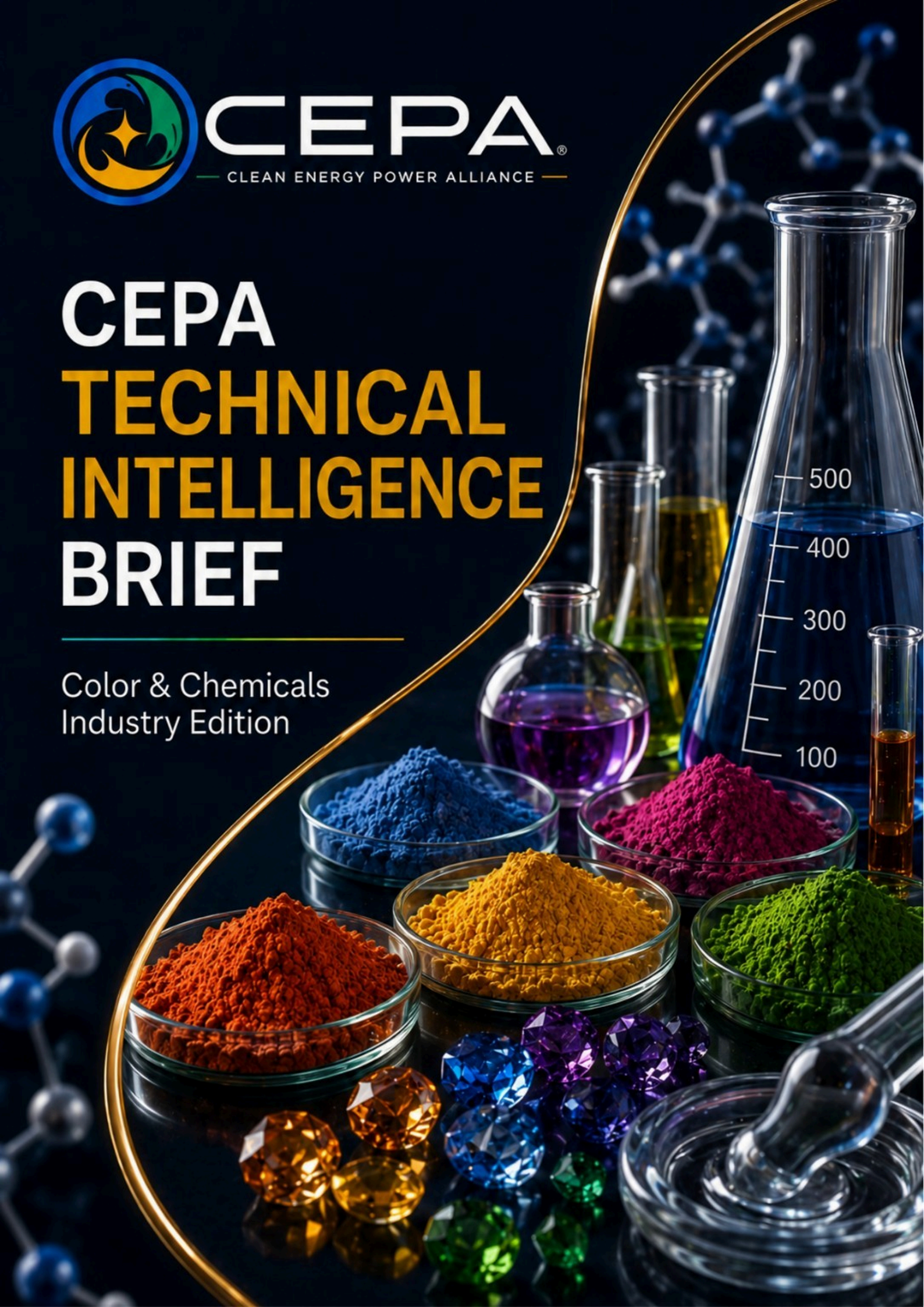




CEPA TECHNICAL INTELLIGENCE BRIEF

Color & Chemicals
Industry Edition



TECHNICAL INTELLIGENCE BRIEF

COLOR & CHEMICALS INDUSTRY EDITION

Chemical processing, packaging
stewardship and circular-resource
intelligence

PROCESS CHEMICALS • PACKAGING SYSTEMS
REUSE & RECONDITIONING • RESOURCE CIRCULARITY
ENVIRONMENTAL COMPLIANCE • SAFETY & RISK
EMISSIONS CONTROL • OPERATIONAL EFFICIENCY



SCAN TO EXPLORE
CEPA INSIGHTS
AND PUBLICATIONS



OCTOBER 2026 RELEASE
CLEAN ENERGY FOR A MORE
RESOURCE EFFICIENT INDUSTRY

Published by



CEPA
— CLEAN ENERGY POWER ALLIANCE —



Prepared by

EterSolis
Waste & Carbon Management

Publication control and complete-series boundary

CEPA-CL-COLCHEM004-P01

KEY

Issue 004 treats industrial chemical packaging as a controlled service asset; it does not reopen the edition's established solvent, wastewater, process-loss or substitution frameworks.

TECHNICAL BASIS

Complete-series review found that earlier COLCHEM issues already cover material loss, cleaning, solvent balance/recovery, packaging residues at overview level, formulation hazard and analytical governance. The new boundary begins after material has been removed from a drum, pail, jerrican or IBC and asks what evidence is required before return, reuse, reconditioning, refill, recycling or rejection.

DECISION INTERPRETATION

Readers should interpret every "empty," "reusable," "reconditioned," "recycled" or "closed-loop" claim against its own legal, technical and evidence boundary. These terms are not interchangeable.

CONTROL ACTION

Use one controlled packaging-status vocabulary and one unique asset/event record for reusable formats.

REQUIRED RECORDS

Packaging ID; format/design type; prior lading; emptying record; residual status; inspection; cleaning/reconditioning; tests; release/rejection; next destination.

AUDIT / ESCALATION TRIGGER

Escalate if an asset changes status based only on appearance, waste classification, a transport mark or a sustainability label.

Sources: C4-EV-001..004; prior COLCHEM issues | Claim: CEPA-CL-COLCHEM004-P01

Executive findings: packaging as a controlled asset system

CEPA-CL-COLCHEM004-P02

KEY

Circular packaging performance is credible only when residual status, chemical compatibility, structural integrity, required tests, chain of custody and actual next use are controlled together.

