
**Reusable packaging system design –
Specifications and recommendations**

Part 6:
Reverse logistics

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RESOLVE

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Reusable Packaging System Design Standard:

Reverse logistics

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Foreword

PR3 is a public-private partnership between corporate, government and NGO stakeholders that has created a standard for the design of reusable packaging systems and is testing it in collaborative demonstration projects. PR3's goal is to transform disconnected, proprietary, and small-scale reuse models into shared interoperable public-private systems. The standard is meant to integrate, de-risk, and support reuse initiatives globally.

PR3 founding partners, funders and advisors include Break Free from Plastic, Cisco, City of Seattle, Nestle, Plastic Solutions Fund, SAP, and The Ellen MacArthur Foundation.

This document was prepared by PR3 with input from its partners. It represents the views of PR3 only and does not indicate the views of any of PR3's partners.

This is a working draft document and is subject to change.

This edition (Version 1.0) cancels and replaces any previous editions.

A list and links to all parts in the PR3 Reusable Packaging System Design standard can be found on the PR3 website, see <https://www.pr3standards.org/the-pr3-standards>.

Any feedback or questions on this document should be directed to PR3 Technical Director at: <https://www.pr3standards.org/contact>

Introduction

Single-use packaging is a critical threat to human health and the environment. Research shows that reuse has the greatest potential to dramatically reduce plastic production and greenhouse gas emissions compared to other packaging and waste interventions.

As reusable packaging systems have emerged in recent years, they have been designed independently and are mostly small-scale, disconnected, and proprietary. They each operate within their own systems for collection and reverse logistics. As more enter the market, they will sow confusion, inconvenience, and inefficiencies for companies, workers, and consumers, and bump up against each other in their quest for scale.

PR3 has developed the Reusable Packaging System Design Standard with the goal of transforming these hundreds of disconnected reuse systems into a shared and interoperable public-private system that is more convenient and affordable and has the ability to truly scale.

This document represents the component of the standard that focuses on *reverse logistics*.

Reverse logistics start when a used or dirty container is returned at a collection point. The container will then need to be picked up by a logistics provider, sorted, washed, and returned to the filler. The order of these actions may vary, depending especially on whether the container is washed at the filling facility or at a third-party washing location.

The document provides a set of requirements that are intended to help minimize the financial and environmental costs of moving these containers through the reverse supply chain. The requirements allow a range of companies to easily plug into the system and will enable specialized businesses for collection, warehousing or washing to emerge. By adopting the requirements and recommendations within this document, companies and cities can prevent numerous, proprietary reuse models with independent collection and logistics from taking up street and retail space and causing increased roadway traffic.

This document does not preempt or supersede any industry, local, state, regional or national standards for waste management, transportation, or sanitization, etc.

This document is one of multiple parts that together make up the Reusable Packaging System Design Standard. Other parts include collection points, containers, digital, incentives, labeling, and washing. A list and links to all parts in the standard can be found on the PR3 website, see <https://www.pr3standards.org/>.

Reusable packaging system design – Specifications and recommendations

Part 6: Reverse logistics

1 Scope

This document specifies minimum requirements and recommendations for the reverse logistics of reusable packaging.

It is applicable to the collection, recovery, and redistribution of reusable containers that are designed according to [Part 2: Containers](#).

It is applicable to reusable containers that are collected at locations designed and operated according to [Part 1: Collection points](#).

This document is intended only for containers and collection points that are part of a shared, interoperable reuse ecosystem. It is not intended for independent, proprietary systems, though certain clauses may also be applicable to independent systems.

This document does not preempt or supersede any industry, local, state, regional or national standards.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document.

