

WATER-ACTIVATED PAPER-BASED ASH CONTAINMENT SYSTEMS

A Technical Framework for Extinguishment Validation,
Residue Control and Hospitality Deployment

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Cover image. Illustrative use scene showing the water-activated Ekoroll paper ashtray. The image is provided for public technical communication and does not constitute controlled test evidence.

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Public disclosure notice

This technical report provides a public and non-confidential account of the development, functional evaluation and intended operational use of the Ekoroll Disposable Paper Ashtray. More than 250 product units were functionally evaluated during successive development stages before the final production configuration was established. This report does not disclose confidential manufacturing geometry, supplier-specific process parameters, absorbent-core formulation details, tooling data or commercially sensitive information.

Performance statements are limited to developer-generated observations, documented product specifications and the validation scope expressly described herein. The product is intended exclusively for the controlled collection and extinguishment of cigarette butts and ash in designated smoking areas. This publication does not promote or encourage tobacco use.

Intellectual-property boundary

Publication of this report does not grant a licence to reproduce the product geometry, manufacturing process, branding, tooling, confidential material combinations or other Ekoroll intellectual property. All rights remain with their respective owners.

AT A GLANCE

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Executive summary

Cigarette-butt and ash management is a recurring operational challenge in hospitality, tourism, events and other high-traffic environments. Reusable ashtrays require collection, emptying, cleaning, storage and redistribution, while inadequately controlled cigarette waste can contribute to litter, residue dispersion, odour and fire-related risk. Tobacco-product filters containing plastic are specifically addressed by the European Union Single-Use Plastics Directive, and the WHO FCTC reports that approximately 4.5 trillion cigarette butts are littered globally each year [1-3].

This report documents the Ekoroll Disposable Paper Ashtray, a water-activated, fibre-dominant containment system designed for controlled use in designated smoking areas. The current configuration combines a 210 gsm paperboard body, a 12 gsm polyethylene moisture-resistant layer and a water-absorbent polymer core. The product has a nominal width of 90 mm, a unit weight of 4.9 ± 0.1 g and a standard packing format of 50 units per bag and 1,000 units per carton [4].

During iterative development, more than 250 units were functionally evaluated. Developer-generated trials established approximately 50 ml of water as the principal activation reference and demonstrated extinguishment and containment of up to 15 cigarette butts in the final product configuration. These observations are development evidence, not independent fire-safety certification.

The report introduces a repeatable framework for evaluating hydration, extinguishment, visible re-ignition, thermal behaviour, liquid leakage, sequential loading, structural stability, service-age performance and hospitality deployment. It also establishes clear claim boundaries: the product is described as paper-based and fibre-dominant, not plastic-free, compostable, biodegradable, fireproof or conventionally recyclable after use.

The principal technical position is that a disposable ashtray should be evaluated as an activated operating system. Performance depends on the interaction of the paperboard body, polymer coating, absorbent core, activation water, user action, staff monitoring and end-of-use handling.

PUBLIC CLAIM BOUNDARY

Internal development testing identified approximately 50 ml as the principal activation reference and demonstrated use with up to 15 cigarette butts. Controlled measurements and independent certification must be reported separately from these developer-generated findings.

SECTION 01

Problem definition and operational context

Cigarette-butt management is often treated as a minor cleaning issue. In practice, it is a multi-stage operational system involving user behaviour, receptacle availability, extinguishment, residue containment, collection, staff handling, temporary storage and final disposal.

1.1 Cigarette waste as an operational system

The performance of the system does not depend solely on whether an ashtray is physically present. It also depends on whether the receptacle is visible, stable, accessible, capable of receiving a glowing cigarette end, able to limit loose ash movement, easy for staff to deploy and suitable for controlled post-use handling.

DESIGN QUESTION

How can a complete cigarette-waste containment workflow support extinguishment, residue control, staff handling and high-volume deployment?

1.2 Public-health and environmental context

The WHO and WHO FCTC identify tobacco waste as an environmental problem extending beyond direct health effects. WHO FCTC materials report that approximately 4.5 trillion cigarette butts are littered each year, while cigarette filters are commonly made from cellulose acetate and can contribute microplastic pollution [1,2].

Directive (EU) 2019/904 identifies tobacco-product filters containing plastic as the second most frequently found single-use plastic items on European Union beaches and establishes awareness-raising and extended-producer-responsibility measures for this waste category [3]. This context supports the need for accessible waste-containment infrastructure, but it does not prove that any individual ashtray automatically reduces litter.