TECHNICAL BASIS

U.S. rules illustrate why one label is insufficient. 40 CFR 261.7 defines when certain hazardous-waste containers are "empty" for RCRA purposes. Separate DOT rules govern whether hazardous-material packagings may be reused or reconditioned for transport, including condition, residue, integrity, testing and marking requirements. EU PPWR adds a separate lifecycle/reuse policy framework with phased obligations.

DECISION INTERPRETATION

Executives should manage reusable packaging as a fleet with safety, compliance, quality and asset-productivity controls-not as discarded packaging that happens to come back.

CONTROL ACTION

Create a packaging assurance owner and a fleet register covering every controlled reusable/reconditionable format.

REQUIRED RECORDS

Fleet inventory; legal/applicability map; unique IDs; last contents; service-cycle history; inspection/test status; rejection reason; cost and loss data.

AUDIT / ESCALATION TRIGGER

Escalate any reuse target that counts returned units without proving release for a safe/eligible next service cycle.

Sources: C4-EV-001..004 | Claim: CEPA-CL-COLCHEM004-P02

Packaging service-cycle boundary

CEPA-CL-COLCHEM004-P03

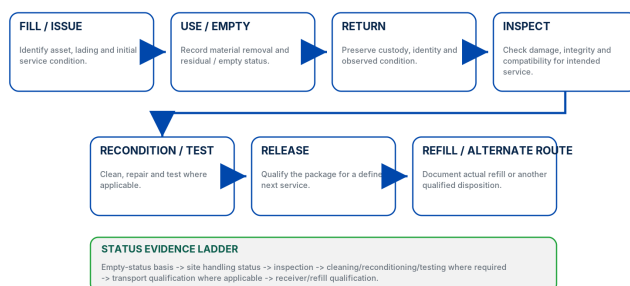
KEY

A defensible reusable-packaging metric must follow the same container through a complete service cycle rather than counting outbound and returned packaging as unrelated transactions.

Chemical Packaging Service-Cycle Control

Each status is a separate evidence gate; return is not reuse.

COL4-V01



Sources: 40 CFR 261.7, 49 CFR 173.24, 173.28, 180.352; CEPA controlled service-cycle method. Conceptual decision model — not a universal legal workflow.

COL4-V01_Packaging_Service_Cycle | Conceptual framework; no facility performance implied.

TECHNICAL BASIS

The working service cycle is: fill -> ship/use -> material removal -> residual-status determination -> return -> inspection -> cleaning/reconditioning where required -> testing/requalification where required -> release -> refill or alternate route. Internal and third-party steps require the same status continuity even when custody changes.

DECISION INTERPRETATION

This boundary makes failure visible. A high collection rate can coexist with low reuse if containers are rejected for residue, incompatible prior contents, damage, overdue tests or poor return logistics.

CONTROL ACTION

Assign one unique container or batch identity that survives custody transfer and links every service event.

REQUIRED RECORDS

Issue/dispatch record; consignee; return date; condition; last lading; inspection/test; cleaning; rejection; final refill/recycle evidence.

AUDIT / ESCALATION TRIGGER

Escalate fleet KPIs that cannot distinguish "returned," "accepted," "released for reuse," and "actually refilled."

Sources: C4-EV-002..004; CEPA method | Claim: CEPA-CL-COLCHEM004-P03

Empty does not mean clean, reusable or recyclable

CEPA-CL-COLCHEM004-P04

KEY

Regulatory empty-container status answers a waste-law question; it does not by itself answer cleanliness, transport reuse, product-quality or recycler-acceptance questions.

TECHNICAL BASIS

Under 40 CFR 261.7, non-acute hazardous-waste containers can qualify as empty when common removal practices are completed and specified residue conditions are met; acute hazardous-waste containers have stricter triple-rinse/equivalent/liner conditions. DOT 49 CFR 173.28 separately requires reusable packaging to be inspected and free from incompatible residue, rupture or integrity-reducing damage.

DECISION INTERPRETATION

Plants need a status ladder rather than a single EMPTY field: material removed -> RCRA-empty/not applicable -> safe to handle under site procedure -> inspected -> cleaned/reconditioned as required -> transport-qualified where applicable -> receiver/refill-qualified.

CONTROL ACTION

Prohibit automatic conversion of an "empty" waste status into a reuse release.

REQUIRED RECORDS

Waste classification; prior product; residual observations/mass; cleaning record; packaging design type; transport qualification; receiver specification.

AUDIT / ESCALATION TRIGGER

Escalate when "empty" is used as evidence that a package is clean, decontaminated, transport compliant or recyclable.

Sources: C4-EV-001, C4-EV-002 | Claim: CEPA-CL-COLCHEM004-P04

Residual-content decision logic

CEPA-CL-COLCHEM004-P05

KEY

Residual material is both a compliance variable and a recoverable-value/contamination variable; the relevant decision depends on what the container held and what route is proposed next.

TECHNICAL BASIS

40 CFR 261.7 uses specific federal criteria for non-acute hazardous-waste containers and different provisions for compressed gases, acute hazardous wastes and hazardous-waste pharmaceuticals. A CEPA fleet system should preserve the exact prior-lading classification and avoid turning federal waste-law thresholds into generic cleanliness specifications.

DECISION INTERPRETATION

Where residual material can be recovered before cleaning, record it separately from wash residues. This prevents circular-packaging claims from hiding product loss or transferring concentrated material into wastewater.

CONTROL ACTION

Add a residual-recovery step before washing whenever technically, legally and safely appropriate.

REQUIRED RECORDS

Prior lading; waste/hazard classification; container size; removal method; recovered heel mass; cleaning residues; next-use specification.

AUDIT / ESCALATION TRIGGER

Escalate use of one universal residual threshold across different waste classes, jurisdictions or receiver requirements.

Sources: C4-EV-001; CEPA method | Claim: CEPA-CL-COLCHEM004-P05

Container integrity and compatibility

CEPA-CL-COLCHEM004-P06

KEY

Reuse eligibility requires both physical integrity and chemical compatibility with the next lading; neither condition can be inferred from appearance alone.

TECHNICAL BASIS

49 CFR 173.28 bars reuse where incompatible residue, rupture or damage reduces structural integrity. 49 CFR 173.24(e) separately places responsibility on the offeror to ensure packaging compatibility with the lading, specifically addressing concerns such as corrosivity, permeability, softening, premature aging and embrittlement, and requires packaging materials/contents to avoid significant chemical or galvanic reaction.

DECISION INTERPRETATION

A fleet that maximizes cycles without tracking compatibility can increase corrosion, permeation, contamination or closure failure risk. Cycle count is therefore a context variable, not a standalone quality indicator.