- DRAFT RES-001 – Reusable Packaging System Design Standard – Part 02: Containers
- DRAFT RES-002 – Reusable Packaging System Design Standard – Part 07: Washing
- DRAFT RES-003 – Reusable Packaging System Design Standard - Part 05: Labeling
- DRAFT RES-004 – Reusable Packaging System Design Standard – Part 03: Digital
- DRAFT PR3’s Reusable Packaging System Design Standard – Part 01: Collection points
- DRAFT PR3’s Reusable Packaging System Design Standard - Part 04: Return incentives

3 Terms and definitions

For the purposes of this document, the terms and definitions given in the [Glossary of Terms](#) and the following apply.

In all clauses, the following verbal forms are used:

- Requirements are indicated by “SHALL” or “SHALL NOT”
- Recommendations are indicated by “SHOULD” or “SHOULD NOT”
- Permission is indicated by “MAY” or “MAY NOT”

3.1

automated collection machines

standalone machines designed to collect reusable containers and located inside private establishments or outside in public spaces

3.2

container

asset

piece of primary packaging, such as a bottle, cup, or jar, that is used to safely and hygienically deliver goods from a business to a consumer and is designed to be reused in an industrial reusable packaging system

3.3

collection bin

bin

at a collection point, a moveable bin that can be collected by a logistics provider and delivered to recovery facility.

3.4

collection point

a range of locations and receptacles that accept used/dirty reusable containers that are designed to be part of a reuse system. Collection points can be staffed locations, such as counters at retail stores or restaurants, or they can be un-staffed machines or bins into which consumers insert used containers.

3.5

logistics provider

business involved in moving assets through the reuse supply route, including collecting, sorting, aggregating and/or transporting assets. E.g. the company that collects assets from collection points; the company that sorts and aggregates assets at a recovery facility; the company that redistributes assets to cleaning or filling sites.

3.6

passive collection bins

bins located in private locations, such as homes

3.7

recovery facility

location that receives used/dirty reusable containers from a logistics provider. The location is used to sort and aggregate assets according to where they must go next on their supply route: some

might go back to the container owner for washing, some to specialized washing facilities, and some must be removed from the system because of damage or wear.

3.8

reuse ecosystem

system for reusable containers in a given region that provides shared collection and reverse logistics between brands and companies.

3.9

reuse identification card

card that holds value from reusable container deposits. The card is available to consumers/system users, in addition to smart phone apps and credit cards. A system administrator can pay out the cash value to card holders.

3.10

return incentive

something of value that is given to users that return used containers to a collection point. Incentives can be deposits that are returned, discounts that are given via coupons or forthcoming purchases, etc.

3.11

staffed collection locations

private establishments that have employees to help facilitate the collection of reuse containers

4 Collection

Note: Collection is the point at which used/dirty containers that have been inserted into a collection point are picked up by a logistics provider.

4.1 Collection bin design

Note: All collection points are designed according to [Part 1: Collection points](#) and include movable bins in which containers are inserted.

Note: The below requirements are also described in [Part 1: Collection points](#).

Used containers that are part of the reuse ecosystem SHALL be aggregated (by employees, consumers or machines) into movable bins to be collected by the logistics provider(s).

Collection bins MAY be fitted with a lid that seals the bin during collection.

Bags MAY be used instead of bins when necessary, as long as they can be completely closed or sealed and easily transported without the contents spilling out..

Collection bins SHOULD be reusable.

Single-use bins SHOULD NOT be used.

Bins SHALL align with local infrastructure, e.g. where box trucks are used for collection, bins are designed for easy loading and fitting into trucks, including flexible connectors wherever possible to ensure adaptability.

4.2 Collection bin handling

Bins SHOULD NOT be left outside an establishment unless a lockable storage location is available.

Note: Unlike single-use containers, reusable containers have value and theft prevention is an essential component of system design.

Bins SHALL follow collection schedules that are consistent with regulatory sanitation standards and industry best practices for waste and recycling.

Bin handling procedures SHALL be printed and kept in all vehicles, sorting, storage and washing facilities for reference.

Employees SHALL use gloves to handle collection bins.

Employees SHALL wash hands and replace gloves if switching between collection and distribution roles.