1.3 Limitations of conventional reusable ashtrays

Reusable ashtrays remain appropriate in many controlled settings. Their use nevertheless creates a recurring cycle of distribution, monitoring, collection, emptying, washing, drying, storage and redistribution. This cycle requires staff time, washing capacity and a defined handling procedure for contaminated ash and cigarette waste.

- Units may be moved, lost or damaged in high-traffic outdoor environments.
- Loose ash can disperse before collection, particularly in wind.
- Accumulated cigarette butts can create odour and visual contamination.
- Temporary events may lack nearby washing and storage infrastructure.

1.4 Limitations of passive paper containers

A conventional paper container cannot automatically be assumed to be suitable for receiving burning cigarette ends. Untreated paper is combustible, may weaken in contact with moisture and does not by itself provide a controlled extinguishing medium. The Ekoroll product should therefore be evaluated as a coupled paperboard, coating, absorbent-core and water-activation system rather than as a passive folded-paper receptacle.

1.5 Intended system response

Stage	Intended response
Activation	Approximately 50 ml of water is introduced before service and taken up by the absorbent core.
Use	The glowing cigarette end is placed directly into contact with the hydrated receiving medium.
Temporary containment	Extinguished cigarette butts, ash and associated residue remain within the product body.
Collection	Staff remove the complete used unit without emptying or washing it and follow local cigarette-waste procedures.

SECTION 02

Product and system architecture

The Ekoroll Disposable Paper Ashtray is defined as a water-activated, single-use ash-containment system. The manufactured dry article becomes an activated operating system only after the specified quantity of water is added and the intended deployment procedure is followed.



Figure 1. Product views showing the dry and activated Ekoroll Disposable Paper Ashtray configurations. Conceptual illustration; not to scale and not presented as controlled validation evidence.

2.1 Documented physical configuration

Parameter	Documented specification
Product type	Disposable paper ashtray
Nominal width	90 mm
Unit weight	4.9 g $\pm$ 0.1 g
Paperboard basis weight	210 gsm
Polyethylene coating	12 gsm
Absorbent component	Water-absorbent resin / superabsorbent polymer
Standard packaging	50 units per bag; 1,000 units per carton

These values are taken from the current product specification [4]. The available material safety documentation describes the unused article as approximately 85-90% natural pulp paper, 8-10% polyethylene and 2-5% water-absorbent resin by weight [5]. These formulation ranges are documented values rather than independent analytical measurements performed for this report.

2.2 Coupled system elements

No single element independently provides the complete intended function. The paperboard body provides geometry and a printable exterior; the polyethylene layer supports moisture management; the dry absorbent core requires water activation; water without containment would remain mobile; and the operating procedure determines whether a glowing cigarette end reaches the hydrated medium.

2.3 Fibre-dominant body

Natural pulp paper is the principal documented material by weight. The paperboard body provides three-dimensional form, supports the absorbent material, permits compact stacking and allows the entire used unit to be removed without emptying its contents. Fibre dominance does not mean the product is plastic-free.

2.4 Moisture-resistant layer

The documented 12 gsm polyethylene coating is a moisture-management component. Its intended role is to reduce immediate water penetration into the paperboard, preserve the container geometry during service and support retention of activation water. It is not described as a fire barrier, and its presence creates an important end-of-life limitation for paper recycling.

2.5 Water-absorbent polymer core

The base contains water-absorbent resin, commonly described as a superabsorbent polymer. The available MSDS describes this component as physically absorbing water without a chemical reaction under normal use [5]. The public report evaluates the core by observable system function and does not disclose confidential formulation, particle characteristics, supplier identity or process parameters.



Figure 3. Conceptual exploded-view illustration of the paperboard body, moisture-management layer and absorbent core. Conceptual illustration; not to scale and not presented as controlled validation evidence.

2.6 Capacity as a system property

Capacity is not determined solely by external width or geometric volume. Practical capacity depends on usable base area, absorbent expansion, cigarette orientation, ash distribution, available wet surface and whether later cigarette ends can maintain direct contact with the hydrated core.

Capacity concept	Definition
Physical capacity	The number of cigarette butts that can fit inside the product.
Functional capacity	The number that can be extinguished and contained under the tested conditions.
Operational capacity	The number suitable before replacement while preserving access, residue control, appearance and handling.

CURRENT CAPACITY POSITION

Maximum internally demonstrated loading: up to 15 cigarette butts. Provisional routine operating range: approximately 10-12 cigarette butts. The final recommended replacement threshold remains subject to documented confirmation and site-specific requirements.

SECTION 03

Water activation and extinguishment mechanism

The functional mechanism described here is an engineering model based on the product architecture, documented material composition and developer-observed testing. It is not presented as an independently certified fire-science model.