CONTROL ACTION

Create a controlled compatibility decision record tied to the exact packaging material/lining/closure and prior/intended lading; use applicable regulatory/test evidence and supplier/engineering data for the specific service.

REQUIRED RECORDS

Design type; material/lining; closure/gasket; prior contents; next contents; temperature; compatibility basis; inspection defects; service-cycle count; approver.

AUDIT / ESCALATION TRIGGER

Escalate any refill decision made without prior-lading identity or without a documented compatibility basis for the proposed service.

Sources: C4-EV-002, C4-EV-008 | Claim: CEPA-CL-COLCHEM004-P06

Non-bulk packaging reuse under 49 CFR 173.28

CEPA-CL-COLCHEM004-P07

KEY

For hazardous-material transport within scope, reuse is conditional on packaging condition and applicable test/mark requirements; it is not a blanket permission to refill a previously used container.

TECHNICAL BASIS

49 CFR 173.28 requires inspection before reuse and sets provisions for non-bulk packaging, including leakproofness retesting for specified packagings, permanent thickness marking for certain drums/jerricans and defined exceptions. The rule also distinguishes reuse, reconditioning and remanufacture.

DECISION INTERPRETATION

The plant packaging register should therefore record the specific regulatory path used for each refill—not merely "DOT approved." Applicability depends on packaging type, material, design and use.

CONTROL ACTION

Link every reusable hazardous-material package to its design type, applicable reuse provision and current test/mark status.

REQUIRED RECORDS

UN/DOT marking; design type; capacity; material/thickness where relevant; test records; original filler status where relevant; lading compatibility.

AUDIT / ESCALATION TRIGGER

Escalate a reuse release that relies on a generic certification statement without identifying the applicable packaging provision.

Sources: C4-EV-002 | Claim: CEPA-CL-COLCHEM004-P07

Drum reconditioning workflow

CEPA-CL-COLCHEM004-P08

KEY

Reconditioning is a controlled restoration and verification process; superficial cleaning or repainting is not equivalent to reconditioning.

TECHNICAL BASIS

49 CFR 173.28 defines metal-drum reconditioning to include cleaning to base construction material with former contents and corrosion removed, restoration of shape/contour and non-integral gaskets, and inspection before painting with rejection of specified significant defects. Other non-bulk packagings have related cleaning, inspection and component-restoration requirements.

DECISION INTERPRETATION

This creates a clear assurance chain: receive -> identify prior lading -> remove residual -> clean -> inspect substrate/structure -> restore closures/components -> test/mark as applicable -> release or reject.

CONTROL ACTION

Qualify reconditioners against the actual functions and records required for the formats they handle.

REQUIRED RECORDS

Reconditioner identity; cleaning method; inspection checklist; defects/rejections; gasket/closure work; test results; markings; release record.

AUDIT / ESCALATION TRIGGER

Escalate when reconditioning evidence is limited to a wash certificate or cosmetic appearance.

Sources: C4-EV-002 | Claim: CEPA-CL-COLCHEM004-P08

IBC qualification and inspection cycle

CEPA-CL-COLCHEM004-P09

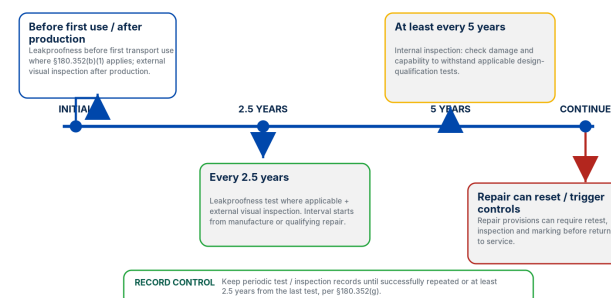
KEY

IBC reuse requires calendar-controlled qualification: an otherwise acceptable container cannot be treated as current if an applicable inspection or test is overdue.

IBC Periodic Test / Inspection Control

Scope: metal, rigid-plastic and composite IBCs under 49 CFR 180.352(b).

COL4-V03



Source: 49 CFR 180.352(b), (d), (g). This timeline does not replace design-specific applicability review or the full regulation.

COL4-V03_IBC_Periodic_Test_Inspection_Timeline | Conceptual framework; no facility performance implied.

TECHNICAL BASIS

49 CFR 180.352 requires, for specified metal/rigid-plastic/composite IBCs, leakproofness testing for certain liquid/pressure uses initially and every 2.5 years, external visual inspection every 2.5 years, and internal inspection at least every five years; repairs trigger defined retest/inspection and marking controls. Records are retained and must identify tests, facilities, persons and results.

DECISION INTERPRETATION

A reusable IBC program therefore needs a fleet-level due-date engine. Manual label checking at dispatch is a weak control because status changes with time, repair and test history.

CONTROL ACTION

Block fill/release when an applicable qualification is overdue or the IBC identity cannot be reconciled to its records.

REQUIRED RECORDS

Unique IBC ID; manufacture/repair dates; 2.5-year/5-year due dates; test/inspection results; repair records; markings; service status.

AUDIT / ESCALATION TRIGGER

Escalate missing identity, unreadable markings, overdue qualification, unresolved repair history or failed inspection.

Sources: C4-EV-003 | Claim: CEPA-CL-COLCHEM004-P09

Leakproofness, closures and gasket control

CEPA-CL-COLCHEM004-P10

KEY

Leak tightness depends on the complete closure system and applicable test condition; a structurally sound shell does not compensate for incorrect or degraded closures.

TECHNICAL BASIS

49 CFR 173.28 includes leakproofness retesting requirements for specified reusable non-bulk packagings and reconditioning provisions that address gaskets and closure devices. IBC rules separately require leakproofness tests for defined uses and verification of service equipment after repair/maintenance.

DECISION INTERPRETATION

Closure torque/specification, gasket material, valve condition and evidence of the required test should be controlled as product-release data where relevant. A generic "no visible leak" check is not equivalent to a prescribed test.

CONTROL ACTION

Create closure and service-equipment release criteria by packaging design type.

REQUIRED RECORDS

Closure/valve type; gasket material; replacement status; torque/specification if applicable; leak test method/result/date; inspector.

AUDIT / ESCALATION TRIGGER

Escalate substitution of closure/gasket components without compatibility and design-type review.

Sources: C4-EV-002, C4-EV-003 | Claim: CEPA-CL-COLCHEM004-P10

Cleaning verification and cross-media burden

CEPA-CL-COLCHEM004-P11

KEY

Packaging circularity is incomplete if cleaning makes the container reusable by transferring uncontrolled chemical load into wash water, spent solvent, sludge or air.