If a glove rips while handling dirty foodware or bins, employee SHALL immediately wash hands and clean and sanitize any surfaces touched on the way to washing hands.

Collection bins SHALL be cleaned and sanitized with an FDA or other local governing body-approved sanitizing solution for nonfood-contact surface each time it is emptied and before being reused at a collection point.

NOTE: Nonfood-contact surfaces of equipment must be kept free of an accumulation of dust, dirt, food residue, and other debris. Timely cleaning and sanitizing prevent the growth of microorganisms on both food-contact surfaces of equipment and non-food contact surfaces. Additionally, proper cleaning frequency prevents the development of slime, mold, or other soil and related microorganisms on food-contact surfaces and equipment.

4.2.1 Procedure for collecting dirty bins from collection points

Employees SHALL follow the below steps in order.

- 4.2.1.1 Employee SHALL follow all local regulations, standards and industry best practices for waste management operations
- 4.2.1.2 Employee SHALL scan or otherwise log the digital tag/ID on the collection point and/or bin to register the collection time and location.

- 4.2.1.2 When directly in front of the collection point, employee SHALL don gloves following the glove placement procedure [Part 7: Washing](#).
- 4.2.1.3 Employee SHALL unlock and open the collection point housing unit (if applicable) and seal collection bin with lid, if available.
- 4.2.1.4 Employee SHALL place the sealed collection bin into the designated dirty section of the collection vehicle.
- 4.2.1.5 Employee SHALL clean internal overflow bin of excess liquids or debris, if applicable, according to local procedures.
- 4.2.1.6 Employee SHALL follow procedure for sanitizing the collection point housing unit per [Part 1: Collection points](#).
- 4.2.1.7 Employee SHALL repeat steps 2-4 above if multiple collection point housing units are in the same location.
- 4.2.1.8 Employee SHALL remove gloves, properly dispose of gloves in a nearby trash can and wash hands thoroughly according to [Part 7: Washing](#).

4.2.2 Procedure for delivering or inserting clean collection bins to collection points

Employees SHALL follow the below steps in order.

- 4.2.2.1 Employee SHALL place a new pair of clean gloves following the glove placement procedure from [Part 7: Washing](#).
- 4.2.2.2 Employee SHALL place sanitized collection bin from collection vehicle into collection point housing unit (if applicable).
- 4.2.2.3 Employee SHALL close and lock the collection point housing unit (if applicable).
- 4.2.2.4 Employee SHALL repeat step 2 above if multiple additional collection point housing units are in the same location.
- 4.2.2.5 Employee SHALL remove gloves according to the procedure, properly dispose of gloves in a nearby trash can, and wash hands thoroughly according to [Part 7: Washing](#).

4.2.3 Procedure for delivering dirty collection bins to a recovery facility

Employees SHALL follow the below steps in order.

- 4.2.3.1 Employee SHALL don gloves following the glove placement procedure from Part [Part 7: Washing](#).
- 4.2.3.2 Employee SHALL unload dirty collection bins for sorting and/or washing/sanitizing according to facility's SOPs.

4.3 Record keeping

The collection date and location SHALL be logged for each container collected in the system.

A log that includes the data in Table 1 SHALL be created each time containers are picked up from the collection point:

Table 1

Description	Date fields (see Part 3: Digital)
Collection date	Date
Collection location	CompanyID/CollectionPointID/BinID(optional)
Recovery location	CompanyID
Container list	1 CompanyID/PackagingID/ReturnValueAdministered 2 CompanyID/PackagingID/ReturnValueAdministered 3 CompanyID/PackagingID/ReturnValueAdministered 4

Using unique bin identifiers MAY provide a convenient way for collection point owners and logistics providers to keep track of container collection locations.

4.3.1 Staffed collection locations

Staffed collection locations MAY log containers prior to them being picked up by a logistics provider.

If staffed collection locations do not log containers prior to them being picked up by a logistics provider, then the containers SHALL be logged at the recovery facility prior to being aggregated with containers from other collection locations.