Figure 4. Illustrative water-addition step before deployment. The image does not establish the exact measured water volume. Conceptual illustration; not to scale and not presented as controlled validation evidence.

3.1 Activation sequence

1. Inspect the dry unit for crushing, tearing, missing absorbent material or visible contamination.
2. Place it on a stable level preparation surface.
3. Add approximately 50 ml of clean water gradually into the base.
4. Allow the absorbent core to become substantially hydrated.
5. Confirm that excessive free liquid is not present.
6. Transfer the activated unit carefully to the designated smoking area.

3.2 Hydration behaviour

The absorbent core is intended to convert a portion of the added water from freely mobile liquid into a retained hydrated medium. Expected benefits include increased distribution of moisture, improved direct contact with cigarette ends, partial immobilisation of ash and reduced splashing compared with an open container of free water.

Hydration behaviour can vary with actual SAP quantity, particle distribution, water temperature, water volume, activation time, storage conditions and production variation. The controlled protocol therefore compares 40 ml, 50 ml and 60 ml conditions.

3.3 Direct cigarette-end contact



Figure 5. Activated product with a cigarette end positioned for direct contact with the hydrated receiving medium. Conceptual illustration; not to scale and not presented as controlled validation evidence.

Extinguishment performance depends on actual contact between the glowing cigarette end and the wet receiving medium. Passive placement on accumulated dry material may not provide the same contact condition. The user instruction should therefore require direct contact and visual confirmation that glowing and smoke have ceased.

3.4 Extinguishment criteria

Observation	Recorded criterion
T1	Disappearance of visible flame, where present
T2	Disappearance of visible glowing
T3	Cessation or substantial reduction of visible smoke
T4	Completion of the defined re-ignition observation period

Visible flame alone is not a sufficient criterion because a cigarette may continue to smoulder after the flame disappears. The proposed re-ignition observation points are 30 seconds, 1 minute, 5 minutes and 10 minutes.

3.5 Sequential loading and moisture retention

Each additional cigarette changes the internal condition: wet surface can become obstructed, butts may overlap, ash can form a drier upper layer and heat may be transferred to previously deposited material. The protocol therefore evaluates cumulative loading at 1, 5, 10, 12 and 15 cigarette butts and service-age intervals up to four hours.

3.6 Potential failure modes

Failure mode	Possible cause
Incomplete hydration	Insufficient water or poor distribution
Free liquid accumulation	Excess water or insufficient absorption
Base leakage	Coating damage, seam defect or prolonged exposure

Failure mode	Possible cause
Wall deformation	Excessive moisture or insufficient stiffness
Incomplete extinguishment	Poor contact with the hydrated core
Re-ignition	Residual heat or movement away from wet material
Capacity obstruction	Excess accumulation of butts and ash
Premature drying	Extended exposure, heat or airflow

SECTION 04

Development and evidence record

More than 250 individual ashtray units were functionally evaluated during iterative development of the final production configuration. These evaluations were conducted to refine the product rather than to create a pre-registered statistical study, and complete numerical records are not available for every historical trial.

DEVELOPMENT AND PUBLICATION RECORD



Figure 6. Public development and publication record for Version 1.0.

4.1 Development period and status

The development and internal evaluation period documented in this report is January 2026 to July 2026. The public report publication date is 28 July 2026. These dates serve different purposes: the development period records the product-refinement programme, while the publication date records when the public technical report was issued.

4.2 Retrospective development-stage model

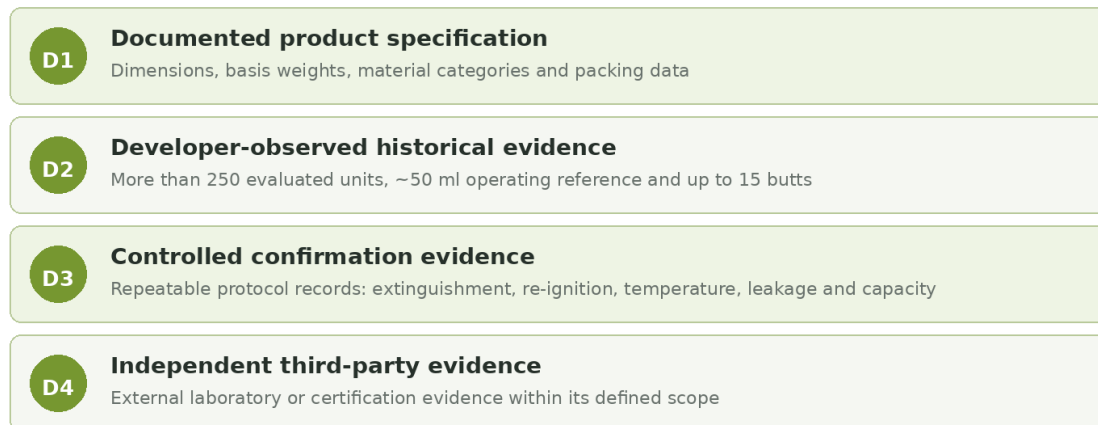
Stage	Principal focus
A - Structural body and geometry	Stability, internal area, opening width, wall height, stackability and print surface.
B - Moisture management and absorbent core	Interaction of paperboard, coating, absorbent material, water quantity and activated stability.
C - Extinguishment and multi-butt capacity	Direct contact, sequential loading, ash retention, structural integrity and practical capacity.
D - Deployment readiness	Packing, separation from stacks, water activation, distribution, monitoring, collection and custom printing.