TECHNICAL BASIS

EPA describes drum/IBC reconditioning processes that include washing and burn-off and documents that cleaning/reconditioning can generate regulated or otherwise significant residual streams. Earlier COLCHEM work established cross-media/source-control principles; Issue 004 applies them to the packaging service cycle and the evidence required before a returned asset is released.

DECISION INTERPRETATION

The objective is not "maximum cleaning." It is the minimum validated cleaning/restoration needed for the proposed next use while preserving safety, product quality and downstream treatment compatibility.

CONTROL ACTION

Require a cleaning acceptance specification plus a residue disposition record for every controlled reconditioning route.

REQUIRED RECORDS

Cleaning method; media volumes; recovered heel; wash/burn-off residual destination; inspection/analysis where required; acceptance/release result.

AUDIT / ESCALATION TRIGGER

Escalate a reusable-packaging claim that omits cleaning residuals or cannot show where recovered contents and wash/reconditioning residuals went.

Sources: C4-EV-006, C4-EV-007; prior COLCHEM-002 continuity | Claim: CEPA-CL-COLCHEM004-P11

Return-loop chain of custody

CEPA-CL-COLCHEM004-P12

KEY

A reusable packaging system becomes auditable when container identity and service status remain intact across every custody transfer.

TECHNICAL BASIS

Return loops often involve manufacturer, customer, carrier, pool operator and reconditioner. Each handoff can break the evidence chain: last contents can be unknown, damage can occur without attribution, inspection/test records can detach from the physical asset, and rejected packaging can disappear into an unverified route.

DECISION INTERPRETATION

The minimum digital record should connect unique ID, current holder, last lading, return date, residual status, condition, cleaning/reconditioning, tests, release decision and next fill/destination. Serialisation is a means; evidence continuity is the objective.

CONTROL ACTION

Implement event-based packaging records and exception queues for unknown/overdue/rejected assets.

REQUIRED RECORDS

Unique ID; custody events; timestamps; prior/next lading; inspection/test status; rejection and disposition; final refill/recycle proof.

AUDIT / ESCALATION TRIGGER

Escalate any packaging entering a controlled reuse pool with unknown identity, last contents or qualification status. # Pages 13-36 Controlled by Charter v2 architecture; substantive drafting proceeds after remaining compatibility, cleaning and PPWR applicability evidence closes.

Sources: C4-EV-001..004; CEPA method | Claim: CEPA-CL-COLCHEM004-P12

Closed-loop versus open-loop return systems

CEPA-CL-COLCHEM004-P13

KEY

Reuse-system governance must match the custody model: a closed loop can rely on known participants and return points, while an open loop needs stronger identity, condition and handoff controls.

TECHNICAL BASIS

EU PPWR recognizes reuse systems with defined participants and reconditioning obligations. For chemical packaging, custody can move among filler, customer, collector and reconditioner; each transfer can break information on prior lading, test status or rejection history.

DECISION INTERPRETATION

Choose the loop model deliberately. A return contract is not enough if the next user cannot verify container identity, service history and release status.

CONTROL ACTION

Document participants, approved handoff points, data fields, rejection ownership and escalation rules for each loop.

REQUIRED RECORDS

Participant register; container IDs; handoff events; return locations; release status; rejection destination; service-cycle count.

AUDIT / ESCALATION TRIGGER

Escalate any open-loop asset whose identity or prior-lading/test history is lost before refill.

Sources: C4-EV-004, C4-EV-005; CEPA method | Claim: CEPA-CL-COLCHEM004-P13

Compatibility matrix for next lading

CEPA-CL-COLCHEM004-P14

KEY

A container that is structurally sound can still be unsuitable for the next lading if the shell, liner, gasket or closure is chemically incompatible or if prior residues create contamination risk.

TECHNICAL BASIS

49 CFR 173.24(e) requires the person offering hazardous material for transportation to ensure packaging compatibility with the lading and identifies degradation/permeation mechanisms relevant to that decision. 49 CFR 173.28 also requires reused packaging to be free of incompatible residue and integrity-reducing damage. Those transport rules do not create a universal cross-product compatibility table; the exact service still requires packaging/product-specific evidence.

DECISION INTERPRETATION

Compatibility approval should use exact packaging material/lining/closure and both prior and proposed lading; where evidence is incomplete, downgrade to cleaning/reconditioning review or reject the route.

CONTROL ACTION

Create a controlled compatibility matrix owned by packaging engineering/EHS/quality and linked to change control, with source/evidence references for each approved service.

REQUIRED RECORDS

Container design; material/lining; closures/gaskets; prior lading; proposed lading; temperature; compatibility source/test; approver; expiry/review date.

AUDIT / ESCALATION TRIGGER

Escalate any reuse decision based only on product family, SDS headline classification or visual condition.

Sources: C4-EV-002, C4-EV-008 | Claim: CEPA-CL-COLCHEM004-P14

Labels, marks and status communication

CEPA-CL-COLCHEM004-P15

KEY

Container identity, transport marks and internal reuse status must not contradict one another or survive beyond the conditions they actually represent.

TECHNICAL BASIS

Reused/reconditioned hazardous-material packagings can have design-type, test and marking obligations. A fleet also needs operational status labels such as HOLD, RELEASED, REJECTED or CLEANING REQUIRED; those internal statuses are not substitutes for regulated markings.

DECISION INTERPRETATION

Separate regulated transport marking from operational status. The user should be able to determine both legal/test status and current plant release status without inference.

CONTROL ACTION

Use controlled label removal/retention rules and electronic status records tied to the unique container ID.

REQUIRED RECORDS

Regulated marks; test/requalification date; internal status; prior-lading label disposition; new product label; owner/date.

AUDIT / ESCALATION TRIGGER

Escalate obsolete or ambiguous markings, missing requalification information, or internal labels that could be mistaken for regulatory certification.

Sources: C4-EV-002, C4-EV-003; applicable transport rules | Claim: CEPA-CL-COLCHEM004-P15

Damage and rejection taxonomy

CEPA-CL-COLCHEM004-P16

KEY

Reuse programs need explicit reject criteria because dents, corrosion, pitting, fatigue, closure damage and other integrity defects do not carry equal risk across formats.

TECHNICAL BASIS

DOT reconditioning and IBC rules require inspection and rejection/repair responses for defined damage and integrity concerns. A generic PASS/FAIL field loses defect type and recurrence information needed for fleet engineering.