4.3.2 Automated collection machines

Automated collection machines SHALL scan and log each container before accepting it, as described in [Part 1: Collection points](#) and keep a log of all containers collected.

4.3.3 Private collection bins

Containers collected in private collection bins (e.g. residential bins) SHALL be logged at the recovery facility prior to being aggregated with containers from other collection bins.

4.4 Transport

Note Vehicles may include but are not limited to trucks, vans, pedicabs, bikes, etc.

Note: Transport, including both distance and mode, is a key parameter influencing the overall environmental performance of reusable packaging. Studies show reuse systems with transport distances over 800km (between point of filling and point of sale or point of collection) may not have better environmental performance than single-use alternatives, though this will also depend on container design and weight. While reusable foodware systems can be relatively easy to design with short transport distances, manufactured consumer goods often will have to travel farther for refilling at manufacturing and packing facilities. These factors shift substantially depending on vehicle emissions. Where possible, aligning with forward distribution routes for container pickup and deliver can provide efficiencies.

Vehicle operators SHALL follow all regulations for transporting consumer goods.

Collection vehicles MAY be used solely for collection of used/dirty containers.

Collection vehicles that handle both collection bins with used/dirty containers and collection bins with clean containers for distribution SHALL have separate and designated dirty and clean areas.

Note: In some jurisdictions, dirty containers and/or food waste are not allowed to be transported in the same vehicle as clean containers and/or consumer goods.

Vehicle operators that do not have separate dirty and clean areas and switch between collecting dirty bins and distributing clean containers SHALL wash and sanitize vehicle storage areas between uses.

Vehicle operators SHOULD seek further advice from local authorities on local transportation and sanitization requirements.

Boxes of clean, latex gloves SHALL be available in vehicles or near each collection point.

For each logistics company that transports containers, the average fuel economy of its vehicle fleet SHOULD be recorded so that overall system environmental performance can be evaluated.

5 Recovery

Note: Recovery is the step in reverse logistics where dirty/used containers in collection bins are delivered to a facility, such as a warehouse or a washing facility, where they will be aggregated, sorted and redistributed.

5.1 Facility design

Where possible, recovery facilities SHOULD be co-located with washing facilities in order to reduce transport distances and associated costs and environmental impacts.

Where possible, recovery facilities SHOULD be centrally located within container distribution routes.

Where possible, recovery facilities SHOULD mirror forward supply chain, e.g. with concentric circle models of distribution and site locations near highway convergences.

Where possible, cities and businesses SHOULD consider synergies with existing waste management infrastructure, such as converting existing material recovery facilities to sort reuse containers.

Note: The potential to tap into existing waste transports routes and services is reduced because reuse cannot utilize the compaction trucks that are typically use for waste services.

Where possible, businesses SHOULD add space and infrastructure to new e-commerce distribution and warehouse facilities for sorting, washing, and redistribution of reuse containers.

5.2 Record keeping

Recovery facilities SHALL ensure that each container that enters the facility is logged according to where it was collected per section 4.3.

Note: This is to ensure that environmental performance of the system can be calculated.

Note: Containers are not required to have unique identifiers. Instead, each container must be assigned a Packaging ID, which can be a SKU or other code assigned to all containers of the same type in a certain pool. This will enable estimates for the environmental performance of the pool.

Containers SHALL be sorted and aggregated at the recovery facility for the most efficient washing or redistribution.

5.2.1 Washing

When washing facilities are not co-located with recovery facilities, washing facilities SHALL ensure that each container that enters the washing facility is logged according to the recovery facility it came from according to Table 2.

Table 2

Description	Date fields (see Part 3: Digital)
Delivery date	Date
Recovery location	CompanyID
Wash location	CompanyID
Container list	1 CompanyID/PackagingID/

	2 CompanyID/PackagingID/ 3 CompanyID/PackagingID/ 4
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Note: This is to ensure that environmental performance of the system can be calculated.

