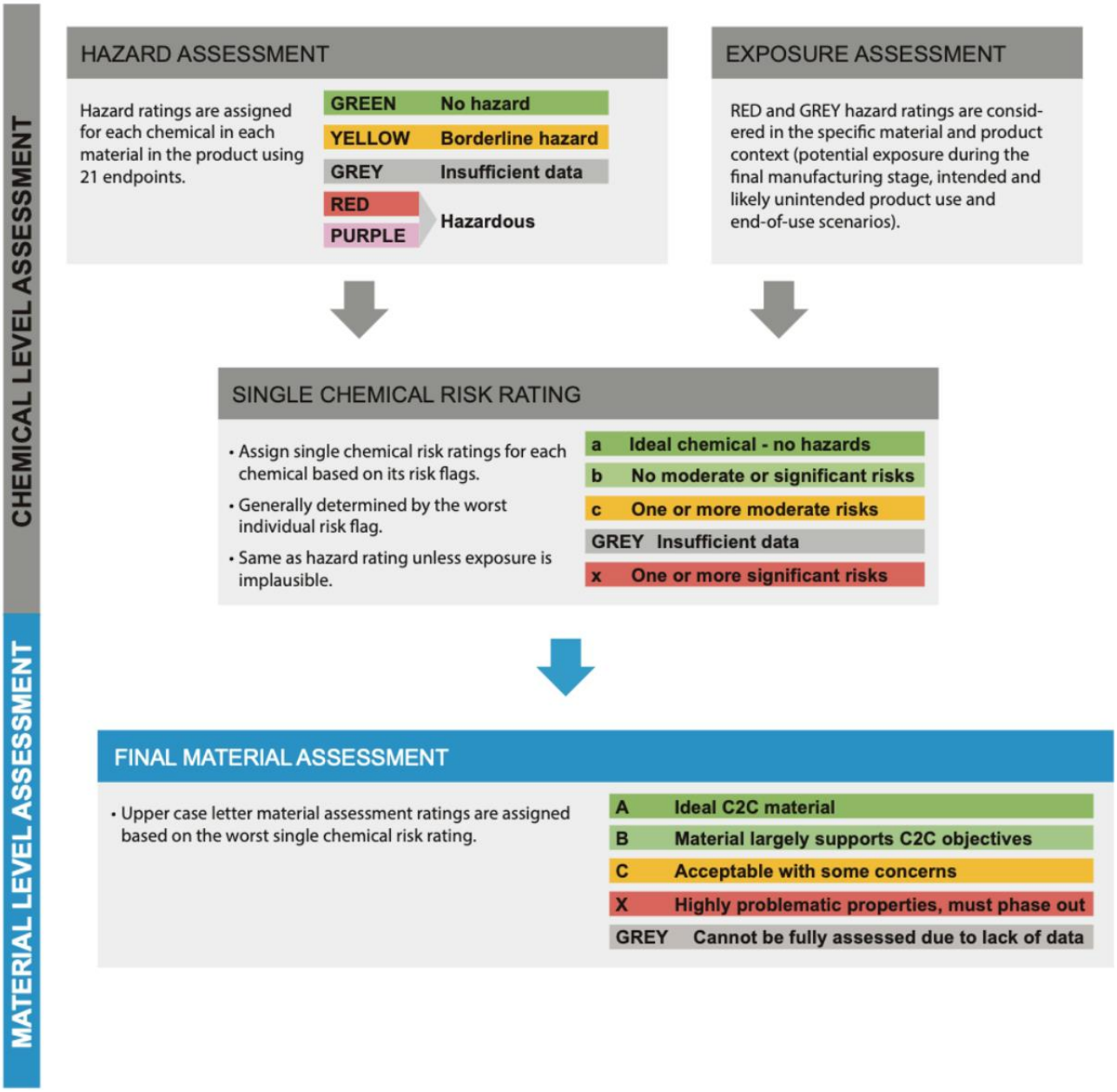

Figure – C2C Certified Material Health Assessment Methodology.

Table – Partial summary of the Material Health requirements of the C2C Certified (Full Scope) Standard and C2C Certified Material Health Standard.

	Bronze	Silver	Gold	Platinum
Chemical composition of end product	100% by weight defined by generic material type; ≥ 75% by weight assessed.	≥ 95% assessed.	100% assessed.	100% assessed.
Chemicals and materials in end product	Compliance with leading chemical regulations. Compliance with Per- or Polyfluoroalkyl Substances (PFASs), Organophosphate	Compliance with restrictions on PBT's, vPvB's	All materials are A/a, B/b, or C/c assessed.	> 50% A or B assessed and no X/x-assessed or grey process chemicals.

	Ester Flame Retardants (OPFRs), Halogenated Flame Retardants (HFRs), and highly halogenated carbon-based material restrictions. Strategy for optimization, beginning with X /x-assessed and grey chemicals.	and EU CLP Cat. 1 & 2 CMRs. No materials with > 1% carbon-bonded halogens by weight.		
Chemical formulations used in processing (i.e., process chemicals)	Must meet requirements for chemicals in the end product if they remain in the product's materials. Otherwise, process chemicals that enter effluent and sludge are subject to restrictions and assessment per the Water & Soil Stewardship category of the Full Scope standard.			All process chemicals are A/a, B/b, or C/c assessed.