DECISION INTERPRETATION

Code defects by location/mechanism and distinguish repairable, reconditionable and terminal-reject conditions. Repeated defects are a design/logistics signal.

CONTROL ACTION

Implement a standard defect taxonomy with photographs/measurements where useful and trend by supplier, route and cycle count.

REQUIRED RECORDS

Defect code; location; severity; inspection method; repair/recondition action; retest result; cycle count; final disposition.

AUDIT / ESCALATION TRIGGER

Escalate recurring defect modes or any decision that overrides a required test/inspection based on appearance.

Sources: C4-EV-002, C4-EV-003 | Claim: CEPA-CL-COLCHEM004-P16

Reconditioning quality release

CEPA-CL-COLCHEM004-P17

KEY

Reconditioning is a controlled transformation from returned asset to released packaging; cleaning completion alone is not a quality release.

TECHNICAL BASIS

Federal transport rules distinguish reconditioning, testing and marking requirements by packaging type. EPA describes reconditioners as cleaning, restoring, testing and certifying containers. The release gate therefore has to reconcile cleanliness, structural condition, closures, tests and intended service.

DECISION INTERPRETATION

A reconditioned container should enter available fleet inventory only after all applicable release criteria are complete and traceable.

CONTROL ACTION

Use a release checklist that blocks inventory status until required inspection, repairs, leakproofness/requalification and documentation are closed.

REQUIRED RECORDS

Incoming status; cleaning method; repair log; inspection; leakproofness/other test; mark; release signer; intended service.

AUDIT / ESCALATION TRIGGER

Escalate units returned to service with missing test records, unresolved defects or unknown prior-lading status.

Sources: C4-EV-002, C4-EV-003, C4-EV-006 | Claim: CEPA-CL-COLCHEM004-P17

Recyclability after chemical service

CEPA-CL-COLCHEM004-P18

KEY

A chemical container's base material may be technically recyclable while the used package is not acceptable to a particular recycler until residual status, contamination and receiving conditions are resolved.

TECHNICAL BASIS

RCRA empty status, physical material recyclability and receiver acceptance answer different questions. EPA's used-drum program illustrates why residual status and downstream management matter even for containers intended for reconditioning/recycling. Receiver specifications remain route-specific and must be verified rather than assumed.

DECISION INTERPRETATION

Use safe reuse/reconditioning where qualified, then material recycling where the actual receiver accepts the used-packaging condition; do not claim recycling from shipment alone.

CONTROL ACTION

Qualify recyclers/reconditioners and require acceptance evidence for the actual used-packaging condition.

REQUIRED RECORDS

Material type; residual status; cleaning status; receiver specification/acceptance; accepted mass/units; reject reason; final process evidence.

AUDIT / ESCALATION TRIGGER

Escalate "recycled" claims based only on transfer notes or commodity material type.

Sources: C4-EV-001, C4-EV-006; CEPA receiver-qualification method | Claim: CEPA-CL-COLCHEM004-P18

Reusable packaging under EU PPWR

CEPA-CL-COLCHEM004-P19

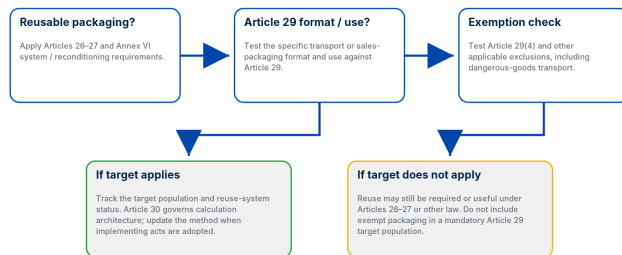
KEY

Under EU PPWR, reusable packaging is a designed and governed state: it must be intended for multiple uses, remain safe/hygienic, be capable of emptying/refilling and reconditioning, and operate within a reuse system.

EU PPWR Reuse-System / Target Applicability

Separate reusable-system obligations from Article 29 target applicability and exemptions.

COL4-V06



Sources: Regulation (EU) 2025/40 Articles 26-30 and Annex VI; Commission Guidance C/2026/3702 (OJ C 2026/3884).
Interpretive aid only; applicability remains fact- and jurisdiction-specific.

COL4-V06_PPWR_Applicability | Conceptual framework; no facility performance implied.

TECHNICAL BASIS

Regulation (EU) 2025/40 Articles 11, 26 and 27 link reusable packaging to technical documentation, reuse systems and reconditioning. This is broader than a simple "durable package" characteristic.

DECISION INTERPRETATION

For EU-market packaging, design and system evidence should be developed together. A technically durable drum outside a functioning reuse system does not by itself demonstrate compliance with PPWR reuse-system obligations.

CONTROL ACTION

Add PPWR reuse-system evidence to the packaging technical file where applicable.

REQUIRED RECORDS

Design intent; expected rotations; safety/hygiene controls; reconditioning capability; reuse-system participation; technical documentation.

AUDIT / ESCALATION TRIGGER

Escalate EU reuse claims that rely only on material durability or return frequency.

Sources: C4-EV-004 | Claim: CEPA-CL-COLCHEM004-P19

EU transport-packaging targets and dangerous-goods exception

CEPA-CL-COLCHEM004-P20

KEY

The EU 2030 transport-packaging reuse target cannot be applied indiscriminately to chemical drums and IBCs because Article 29 contains material exceptions, including dangerous-goods transport.

TECHNICAL BASIS

Article 29(1) covers formats including IBCs, pails, drums and canisters and sets a 40% reusable-within-reuse-system target from 2030 for covered uses. Article 29(4)(a) exempts transport/sales packaging used to transport dangerous goods under Directive 2008/68/EC. Commission 2026 guidance also notes practical reuse constraints for certain viscous products.

DECISION INTERPRETATION

Segment the fleet before target calculations: covered transport packaging, dangerous-goods-exempt packaging, other exempt/custom formats and packaging outside Article 29 scope.

CONTROL ACTION

Build an EU applicability matrix before setting reuse targets or public commitments.

REQUIRED RECORDS

Packaging format; product/lading; dangerous-goods status; route; economic operator role; exemption evidence; reuse-system status.

AUDIT / ESCALATION TRIGGER

Escalate any corporate 40% target that counts exempt and covered packaging together without a legal/applicability basis.

Sources: C4-EV-004, C4-EV-005 | Claim: CEPA-CL-COLCHEM004-P20

Format-specific control: drums, pails, canisters and IBCs

CEPA-CL-COLCHEM004-P21

KEY

Reusable packaging formats need separate control plans because construction, closures, testing, service life and failure modes differ.