Note: Containers are not required to have unique identifiers. Instead, each container must be assigned a Packaging ID, which can be a SKU or other code assigned to all containers of the same type in a certain pool. This will enable estimates for the environmental performance of the pool.

Washing facilities SHALL ensure a count of each container (i.e. CompanyID/Packaging ID) washed at the facility according to Table 3.

Table 3

Description	Date fields (see Part 3: Digital)
Wash date	Date
Wash location	CompanyID
Container list	1 CompanyID/PackagingID/WashMethod(opt) 2 CompanyID/PackagingID/WashMethod(opt) 3 CompanyID/PackagingID/WashMethod(opt) 4

For washing facilities with multiple washing or drying methods, the facility SHALL ensure a count of each container according to method used.

Note: This is to ensure that environmental performance of the system can be calculated.

6 Redistribution

Note: redistribution is the step in reverse logistics where clean containers are delivered to a facility where they will be refilled. This may be a manufacturing or packing facility or it may be a food service location, such as a restaurant or cafe. In some cases, redistribution will happen before washing.

6.1 Storage/distribution bin design

Clean containers SHALL be stored and transported in sealable bins that are approved by FDA, NSF and/or other governing body.

Bins SHALL be sealed during transport and storage.

In the case that collections bins and storage/distribution bins are used interchangeably, they SHALL be washed and sanitized between each use according to **Part 7: Washing** and clearly labeled as “clean” or “used.”

Bags MAY be used instead of bins when necessary, as long as they can be completely closed or sealed and easily transported without contents spilling out.

Storage/distribution bins SHOULD be reusable.

Single-use bins SHOULD NOT be used.

Storage/distribution bins SHALL align with local infrastructure, e.g. where box trucks are used for collection, bins are designed for easy loading and fitting into trucks, including flexible connectors wherever possible to ensure adaptability.

6.2 Storage/distribution bin handling

Bins SHOULD NOT be left outside an establishment unless a lockable storage location is available.

Note: Unlike single-use containers, reusable containers have value and theft prevention is an essential component of system design.

Bin handling procedures SHALL be printed and kept in all vehicles and storage facilities for reference.

6.2.1 Procedure for picking up clean containers for distribution

Employees SHALL follow the below steps in order.

- 6.2.1.1 Employee SHALL wash hands according to [Part 7: Washing](#).
- 6.2.1.2 Employee SHALL don gloves following the glove placement procedure according to [Part 7: Washing](#)
- 6.2.1.3 Employee SHALL collect clean containers packed and sealed in a distribution/storage bin(s) from the washing facility.
- 6.2.1.4 Employee SHALL place distribution/storage bin(s) into the designated clean section of the vehicle(s).

6.2.2 Procedure for distributing clean containers

Employees SHALL follow the below steps in order.

- 6.2.2.1 Employee SHALL distribute clean containers in sealed distribution/storage bins to vendors back of house.
- 6.2.2.2 Employee SHALL give storage/distribution bin(s) directly to vendor employees or place it in designated areas in the back of house or behind the counter, away from customers and potential contamination until used.

6.3 Record keeping

The distribution date and location SHALL be logged for each container collected in the system.

A log that includes the data in Table 4 SHALL be created each time containers are distributed:

Table 4

Description	Date fields (see Part 3: Digital)
Distribution date	Date
Distribution location	CompanyID
Previous location	CompanyID
Container list	1 CompanyID/PackagingID 2 CompanyID/PackagingID 3 CompanyID/PackagingID 4

Using unique bin identifiers MAY provide a convenient way for logistics providers to keep track of container distribution.

Note: This is to ensure that environmental performance of the system can be calculated.

Note: Containers are not required to have unique identifiers. Instead, each container must be assigned a Packaging ID, which can be a SKU or other code assigned to all containers of the same type in a certain pool. This will enable estimates for the environmental performance of the pool.

6.4 Transport

Note Vehicles may include but are not limited to trucks, vans, pedicabs, bikes, etc.