Material Health Requirements for C2C Certified® Circularity

Products certified per the C2C Certified Circularity Standard are required to meet (at minimum) the Bronze level requirements in Sections 4.1 Compliance with Leading Chemical Regulations and 4.2 Avoidance of Organohalogens and Functionally Related Chemical Classes of Concern.

These requirements may be met through several pathways, including:

- Declarations of compliance from the applicant and suppliers
- Evaluation of full chemical composition information by a C2C Certified Material Health Assessor
- Analytical testing for applicable restricted substances
- Compliance with a C2CPII-recognized standard or program (such as OEKO-TEX® STANDARD 100 or the Zero Discharge of Hazardous Chemicals Program's Manufacturing Restricted Substances List (ZDHC MRSL).

For biological and recycled content materials, analytical testing may be required. This is because these materials often have variable compositions, and suppliers are unlikely to have the required composition information to verify compliance with Sections 4.1 and 4.2. more generally, the purpose of testing is to ensure that highly hazardous substances are not present even when there are unknowns about the material composition.

The testing requirements are described in the respective methodologies (Biological and Recycled Content Materials) and summarized below:

- **Biological materials:** These are materials derived from living organisms. Common examples in textiles include cotton and wool. Biological materials may contain contaminants such as pesticide residues, and some may accumulate harmful chemicals from the environment. Analytical testing is required to verify that these materials do not contain substances such as pesticides and toxic metals. However, some testing requirements can be waived if sufficient information is obtained from suppliers, for example, declarations indicating that restricted pesticides were not used during the relevant production stage(s)).

- **Recycled content materials:** These include any material containing post-consumer recycled content. Pre-consumer recycled content from mixed or undefined sources is also assessed per the Recycled Content Assessment Methodology. Common recycled content materials used in textiles are fibers, yarn, and fabric. These materials must be tested for certain restricted substances that may be introduced by the recycling stream. Exceptions to the testing requirements may be possible if the material and its recycling stream are already well-defined.

The analytical laboratory conducting the tests must be ISO/IEC 17025 accredited and the accreditation scope must include the applied test method(s). Some tests require a specific method by used, while others may be defined by the lab the applicant uses.

Applicants may share the Restricted Substances reference document (RSRD) with their suppliers to prepare for certification.

Recognition of OEKO-TEX® and ZDHC towards meeting the Material Health requirements

OEKO-TEX® STANDARD 100 certification covers most of the Material Health requirements of the C2C Certified Circularity Standard. Materials and products with a Standard 100 certificate meet the requirements of:

- Section 4.1: Standard 100 fully covers the C2C Certified Section 4.1 requirements
- Section 4.2: Standard 100 covers the PFAS restriction

For textile chemical formulations, the formulation may comply with the most recent version of the Zero Discharge of Hazardous Chemicals (ZDHC) Manufacturing Restricted Substances List (MRSL) or equivalent as an alternative to demonstrating compliance with the Section 4.1 restrictions. Therefore, for MRSL compliant formulations it is only required to demonstrate compliance with Section 4.2 (unless the formulation contains biological or recycled content materials that require additional testing).

This does not mean that fabrics or trims made with MRSL compliant formulations are automatically approved. Suppliers of materials like fabrics and trims must demonstrate compliance with Sections 4.1 and Section 4.2 by providing supplier declarations or by having the full composition information evaluated by a C2C Certified Material Health Assessor.

5 // Packaging Requirements

Refers to Section 9 in the Full Scope standard.

The requirements in this section apply to the packaging of a product seeking certification for both C2C Certified Full Scope and C2C Certified Circularity.

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9 // Packaging for Certified Products

At a minimum, the packaging for a product seeking certification is subject to the requirements listed in this section. Alternatively, packaging may be:

1. Certified as a separate product –– In this case, the product must meet all standard requirements, the same as other products. Note that standard Sections 2.3 and 5 include requirements specific to single-use plastic packaging when certified as a separate product.
2. Assessed separately from the product in the Material Health and Product Circularity categories only –– In this case, the achievement levels for these two categories are assigned to the packaging separately, and are separately stated on the product's certificate and in the Cradle to Cradle Certified Products registry. If this option is selected, the packaging is not certified in its own right and is not subject to the Clean Air & Climate Protection, Water & Soil Stewardship, or Social Fairness requirements.

Intended Outcome(s)

Product packaging meets high product circularity standards at the entry level of certification, ensuring alignment with the Cradle to Cradle principles for these typically non-circular product types.

Applicable Achievement Level(s)

Bronze and Gold

Requirement(s)

For product packaging, design the packaging for cycling, incorporate cycled content, and ensure access to cycling.