TECHNICAL BASIS

DOT rules distinguish packaging types, and IBCs have specific recurring inspection/testing provisions. PPWR groups multiple transport formats for policy purposes, but that grouping does not erase engineering differences.

DECISION INTERPRETATION

Maintain a common fleet data model but format-specific inspection, test and service criteria.

CONTROL ACTION

Issue format-specific SOP appendices and test schedules.

REQUIRED RECORDS

Format/design type; capacity; material; liner; closures; test schedule; inspection points; service restrictions; cycle count.

AUDIT / ESCALATION TRIGGER

Escalate a single generic inspection checklist used across materially different packaging designs.

Sources: C4-EV-002, C4-EV-003, C4-EV-004 | Claim: CEPA-CL-COLCHEM004-P21

CEPA TECHNICAL INTELLIGENCE BRIEF | TECHNICAL INTELLIGENCE

Return rate, successful cycle rate and fleet loss

CEPA-CL-COLCHEM004-P22

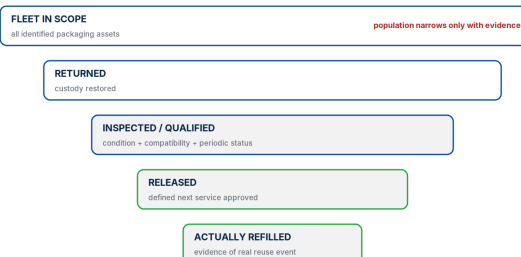
KEY

Return rate is not the same as successful reuse: performance must distinguish returned units, released units, refilled units, rejects and lost assets.

Packaging Fleet Qualification Funnel

Do not treat owned, returned, inspected and actually reused units as the same population.

COL4-V07



Sources: CEPA qualification method informed by 40 CFR 261.7, 49 CFR 173.24, 173.28 and 180.352; PPWR target populations remain legally separate and must be tested independently.

COL4-V07_Fleet_Qualification_Funnel | Conceptual framework; no facility performance implied.

TECHNICAL BASIS

A circular fleet can have strong return logistics but poor service-cycle yield if units fail inspection, cleaning, compatibility or qualification. The relevant denominator depends on whether the question is logistics, quality, asset productivity or environmental performance.

DECISION INTERPRETATION

Report at least return rate and successful-cycle rate separately; add reject/loss reasons to explain the gap.

CONTROL ACTION

Create a monthly fleet reconciliation from outbound to actual refill.

REQUIRED RECORDS

Units issued; returned; inspected; released; refilled; rejected; lost; cycle count; reason codes.

AUDIT / ESCALATION TRIGGER

Escalate any reuse KPI that counts collection/return as completed reuse.

Sources: C4-EV-004; CEPA quantitative method | Claim: CEPA-CL-COLCHEM004-P22

Residual value versus cleaning and reconditioning cost

CEPA-CL-COLCHEM004-P23

KEY

The economic value of a returnable container is net of reverse logistics, residual management, cleaning/reconditioning, testing, rejection risk and asset loss.

TECHNICAL BASIS

EPA documentation shows that reconditioning processes can generate residuals and environmental/safety burdens. A low new-container price can also change the economic threshold for repair/reconditioning.

DECISION INTERPRETATION

Use lifecycle service cost per successful cycle, not gross purchase-price avoidance alone.

CONTROL ACTION

Model cost per successful cycle and sensitivity to reject rate, return distance, cleaning intensity and asset loss.

REQUIRED RECORDS

Purchase cost; deposits; transport; cleaning; repair; tests; residual treatment; reject/loss rate; cycles; labor; downtime.

AUDIT / ESCALATION TRIGGER

Escalate business cases that assume every returned package becomes a successful next cycle.

Sources: C4-EV-006, C4-EV-007; CEPA economics | Claim: CEPA-CL-COLCHEM004-P23

Reconditioning versus new packaging decision

CEPA-CL-COLCHEM004-P24

KEY

The preferred option is the lowest-risk qualified service path, not automatically reuse or new packaging.

TECHNICAL BASIS

Reconditioning preserves asset value but adds cleaning, inspection, testing and residual-management steps. New packaging avoids service-history uncertainty but consumes new material and capital. Regulatory/test status and product-quality risk can dominate economics.

DECISION INTERPRETATION

Use hard safety/legal/quality gates first, then compare cost and resource use among qualified options.

CONTROL ACTION

Implement a route decision tree: reuse-as-is where permitted -> recondition/retest -> recycle -> other lawful disposition.

REQUIRED RECORDS

Eligibility gates; technical condition; next-lading compatibility; cost; time; residual burden; receiver/refill acceptance.

AUDIT / ESCALATION TRIGGER

Escalate route decisions driven by sustainability label or unit cost before safety/legal qualification.

Sources: C4-EV-002, C4-EV-003, C4-EV-006; CEPA method | Claim: CEPA-CL-COLCHEM004-P24

Fleet-pool design and asset ownership

CEPA-CL-COLCHEM004-P25

KEY

Reusable chemical packaging performs as infrastructure only when ownership, deposits, loss risk, maintenance and data responsibilities are explicitly allocated.

TECHNICAL BASIS

Open and closed loops create different incentives. A filler-owned pool can standardize service controls but may bear loss risk; third-party pools can centralize reconditioning but require strong data transfer and service-level agreements.

DECISION INTERPRETATION

Design the commercial model and the technical control model together.

CONTROL ACTION

Define ownership, deposit/fee, loss liability, turnaround, maintenance and data obligations in contracts.

REQUIRED RECORDS

Asset owner; user; return SLA; deposit/fee; loss/damage allocation; service provider; data requirements; dispute rules.

AUDIT / ESCALATION TRIGGER

Escalate unexplained fleet shrinkage or contracts that separate financial custody from technical accountability.

Sources: C4-EV-004; CEPA method | Claim: CEPA-CL-COLCHEM004-P25

Digital identity and service history

CEPA-CL-COLCHEM004-P26

KEY

Unique digital identity turns a reusable container from anonymous packaging into a traceable service asset.

TECHNICAL BASIS

PPWR technical/reuse-system documentation and DOT recurring tests create data that benefit from asset-level linkage. QR/RFID/serial systems can connect prior lading, inspections, tests, repairs and cycle count without changing the underlying legal requirements.

DECISION INTERPRETATION

Use digital identity to reduce status ambiguity, not to replace physical inspection or regulated marks.