Note: Transport, including both distance and mode, is a key parameter influencing the overall environmental performance of reusable packaging. Studies show reuse systems with transport distances over 800km (between point of filling and point of sale or point of collection) may not have better environmental performance than single-use alternatives, though this will also depend on container design and weight. While reusable foodware systems can be relatively easy to design with short transport distances, manufactured consumer goods often will have to travel farther for refilling at manufacturing and packing facilities. These factors shift substantially depending on vehicle emissions. Where possible, aligning with forward distribution routes for container pickup and deliver can provide efficiencies.

Vehicle operators SHALL follow all regulations for transporting consumer goods.

Redistribution vehicles MAY be used solely for distribution of clean containers.

Redistribution vehicles that handle both collection bins with used/dirty containers and distribution bins with clean containers SHALL have separate and designated dirty and clean areas.

Note: In some jurisdictions, dirty containers and/or food waste are not allowed to be transported in the same vehicle as clean containers and/or consumer goods.

Vehicle operators that do not have separate dirty and clean areas and switch between collecting dirty bins and distributing clean containers SHALL wash and sanitize vehicle storage areas between uses.

Vehicle operators SHOULD seek further advice from local authorities on local transportation and sanitization requirements.

For each logistics company that transports containers, the average fuel economy of its vehicle fleet SHOULD be recorded so that overall system environmental performance can be evaluated.

7 Performance metrics

7.1 Use cycle calculations

Container owners/operators SHALL calculate the average number of use cycles for containers in a pool.

Note: Containers in a pool are identified through the data element: Packaging ID. See [Part 3: Digital](#) for information on data elements.

Containers in a pool SHALL achieve at least 10 use cycles each on average within the first 3 years of system operation.

Containers in a pool SHALL achieve at least 20 use cycles each on average within the first 5 years of system operation.

Average number of use cycles SHALL be calculated at least annually.

Logistics providers SHALL participate in calculating use cycles, as needed.

7.1.1 Sample method for manufactured consumer products

$$\text{Average Use Cycles} = \frac{\text{Total \# of fillings across PackagingID during timeframe (i.e. sales plus inventory not yet sold)}}{\text{\# of containers at start of timeframe + delivered containers during timeframe - float}}$$

7.1.2 Sample method for foodware filled at point-of-sale

$$\text{Average Use Cycles} = \frac{\text{Total \# of uses/washes across packaging ID during timeframe}}{\text{\# of containers at start of timeframe + delivered containers - float}}$$

7.2 Return rate calculations

Container owners/operators SHALL calculate the average return rate for containers in a pool.

Note: Containers in a pool are identified through the data element: Packaging ID. See [Part 3: Digital](#) for information on data elements.

Containers in a pool SHALL achieve an average return rate of 90% or higher within the first three (3) years of system operation.

Containers in a pool SHALL achieve an average return rate of 95% or higher within the first five (5) years of system operation.

In the event that return rates of 90% within 3 years and 95% within 5 years are not achieved, system design SHALL be adjusted to improve return rates.

Note: Collection point locations and incentive programs are system design aspects that can be adjusted to improve return rates.

Return rates SHALL be calculated at least annually.

Logistics providers SHALL participate in calculating use cycles, as needed.

$$\text{Return Rate} = 1 - \frac{\text{Purchased/delivered containers during timeframe}}{\text{\# of containers at start of timeframe}}$$

7.3 System optimization

Businesses in the system SHOULD log and contribute data to evaluate the performance of the system, including average mileage per container, average fuel economy/emissions, water usage, chemical usage, etc.

A system administrator MAY calculate overall system performance and provide recommendation for optimization to ensure improvements compared to single-use packaging.

Each business SHOULD evaluate their own operational performance to determine approaches for optimizing transport routes, container design, weight and durability, collection point locations, return incentives and other features.

8 Labeling

Companies that participate in reverse logistics MAY incorporate the reuse logo and signage per [Part 5: Labeling](#) onto facilities and vehicles.