Product packaging materials that are contained in one sales unit as it is offered to the end user or consumer at the point of purchase and not added exclusively for shipping, and any packaging materials that are intended to be used with the product or for the application or dispensing of the product, must comply with:

1. The applicable Bronze level regulatory restrictions in the Cradle to Cradle Certified® Restricted Substances reference document (Section 4.1),

2. The Bronze level restrictions on organohalogens and functionally related chemicals of concern (Section 4.2), and
3. One of the following (a, b, c, or d) for products certifying at the Bronze or Silver levels , or two of the following (a, b, c, d) for products certifying at the Gold or Platinum levels:
   a. The sum of post-consumer cycled and renewable content must be ≥ 20% or equal to the percentage of cycled and renewable content required for the Silver level per Section 5.3 Increasing Demand.
   b. At least 90% of the packaging materials (by weight) meet one of the following:
      i. Compliance with the Silver and Gold level requirements, respectively, in Sections 5.2 Preparing for Active Cycling and 5.4 Material Compatibility for Technical and/or Biological Cycles, or
      ii. Compliance with ii. 1, 2, 3, and 4 below:
         1. The packaging is compatible for municipal cycling systems,
         2. Plastic materials are:
            (a) A type that is commonly recycled or composted via curbside pickup (i.e., PET, HDPE, PP), and
            (b) Accepted by municipal cycling programs in the region(s) where the product is sold.
      iii. Materials that are intended for composting are fully compostable per a C2CPII recognized compostability standard consistent with the intended cycling pathway(s), and
      iv. Materials that are commonly recyclable (e.g., paper, steel, aluminum) do not contain additives or features that are likely to result in low-value (i.e., low-quality) reprocessed material. Additives that may be present in the recycled content used are out of scope for this determination. Exemption: Glass is exempt from this requirement.
   c. The packaging is reusable/refillable, is part of a refill system (e.g., refill pouches), and/or the packaging has a product-specific take-back program.
   d. The applicant has reduced the amount or weight of the packaging materials for the certified product without decreasing the compatibility for cycling (as defined in 'b.' above) or has met the Gold level requirements in Section 5.6 Circular Design Opportunities and Innovation.

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Scope

In general, packaging is defined as material(s) used to contain, wrap, protect, and/or dispense the product. Packaging also includes materials used to identify and/or promote the product as part of the packaging (e.g., labels). Note that this also includes materials that may not commonly be identified as packaging, such as leaflets and hangtags.

As noted, packaging and other materials used exclusively for shipping the product (e.g., polybags, boxes, pallets, shrink wrap) are out of scope. In addition, packaging for products that are sold as inputs to other products is also out of scope. Labels, stickers, hangtags and similar that are added by retailers (rather than by the brand or manufacturer) also are not subject to these requirements.

6 // Annex 1 – European and US Textile Waste Systems

According to a latest report, separate textile collection is currently (until 2024) mandatory in Europe in France, Belgium, Luxembourg, Iceland, Italy, Slovenia, Croatia, Poland, Finland, Estonia, Latvia and Turkey[86].

The average capture rate, published in May 2024[87], for textile waste in Europe is 12%.

Countries with the highest capture rate are Luxembourg (50%) and Belgium (50%), the UK[88] (45%), the Netherlands[89] (45%), France (31.5%)[90], and Austria (30%). They are followed by the Czech Republic (25%), Malta (19%), Germany (18%), the USA[91] (15%), Italy (14%), Cyprus (11%), Denmark (11%).

Other European countries, including Sweden, have reported collection rates below 10%[92].

Up until May 2024, an EPR system was only mandatory in France, Hungary, and the Netherlands and voluntary in the region of Flanders (Belgium)[93], Australia and Columbia[94].

Of the quantities of textiles generated as waste in the United States, the EPA estimates that 85% is disposed of in landfills and incinerators and only 15% of end-of-use textiles is recovered and diverted away from disposal[95].

Effective November 1, 2022, textiles are banned from disposal or transport for disposal in Massachusetts (USA), including clothing, footwear, bedding, curtains, fabric, and similar items, and mattresses.

Reuse and recycling can be assumed to occur after collection.

In Europe, typically, 55% of the input arriving at the sorting facilities can be deemed as fit for the second-hand textiles market[96].

After an item is classified as non-rewearable, it is sorted for specific destinations, separately from the rewearables. Non-rewearables sorting is focused on identifying textiles fit for downcycling, wiping,

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[86] Deckers et al (2024). ETC CE Report 2024/5 Textile waste management in Europe's circular economy. Available here.
[87] Ibid.
[88] Wrap (2024). Textiles Market Situation Report. Available here.
[89] Circle Economy (2023). Destinations of Dutch Used Textiles: Uses and Risks after Export. Available here.
[90] Re-fashion (2022). Activity report. Available here.
[91] US EPA (2018). Textiles: Material-Specific Data. Available here.
[92] Deckers et al (2024) – see reference above.
[93] Ibid.
[94] Ellen MacArthur Foundation (2024). We need Extended Producer Responsibility (EPR) policy for textiles. Available here.
[95] US EPA (2018) – see reference above.
[96] Fashion for Good, Circle Economy (2022). Sorting for Circularity Europe: An Evaluation and Commercial Assessment of Textile Waste Across Europe. Available here.

refurbishment, and fiber-to-fiber recycling or to be used for energy recovery. These end-markets may represent on average around 26% of the sorted textiles.

Currently, the most common destinations for non-rewearable textiles are as nonwovens for automotive, construction or wiping applications, or ground down for use in plastics or composites, with only a small percentage unraveled and turned into new yarns for spinners.

Summary of EU textile waste destinations

Cleaning cloths: 10% of the total volume sorted

Downcycling: 14%

Fiber-to-fiber recycling: 2%

Other minor destinations like refurbishment or incineration: 0.1%

In the US, 45% to 50% of recovered textiles are sent to reuse markets, primarily the global second-hand market[97, 98]. In the US, around 30% of all collected textiles are converted into industrial polishing/wiping cloths and around 20% are processed into fibers to be manufactured into new products, and less then 1% ends up in fiber-to-fiber recycling[99].