CONTROL ACTION

Assign persistent IDs and event timestamps at every controlled handoff.

REQUIRED RECORDS

Unique ID; design type; prior lading; event history; inspection/test; cleaning; repair; release; current location/status.

AUDIT / ESCALATION TRIGGER

Escalate assets whose physical mark/serial cannot be reconciled to the electronic record.

Sources: C4-EV-004; CEPA method | Claim: CEPA-CL-COLCHEM004-P26

Receiver and reconditioner qualification

CEPA-CL-COLCHEM004-P27

KEY

Downstream qualification is part of the reuse system because unsafe acceptance, poor cleaning or weak rejection control can transfer risk outside the originating facility.

TECHNICAL BASIS

EPA documents compliance and damage cases in the drum-reconditioning sector. That evidence does not condemn reconditioning; it demonstrates why vendor qualification, regulatory status, process controls and rejection management matter.

DECISION INTERPRETATION

Qualify the actual service process and evidence package, not only the vendor's marketing claim.

CONTROL ACTION

Audit approved reconditioners/receivers for regulatory status, process flow, residual management, tests, incident controls and data return.

REQUIRED RECORDS

Permits/status; process; cleaning/reconditioning method; waste/residual controls; tests; incident history; insurance; data/acceptance records.

AUDIT / ESCALATION TRIGGER

Escalate service providers that cannot document rejected-container handling or test traceability.

Sources: C4-EV-006, C4-EV-007; CEPA supplier control | Claim: CEPA-CL-COLCHEM004-P27

Cleaning residuals and cross-media transfer

CEPA-CL-COLCHEM004-P28

KEY

Cleaning a container can move residual material into wastewater, air emissions or solid waste; successful reuse must not conceal that transfer.

TECHNICAL BASIS

EPA describes washing and burn-off reconditioning processes and notes potential hazardous residual-management issues. Earlier COLCHEM work addressed cross-media transfer generally; Issue 004 applies it to asset-service decisions and cycle economics.

DECISION INTERPRETATION

Track residual recovery and cleaning wastes per returned container or batch where materiality warrants.

CONTROL ACTION

Add residual/wash/burn-off outputs to the reconditioning service record and economic model.

REQUIRED RECORDS

Recovered heel; wash water; sludge; burn-off residue/emission controls; energy; waste codes; destinations; number of units processed.

AUDIT / ESCALATION TRIGGER

Escalate "zero-waste packaging" claims that omit cleaning/reconditioning residuals.

Sources: C4-EV-006, C4-EV-007; prior COLCHEM continuity | Claim: CEPA-CL-COLCHEM004-P28

Safety and emergency control for returned packaging

CEPA-CL-COLCHEM004-P29

KEY

Returned packaging can contain residues, vapours or incompatible materials; receiving and opening controls must assume uncertainty until status is verified.

TECHNICAL BASIS

EPA damage-case evidence includes fires, explosions and spills in drum-reconditioning contexts. DOT/RCRA statuses answer specific legal questions but do not remove site risk-assessment duties.

DECISION INTERPRETATION

Create a controlled receiving quarantine and verification step before cleaning, repair or hot work.

CONTROL ACTION

Define segregation, grounding/bonding where applicable, gas/residue assessment, PPE and emergency response based on site hazards.

REQUIRED RECORDS

Prior lading; SDS/hazard data; residual status; container condition; receiving inspection; gas testing where required; incident plan.

AUDIT / ESCALATION TRIGGER

Escalate unknown-lading or damaged containers into a defined exception process rather than normal reuse flow.

Sources: C4-EV-001, C4-EV-002, C4-EV-006 | Claim: CEPA-CL-COLCHEM004-P29

Claims: reusable, reconditioned, recycled and circular

CEPA-CL-COLCHEM004-P30

KEY

Packaging claims must state the actual event being evidenced: design for reuse, return, reconditioning, refill, material recycling or verified repeated use.

TECHNICAL BASIS

PPWR provides formal reusable-packaging/reuse-system concepts, while U.S. waste/transport law uses different status terms. "Circular" is not a substitute for these specific states.

DECISION INTERPRETATION

Use claim-specific denominators and outcomes. A reusable design with no completed rotations should not be reported as achieved reuse.

CONTROL ACTION

Create a packaging-claims dictionary tied to evidence fields and public-reporting rules.

REQUIRED RECORDS

Claim text; definition; denominator; period; source system; exclusions; verification; legal market/jurisdiction.

AUDIT / ESCALATION TRIGGER

Escalate claims that combine design potential, return rate and actual refill into one percentage.

Sources: C4-EV-004, C4-EV-005; CEPA claim control | Claim: CEPA-CL-COLCHEM004-P30

Packaging evidence dossier

CEPA-CL-COLCHEM004-P31

KEY

A reusable-packaging program is auditable only when each legal/technical status can be reconstructed from source records.

TECHNICAL BASIS

The dossier should separate waste status, transport qualification, PPWR/reuse-system applicability, technical condition, cleaning/reconditioning, receiver acceptance and economic data.

DECISION INTERPRETATION

One dossier template can serve operations, EHS, quality, procurement and ESG without collapsing their different evidence questions.

CONTROL ACTION

Create an issue-ready dossier at container, batch or fleet level proportional to risk/materiality.

REQUIRED RECORDS

Applicability map; asset records; inspections/tests; residuals; contracts; receiver evidence; KPIs; incidents; claims; source citations.

AUDIT / ESCALATION TRIGGER

Escalate any KPI or claim that cannot be reconstructed to underlying asset/service events.

Sources: C4-EV-001..007; CEPA evidence standard | Claim: CEPA-CL-COLCHEM004-P31

Executive fleet dashboard

CEPA-CL-COLCHEM004-P32

KEY

The dashboard should distinguish logistics, safety/quality, regulatory status, asset productivity and environmental outcomes.

TECHNICAL BASIS

Recommended indicators include return rate, successful-cycle rate, rejection rate/reasons, overdue tests, lost assets, average/median cycles, reconditioning yield, cleaning-resource intensity and cost per successful cycle.

DECISION INTERPRETATION

Display absolute counts beside percentages so denominator shifts do not create false improvement.

CONTROL ACTION

Publish one controlled KPI dictionary and trend by format/site/product class.

REQUIRED RECORDS

Metric formulas; numerator/denominator; data source; owner; period; uncertainty; target/control limit rationale.

AUDIT / ESCALATION TRIGGER

Escalate metrics with changing denominators or unexplained improvements driven by scrapping difficult units.