Table – Separate collection rate per country[100]

Country	Separate collection rate
Austria	30%
Belgium	50%
Bulgaria	1%
Croatia	9%
Cyprus	11%
Czechia	25%
Denmark	11%
Estonia	5%
Finland	0%
France	31.5%

[97] Fashion For Good (2024). Sorting for Circularity – USA. Available here.
[98] SMART. The Association of Wiping Materials, Used Clothing and Fiber Industries. Frequently Asked Questions. Available here.
[99] Fashion For Good (2024) – see reference above.
[100] Deckers et al (2024). ETC CE Report 2024/5 Textile waste management in Europe's circular economy. Available here.

Germany	18%
Greece	2%
Hungary	0%
Iceland	0%
Ireland	1%
Italy	14%
Latvia	0%
Lithuania	8%
Luxembourg	50%
Malta	19%
Netherlands	45%
Norway	1%
Poland	0%
Portugal	0%
Romania	1%
Slovakia	6%
Slovenia	7%
Spain	4%
Sweden	5%
UK	45%
USA	15%

Table references:

Deckers et al (2024). ETC CE Report 2024/5 Textile waste management in Europe's circular economy. Available here
Wrap (2024). Textiles Market Situation Report. Available here.
Re-fashion (2022). Activity report. Available here.
Circle Economy (2023). Destinations of Dutch Used Textiles: Uses and Risks after Export. Available here.

Since there are currently no targets for collection, countries are not obliged to report on separate collection quantities, although they may report voluntarily. Discrepancies may be present in the data due to different collection systems in each country and varied interpretations of the waste categories; for instance, in some countries, textiles collected for reuse may not be classified as waste but as products. Reporting inconsistencies may also be present due to the voluntary nature of reporting on non-waste

textiles, resulting in gaps in datasets on reusable textiles and a lack of comprehensive data on textile waste[101].

The absence of existing legal requirements for collecting used textiles should not be interpreted as a lack of collection efforts. In fact, clothing stands out as one of the rare products with a well-established post-consumer collection and treatment sector that has thrived for decades. The reason for this is quite simple: it has, or at least used to have, economic viability.

European Legislation

Impending European legislation such as the Waste Framework Directive (Art. 11(1)), that requires mandatory separate textile collection from households throughout Europe by 2025, will drive the scaling of collection, sorting and recycling infrastructure across the EU. For countries where there are well-established and well-used commercial and charitable collection systems, the main change will be an increased collection of low value, non-reusable textiles. In countries with less established systems there is likely to be an increase in collection of both rewearable and non-rewearable textiles. The optimisation of collection systems is currently under discussion to enable both high capture rates and good conditions for reuse. For example, better pre-sorting by residents to distinguish between reusable and non-reusable textiles, alongside better information, and education, might facilitate higher reuse and recycling rates[102].

Extended Producer Responsibility (EPR) schemes

The European Commission is proposing to introduce mandatory and harmonized Extended Producer Responsibility (EPR) schemes for textiles in all EU Member States which was recently adopted by the European Parliament.

"MEPs agree to extend producer responsibility (EPR) schemes, through which producers that sell textiles in the EU would have to cover the costs for collecting, sorting and recycling them separately. Member states would have to establish these schemes 18 months after the entry into force of the directive (compared to 30 months proposed by the Commission). The new rules would cover products such as clothing and accessories, blankets, bed linen, curtains, hats, footwear, mattresses and carpets, including products that contain textile-related materials such as leather, composition leather, rubber or plastic..."[103]

USA legislation

In the US, sorting for textile-to-textile recycling is very new. Collecting and sorting infrastructure is much less advanced than in Europe. Growing commitments from the public and private sector, coupled with

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[101] Deckers et al (2024). ETC CE Report 2024/5 Textile waste management in Europe's circular economy. Available here.
[102] Fashion For Good (2022). Sorting for Circularity – Europe. Available here.
[103] European Parliament News (2024). MEPs call for tougher EU rules to reduce textiles and food waste. Available here.

incoming policy across several states, are expected to boost the demand for post-consumer textiles collection, sorting, and recycling infrastructure[104].

Examples of regulations include the textile disposal ban in Massachusetts and proposed Extended Producer Responsibility (EPR) legislation for textiles in California (SB 707, Newman) and New York (S6654/A08078 Kavanagh/Kelles) which would place financial and operational responsibility for textile recycling onto producers. There is indication that other states may be introducing EPR bills for textiles as well[105,106].

A global map of existing and emerging EPR Systems for Textiles was published in a report by the Ellen MacArthur Foundation[107]:

- Adopted and mandatory: France, Netherlands, Hungary, Latvia, California
- Adopted and voluntary: Australia, Colombia
- Proposed: European Union*, Kenya, New York
- Debated (non-exhaustive): Chile, Ghana, India and Canada

*The mandatory EPR scheme in the European Union is in the process of adoption in 2025.

[104]Fashion For Good (2024). Sorting for Circularity – USA. Available here.
[105] Ibid.
[106] Deckers et al (2024). ETC CE Report 2024/5 Textile waste management in Europe's circular economy. Available here.
[107] Ellen MacArthur Foundation (2024). Pushing the boundaries of EPR policy for textiles. Available here.