Sources: C4-EV-001..007; CEPA metrics | Claim: CEPA-CL-COLCHEM004-P32

Failure-mode register

CEPA-CL-COLCHEM004-P33

KEY

A mature reuse system learns from failure modes such as residue nonconformance, incompatible lading, structural damage, failed leak test, lost identity, overdue qualification and logistics loss.

TECHNICAL BASIS

These failures affect different controls and costs; aggregating them as "not reused" prevents corrective action.

DECISION INTERPRETATION

Use a controlled failure taxonomy and root-cause field tied to corrective actions.

CONTROL ACTION

Review top failure modes monthly and feed them into packaging design, customer instructions and provider qualification.

REQUIRED RECORDS

Failure code; asset; cycle; prior lading; site/route; root cause; action; recurrence; cost; final disposition.

AUDIT / ESCALATION TRIGGER

Escalate repeat high-severity failures or any trend linked to one design, route or service provider.

Sources: C4-EV-002, C4-EV-003, C4-EV-006, C4-EV-007 | Claim: CEPA-CL-COLCHEM004-P33

Reuse-route decision tree

CEPA-CL-COLCHEM004-P34

KEY

A reusable container should pass legal/status, safety, compatibility, condition, test and next-use gates before cost or sustainability preference decides the route.

TECHNICAL BASIS

The decision tree prevents RCRA-empty status, return status or visual cleanliness from short-circuiting later transport/product-quality controls.

DECISION INTERPRETATION

The output should be one of: release as permitted, clean/recondition/retest, reassign to qualified compatible service, recycle with receiver acceptance, or other lawful disposition.

CONTROL ACTION

Implement the tree in the return SOP and electronic workflow.

REQUIRED RECORDS

Gate results; supporting evidence; exception approval; final route; next event.

AUDIT / ESCALATION TRIGGER

Escalate manual overrides of hard legal/safety gates or repeated exceptions without corrective action.

Sources: C4-EV-001..006; CEPA method | Claim: CEPA-CL-COLCHEM004-P34

Closed-loop pilot and qualification gates

CEPA-CL-COLCHEM004-P35

KEY

Fleet scale-up should follow demonstrated qualification gates rather than a generic time-based rollout.

TECHNICAL BASIS

Gate A - Baseline: map formats, applicable rules, asset identity, current return paths and failure data. Gate B - Controlled pilot: select a traceable format/customer loop, validate inspection, cleaning/reconditioning, test, release, return and evidence handoffs. Gate C - Scale: expand only after successful-cycle yield, reject causes, provider performance, asset loss and cost per successful cycle are stable enough to manage.

DECISION INTERPRETATION

This sequence prevents a public reuse target or large fleet purchase from outrunning the safety, compliance and data system needed to operate it.

CONTROL ACTION

Require formal gate acceptance by packaging engineering, EHS, quality, logistics/procurement and finance before expansion.

REQUIRED RECORDS

Baseline fleet; applicability matrix; pilot asset list; inspection/test/release records; return/refill outcomes; rejection causes; provider audit; cost; management gate decision.

AUDIT / ESCALATION TRIGGER

Escalate portfolio-scale commitments when the pilot cannot prove actual completed reuse cycles or when reject/loss reasons remain materially unexplained.

Sources: C4-EV-001..006; CEPA method | Claim: CEPA-CL-COLCHEM004-P35

Source register, claim index and future-territory guard

CEPA-CL-COLCHEM004-P36

KEY

The issue closes with a source/claim register and explicitly reserves future COLCHEM territory rather than consuming all packaging, chemistry or waste topics.

TECHNICAL BASIS

Issue 004 is limited to packaging service assurance. It does not reopen solvent/process-loss recovery, safer formulation, general wastewater treatment, product stewardship, or future chemical-policy topics except where needed to define packaging applicability.

DECISION INTERPRETATION

This boundary is a publication-control asset: future issues must review COLCHEM-001 through 004 before a new charter is accepted.

CONTROL ACTION

Archive the complete-series novelty audit with the final evidence package.

REQUIRED RECORDS

Source URLs/locators; claim IDs; novelty lineage; exclusions; unresolved questions; future-theme ledger.

AUDIT / ESCALATION TRIGGER

Escalate any final page or executive finding that materially recreates an earlier COLCHEM decision framework.

Sources: C4-EV-001..007; OPS-019 | Claim: CEPA-CL-COLCHEM004-P36

CEPA TECHNICAL INTELLIGENCE BRIEF | SOURCE REGISTER

Controlled source register

Official/current source spine used by this issue. Scope and applicability boundaries remain controlling.

C4-EV-001	40 CFR 261.7 - Residues of hazardous waste in empty containers 40 CFR 261.7(b)(1), (b)(3)	www.ecfr.gov
C4-EV-002	49 CFR 173.28 - Reuse, reconditioning and remanufacture of packagings 49 CFR 173.28(a)-(c)	www.ecfr.gov
C4-EV-003	49 CFR 180.352 - Retest and inspection of IBCs 49 CFR 180.352(b)-(g)	www.ecfr.gov
C4-EV-004	Regulation (EU) 2025/40 on packaging and packaging waste Arts. 26-30; Annex VI	eur-lex.europa.eu
C4-EV-005	Commission PPWR Guidance C/2026/3702 / OJ C 2026/3084 Guidance Items 18-21	eur-lex.europa.eu
C4-EV-006	U.S. EPA - Used Drum Management and Reconditioning Current EPA technical/regulatory context	www.epa.gov
C4-EV-007	U.S. EPA - Drum Reconditioner Damage Case Report Historical risk/context evidence	www.epa.gov
C4-EV-008	49 CFR 173.24 - General requirements for packagings 49 CFR 173.24(b), (e), (f)	www.ecfr.gov

Status sweep: 27 September 2026. Current-status/source-survivability check must be repeated at the T-3 release gate.

DECISION-GRADE TECHNICAL INTELLIGENCE

Evidence-bound. Source-traceable.

Built for engineering, operational and executive decisions.

PUBLICATION ACCESS

CEPA publications and controlled updates:

cepa.energy/publications

This brief is technical intelligence, not certification and not a substitute for jurisdiction-specific legal, regulatory, safety, food-safety or permit advice. Applicability remains source-, jurisdiction-, process- and evidence-boundary specific.



CORRECTION & PROVENANCE CONTROL

CEPA publication control preserves source provenance, claim lineage and correction evidence. Material source or technical changes reopen the affected claim and QA before a revised release.