7 // Annex 2 – Textile and Leather: An Overview of How Raw Materials Fit into C2C Certified®

Please check the C2CPII-Recognized Certification Programs and Standards document for the latest list of recognized standards.

Textile and Leather - Raw materials					
	Material Health	**Product Circularity**	**Water & Soil Stewardship**	**Clean Air & Climate Protection**	**Social Fairness & Animal Welfare**
Other notes:	Final achievement level that is possible for all will depend at least partly on dyes and other additives used. These are required to be assessed separately from the fiber itself and then are 'wrapped' into the overall rating for each yarn type. For textile chemical formulations, the product may alternatively comply with the most recent version of the Zero Discharge of Hazardous Chemicals (ZDHC) Manufacturing Restricted Substances List (MRSL) or equivalent	Find the compatibility for cycling requirements for raw materials in Section 5.4 of the Full Scope User Guidance.	Note that all wet process steps for textiles are considered pollutant intense and high-volume issues in W&SS. If not included already in the final manufacturing stage (like dying is), then this will have to be addressed separately by Gold level. Use of C2C Certified inputs could receive credit for this. Implementation of the Zero Discharge of Hazardous Chemicals (ZDHC) Wastewater Guidelines are recognized.	LCA to calculate embodied emissions is required at Gold level for all.	Textiles, thread, yarn, and fashion accessories from certain locations are considered de facto high risk. If from these locations and the manufacturing processes for these are not already part of final manufacturing stage, this would have to be addressed using a C2CPII-recognized standard by Gold level. For now, Sedex (SMETA), SLCP and SAI (SA 8000) are partially recognized for Bronze level requirements and currently under review. Fair Wear Foundation and BSCI are in process. See List of Goods Produced by Child Labor and Forced labor for the list of locations.

Cotton	Conventional cotton has potential to be better than X assessed; Pesticide testing required (minimum is per EU Eco-label or OEKO-TEX STANDARD 100 class 1 for pesticide limits)	Cotton is a renewable plant-based fiber. All cotton is required to be certified to a responsible sourcing standard to count as renewable and can be considered to meet high-quality cycling requirement #1aii. (Note: alternative compliance path – a feasibility analysis and public reporting of limitations – is also an option. GOTS, OCS and CMIA are recognized programs.	Cotton is a water-intensive crop. Water and soil issues occurring at the cotton growing phase must be addressed by the Gold level by using material certified to a C2CPII-recognized standard that addresses these issues. Conventional cotton without a relevant certification will be limited to Silver in this category.	No cotton specific requirements to consider in CA&CP.	Conventional cotton may not be used at Gold level unless it can be shown that it is not sourced from de facto high-risk locations: Argentina Azerbaijan Benin Brazil Burkina Faso China Egypt India Kazakhstan Kyrgyz Republic Mali Pakistan Tajikistan Turkey Turkmenistan Uzbekistan Zambia.
Organic cotton (GOTS or OCS)	GOTS cotton is eligible at all levels in the Material Health category; no testing is required. GOTS cotton yarn or textile without dyes or other substances is b-assessed (note that dyes are required to be assessed using the C2CC methods and their assessment ratings will impact the overall rating for the cotton	All cotton needs to be certified to a responsible sourcing standard to count as renewable. (Note: alternative compliance path – feasibility analysis and public reporting of limitations – is also an option. GOTS is preliminary	GOTS is (provisionally) C2CPII-recognized for addressing water and soil issues at the crop growing phase, which is required at Gold. OCS not evaluated by C2CPII yet.	No cotton specific requirements to consider in CA&CP (GOTS will not especially help or hinder).	GOTS does not address Social Fairness sufficiently up to farm level. If cotton is sourced, or possibly sourced, from de facto high-risk locations (see Social Fairness section User Guidance for location list), a social certification for the material is required at Gold-Platinum. If it is possible to specify low-risk sources, then this is not required.

	and therefore also the overall achievement level that is possible). OCS not evaluated by C2CPII yet.	recognized. OCS is recognized for PC 5.3.			OCS not evaluated by C2CPII yet but likely has the same issue.
Certified cotton, Mass Balance (CmiA or BCI)	May not be used to achieve Material Health requirements. Pesticide testing required, either per EU Eco-label or OEKO-TEX.	Can be used to achieve responsible sourcing requirements as required.	Can be used to address water and soil issues at the crop growing phase as required at Gold level.	No cotton specific requirements to consider in CA&CP.	May not be used to address social issues at the cotton growing phase.
Certified Cotton, Hard identity (CmiA)	May be used to achieve the Bronze level Material Health requirements to test for pesticide residues and comply with the RSL.	Can be used to achieve responsible sourcing requirements as required.	Can be used to address water and soil issues at the crop growing phase as required at Gold level.	No cotton specific requirements to consider in CA&CP.	May be used to achieve the Gold level Social Fairness requirements to use material certified to a C2CPII-recognized standard that addresses the human rights issues listed in the Social Fairness policy.
Fair Trade Cotton	Has not been evaluated.	Has not been evaluated.	Has not been evaluated.	No cotton specific requirements to consider in CA&CP.	C2CPII-recognized. May be used to achieve the Gold level Social Fairness requirements to use material certified to a C2CPII-recognized standard that addresses the human rights issues listed in the Social Fairness policy.
Recycled Cotton (GRS)	Any achievement level possible. Material Health certification will depend on pesticides, bleaching, dyeing, printing etc. and	Can be used for cycled content to count toward the required percentages.	The water and soil impact of recycled cotton is significant lower compared to virgin cotton. It has not been evaluated.	No cotton specific requirements to consider in CA&CP.	Has not been evaluated.

	results of required analytical tests per the Recycled Content Assessment Methodology.				
Wool (and other animal fibers like cashmere, silk)	Any achievement level possible. Material Health certification will depend on pesticides, bleaching, dyeing, finishing, etc. For recycled wool the Recycled Content Assessment Methodology would have to be applied.	Wool is a renewable source and can be used at any level. For Gold level RWS or GRS for recycled wool is needed or equivalent (like SFA for Cashmere). At least 95% wool is required for compatibility for high-level recycling at Gold (current municipal) cycling.	Sheep breeding most often takes place in large areas sensitive to erosion. Th production of clean wool contains the use of chemical agents that may contaminate regional water systems. Recycled Wool will avoid these negative impacts. Responsible Wool Standard is recognized for W&SS.	Sheep produce a large amount of methane which contributes 21 times more to the GHG effect compared to CO2. Recycled Wool will avoid the breeding of sheep and the linked impact.	Sheep often undergo mulesing and other animal unfriendly practices. C2CC covers Animal Welfare in Section 10 of the Full Scope Standard, which requires provision of the five (animal) freedoms. For Silver level, at least 50% of materials and substances are required to be certified per a recognized animal welfare certification program. RWS is recognized.
Leather	Leather tanning uses a chemical-heavy process. Heavy metals might be used like Chromium. There are natural tanning processes, such as mineral tanning that can be used to meet Material Health requirements.	Leather is a renewable material because its animal originated. Leather recycling or composting is scarce. Durability of leather products is more feasible.	Pollutant intense (deforestation, soil erosion, water pollution after tanning). Leather Working Group, OEKO-TEX® LEATHER STANDARD and the Sustainable Leather Foundation have standards for sustainable leather. C2CPII does not yet recognize these standards, but it will support applicants in obtaining C2C certification.	High in energy use and emissions: Cattle methane emissions, energy consuming and emissions tanning process. Leather Working Group (LWG), OEKO-TEX® LEATHER STANDARD and the Sustainable Leather Foundation have standards for responsible leather. C2CPII does not yet recognize these standards, but it will support applicants in obtaining C2C certification.	C2CC covers Animal Welfare in Section 10 of the Full Scope Standard, which requires provision of the five (animal) freedoms. For Silver level at least 50% of materials and substances are required to be certified per recognized animal welfare certification program. RWS is recognized. Animal welfare is covered by the standards: LWG, OEKO-TEX® LEATHER STANDARD, ICEC, CSCB and SLF. C2CPII does not yet recognize these standards but it will

					support applicants in obtaining C2C certification.
Polyester	For meeting the requirements in C2C Certified (Full Scope), polyester tends to be limited to Bronze level in Material Health because of residual antimony trioxide catalyst (a carcinogen). It is possible to specify antimony-free (virgin), but unusual for the textile/apparel sector (and in general). Recycled material will also contain antimony residuals. For the Circularity Standard, the requirements related to antimony trioxide (4.6) are not included.	Polyester is extracted from petroleum, a non-renewable source. Highly recyclable when used in high percentages (100% polyester products have the best chance to get recycled), so there is good potential to achieve the required percentages of recycled content, as well as the other Product Circularity requirements. Min. 25% recycled content required as of Silver level, 50% post-consumer recycled at Gold, 100% at Platinum.	W&SS issues to be addressed by Gold level are water use during plastic recycling (if washing is relevant), pollutant intense and high-volume processes during chemical manufacturing and fossil fuel extraction of raw materials. If recycled content is used, this is avoided. Since polyester is limited to Bronze in the Material Health category in most cases, applicants are likely to go for Bronze or Silver level in W&SS as well (and so not be required to address W&SS issues either).	Manufacturing polyester is a chemical- and energy-intensive process with a distinct carbon footprint. There are no polyester specific requirements to consider in CA&CP.	No polyester specific sourcing issues in Social Fairness.
Recycled Polyester (GRS)	Polyester tends to be limited to Bronze level in the Material Health category because of residual antimony trioxide catalyst (a carcinogen). It is possible to specify antimony-free (virgin), but unusual for textile/apparel	Can be used for cycled content to count toward the required percentages. Min. 25% recycled content required as of Silver level, 50% post-	Has not been evaluated.	No polyester specific requirements to consider in CA&CP	Has not been evaluated.

	sector (and in general). Recycled material will also contain antimony residuals. Recycled Content Assessment Methodology would have to be applied.	consumer recycled at Gold, 100% at Platinum.			
Polyamide (Nylon)	Polyamide can reach any level depending on Material Health requirements for performance on, for example, durable water repellents, including high risks on PFOS and PFOA. For recycled polyamide, the Recycled Content Assessment Methodology would have to be applied.	Polyamide is extracted from petroleum a non-renewable source. It has a high recycle potential for remelting and remolding or a chemical recycling process (polyamide 6). In that case, the polymers are broken down in molecules and reformed into a yarn of equal strength. Econyl is an example. As of Gold level, a minimum of 40% recycled by product weight is required, 60% at Platinum.	Polyamide can reach any level depending on Material Health requirements on performance on, for example, durable water repellents, including high risks on PFOS and PFOA. pollutant intense and high-volume processes during chemical manufacturing and fossil fuel extraction of raw materials. If recycled content is used, this is avoided.	Manufacturing polyamide is a chemical- and energy-intensive process with a distinct carbon footprint. There are no polyamide specific requirements to consider in CA&CP	Has not been evaluated.
Viscose	Acceptable through Gold level when C-assessed (which is possible). Achievement level possible in Material Health will depend on dyes and other	Wood based fibers must be responsibly sourced as of Bronze level. The alternative compliance path for cotton is allowed for wood also. FSC and	Water and soil issues occurring in the forest and at timber mills must be addressed at Gold level. FSC and PEFC are currently recognized.	No viscose specific requirements to consider in CA&CP.	Wood / timber from de facto high-risk locations (or with risk of this because source is unknown) are required to be certified to C2CPII-recognized standard to address human rights issues aligned with the Social Fairness

	additives used.	PEFC are currently recognized. Low recycling potential.	Note that pulp process chemistry is required to be assessed at Gold level including when the process occurs outside of the defined final manufacturing stage. This may make Gold level difficult to achieve.		policy. FSC and PEFC are currently recognized. High-risk locations: Brazil Cambodia North Korea Peru Russia Vietnam.
Modal	Same as for viscose.	Same as for viscose.	Same as for viscose.	Same as for viscose.	Same as for viscose.
Lyocel	Same as for viscose.	Same as for viscose.	Same as for viscose.	Same as for viscose.	Same as for viscose.
Refibra (Lenzing)	Same as for viscose. If 100% is recycled cotton, no pesticide testing required. Recycled Content Assessment Methodology would have to be applied. However, a new list of analytes other than what is used currently should be developed because it's likely that the repulping process will result in elimination of some of the substances that would otherwise be required to test for in recycled textiles. Testing at Bronze level is minimal, more extensive testing is required at Silver	High potential to achieve PC cycled content requirements depending on the feedstock.	Same as for viscose and cotton; but if > 75% is recycled content then addressing WSS issues at cotton crop and/or forest phase not required. Assessment of pulping chemistry is required (like what is noted for viscose).	Same as for viscose.	If 100% is recycled cotton, then no special issues in Social Fairness to address.

	(which is also applicable for Gold and Platinum).				
Lyocel (e.g. Tencel by Lenzing)	Same as for viscose.	Same as for viscose.	Water and soil issues occurring in the forest and at the timber mill must be addressed at Gold level. FSC and PEFC are currently recognized. The Eucalyptus tree is a rapidly growing source often grown under sustainable forestry requirements. Note that pulp process chemistry is required to be assessed at Gold level including when the process occurs outside of the defined final manufacturing stage. Lyocell has a low environmental impact compared to other regenerated cellulosics. It is produced using a non-toxic solvent (NMMO) of which the recovery is over 99%.	Same as for viscose.	Same as for viscose.

8 // Annex 3 – Circular Fashion Solution Provider List

Service providers

A non-exhaustive list of service providers active in repair, reuse, and textile-to-textile post-consumer recycling. Applicants should assess the applicability of these providers to the product's intended cycling pathway(s) on a case-by-case basis.

Company and website link	Solution	Fibre type	Readiness	Country
Altex	Mechanical Recycling	All	Commercial	Germany
Ambercycle Cycora®	Chemical Recycling	Polyester	Precommercial	USA
Amino	Blend separation	Polycotton	Precommercial	China
Antex	Thermo-Mechanical Recycling	PES	Commercial	Spain
Archive	Resale operating system for brands	All	Commercial	UK
Aquafil Econyl	Chemical Recycling	Polyamide 6	Commercial	Italy
Bank&Vogue	Sorting		Commercial (large)	USA
BASF Loopamid	Chemical Recycling	Polyamide 6	Commercial	Germany
Birla Cellulose Liva Reviva	Chemical Recycling	Cellulosic	Commercial	India
BlockTexx	Blend separation	Polycotton	Precommercial	Australia
Boer Group	Sorting		Commercial (large)	Belgium, The Netherlands
Bye Waste	Collecting for consumers and companies	All	Commercial (small)	The Netherlands
Carbios	Chemical Recycling	Polyester	Precommercial	France
Cardato Recycled Brand	Mechanical Recycling	Wool	Commercial	Italy
Circ	Blend separation	Polycotton	Precommercial	USA
Circulose®	Chemical Recycling	Cellulosic	Commercial	Sweden
Coleo	Mechanical Recycling	Cotton	Commercial	Spain
CuRe technology	Chemical Recycling	Polyester	Precommercial	The Netherlands

Cyclo®	Mechanical Recycling	Cotton	Commercial	Bangladesh
Decoat	Debonding	Coatings	Precommercial	Belgium
DePoly	Chemical Recycling	Polyester	Precommercial	Switzerland
Earth Protex	Thermo-Mechanical Recycling	Polyester	Commercial	China
Eastman Polyester Renewal Technology	Chemical Recycling	Polyester	Commercial	USA
Evrnu Nucyc	Chemical Recycling	Cellulosic	Precommercial	USA
Finds	Resale Overstock solution for garments	All	Commercial	Global
Frankenhuis B.V.	Mechanical Recycling	All	Commercial	Netherlands
Gr3n	Chemical Recycling	Polyester	Precommercial	Switzerland
Haelixa	DNA-based traceability solution	All	Commercial	Switzerland
Hemster	returns and deadstock into revenue	All	Commercial	US and Canada
HKRITA The Green Machine	Blend separation	Polycotton	Precommercial	Hong Kong
Iceep	Digital take back system	own brand products	Commercial	Switserland/Global
Infinited Fiber Company Infinna®	Chemical Recycling	Cellulosic	Precommercial	Finland
Ioncell	Chemical Recycling	Cellulosic	Precommercial	Finland
Ioniqa Technologies	Chemical Recycling	Polyester	Precommercial	The Netherlands
Jeplan BRING™	Chemical Recycling	Polyester	Precommercial	Japan
JMP Wilcox	Sorting		Commercial (large)	UK
Lenzing Refibra®	Chemical Recycling	Cellulosic	Commercial	Austria
Lizee	Recommerce and Rental		Commercial	France
Loop industrues	Chemical Recycling	Polyester	Commercial	Canada
Looper Textile	Retailer take back		Commercial	Sweden

Makers Unite	Repair	All	Commercial	The Netherlands and Turkey
Manufy	Ciircular Textiles B2B platform	All	Commercial	The Netherlands
Mended	Repair	All	Commercial	The Netherlands and Germany
Modare-Cáritas	Sorting		Commercial (large)	Spain
Natural Fiber Welding	Mechanical Recycling	Natural	Commercial	USA
Nouvelles Fibres Textiles	Mechanical Recycling	All	Commercial	France
Nova Fides	Mechanical Recycling	Wool	Commercial	Italy
Oxfam	Retailer take back		Commercial	UK
Procotex	Mechanical Recycling	All	Commercial	Belgium
Prolong	Care & Repair	All	Commercial	
Protein evolution	Chemical Recycling	Polyester	Precommercial	USA
Pure Waste®	Mechanical Recycling	Cotton	Commercial	Finland
Purfi	Mechanical Recycling	All	Commercial	Belgium
Queen of Raw	Buy and sell sustainable and deadstock fabrics	All	Commercial	USA, NY
Re-Down	Mechanical Recycling	Down	Commercial	France
Re&Up	Blend separation	Polycotton	Precommercial	The Netherlands
Recircled	Recommerce			USA, Italy
Recover	Mechanical Recycling	Cotton	Commercial	Spain
Recyc'Elit	Chemical Recycling	Polyester	Precommercial	France
Reflaunt	Recommerce		Commercial	Singapore
reGAIN app	Retailer take back		Commercial	UK
Renewal workshop	Recommerce		Commercial	USA, The Netherlands
Repair Cafe	Repair	All	Community	Global
Reskinned	Retailer take back		Commercial	UK

Responsible	Recommerce			UK
Rester	Mechanical Recycling	All	Commercial	Finland
Retold Recycling	Retailer take back			USA
Reversed Resources	A SaaS platform to digitise, connect and scale global textile-to-textile recycling	All	Commercial	Estonia, Bangladesh, India
Salvation Army	Retailer take back		Commercial	UK
Samsara Eco	Enzymatic Recycling	Polyester	Precommercial	Australia
Saveyourwardrobe	Repair			UK
Saxcell	Chemical Recycling	Cellulosic	Precommercial	The Netherlands
Södra OnceMore®	Chemical Recycling	Cellulosic	Commercial	Sweden
SOEX	Mechanical Recycling	All	Commercial	Germany
SOEX	Sorting		Commercial (large)	Germany
SoJo	Repair			UK
Sortile	AI sorting system for textile waste		Commercial (small)	USA, NY
SuperCircle	Recommerce		Commercial	USA
Syre	Chemical Recycling	Polyester	Precommercial	Sweden
Tesma Cashmere	Mechanical Recycling	Cashmere	Commercial	Italy
TEXAID	Retailer take back		Commercial	Spain
TEXAID	Sorting		Commercial (large)	Switzerland, Germany
Texloop™	Mechanical Recycling	Cotton	Commercial	USA
Textile Change	Blend separation	Polycotton	Precommercial	Denmark
The Restory	Repair			UK
ThredUp	Recommerce			USA
Thrift +	Retailer take back		Commercial	UK
Trashie	Retailer take back			USA
Trove	Recommerce		Commercial	USA

Usha Yarns	Mechanical Recycling	All	Commercial	India
Vanotex	Mechanical Recycling	All	Commercial	Belgium
Vestiaire Collective	Recommerce		Commercial	France
Wear N Repair (B2C) + Compreli (B2B)	Repair	All	Commercial	Sri Lanka
Wolkat	Mechanical Recycling	All	Commercial	Netherlands
Worn Again	Blend separation	Polycotton	Precommercial	UK
Wtorpol	Sorting		Commercial (large)	Poland
Yellow Octopus	Retailer take back		Commercial	UK
Zoa Rental	Rental		Commercial	UK