4.3 Principal historical observations

Development parameter	Current historical observation
Units evaluated	More than 250 individual ashtrays
Principal activation-water reference	Approximately 50 ml
Maximum internally demonstrated loading	Up to 15 cigarette butts
Product status	Final production configuration
Evidence character	Developer-generated functional validation history

4.4 Evidence classification

EVIDENCE CLASSIFICATION



Claims in the report are labelled or worded to match the maturity of the supporting evidence.

Figure 7. Evidence classes used to match public wording to the maturity of supporting information.

4.5 Claim-to-evidence map

Public statement	Evidence class	Reporting status
Nominal width, weight, paperboard and coating values	D1	Documented
More than 250 units evaluated	D2	Developer-reported
Approximately 50 ml operating reference	D2	Developer-observed; D3 confirmation planned
Up to 15 cigarette butts internally tested	D2	Developer-observed; D3 confirmation planned
Controlled extinguishment time	D3	Pending traceable records
Product is fireproof	None	Prohibited claim
Product is plastic-free	Contradicted by documented composition	Prohibited claim
Product is compostable or conventionally recyclable after use	No supporting complete-product evidence	Not claimed

4.6 Historical-data limitations

- Not every unit was assigned a unique test identification number.
- Conditions were not identical across all 250-plus evaluations.
- Cigarette type, burn length, airflow and ambient conditions were not constant in every historical trial.
- Exact extinguishment times and re-ignition observations were not recorded for every unit.
- The historical programme was primarily intended to improve the product, not produce a publishable statistical dataset.

These limitations do not invalidate the development experience. They define why the repeatable controlled confirmation protocol in the next section is necessary.

SECTION 05

Controlled functional confirmation protocol

PROTOCOL IDENTITY

EKR-TP-2026-02 - Functional Confirmation Protocol for a Water-Activated Paper-Based Ash Containment System. Related report: EKR-TR-2026-02. Primary configuration: standard final-production version. Reference water volume: 50 ml. Comparison volumes: 40 ml and 60 ml. Maximum loading condition: 15 cigarette butts.

CONTROLLED CONFIRMATION WORKFLOW



Critical observations: sustained body ignition, visible re-ignition, uncontrolled leakage, rupture, instability or unsafe heat transfer.

Version 1.0 records the protocol and developer-generated findings. Controlled results are reported only where traceable records exist.

Figure 8. Controlled confirmation workflow for traceable testing of the final product configuration.

5.1 Objective and safety requirements

The protocol is designed to assess water uptake, extinguishment, residual glowing, re-ignition, sequential loading, leakage, thermal behaviour, moisture retention, structural integrity, tilt tolerance and premium-version equivalence. It is not an accredited fire-safety certification.

- Conduct tests on a non-combustible surface with a metal safety tray.
- Maintain immediate access to water and an appropriate fire extinguisher.
- Use ventilation, protective gloves, eye protection and heat-resistant handling tools.
- Remove unnecessary combustible materials and supervise continuously.
- Stop immediately if the paper body sustains flame, uncontrolled leakage occurs, the unit becomes unstable or the supporting surface overheats.

5.2 Test articles and sample allocation

The primary programme allocates 60 final-production units, preferably from one identified production batch. A later second-batch study using 20-30 additional units is recommended to assess production repeatability.

Test group	Condition	Samples
A - Hydration and leakage	40 / 50 / 60 ml	12
B - Single-butt extinguishment	40 / 50 / 60 ml	12
C - Sequential loading	50 ml; 1, 5, 10, 12 and 15 butts	20
D - Service-age performance	50 ml; 30 min, 1 h, 2 h and 4 h	8
E - Premium equivalence	50 ml	4
F - Reserve and repeats	As required	4
Total		60

5.3 Required equipment and conditioning

- Verified digital scale and graduated measuring device

- Digital stopwatch and room-condition instruments
- Non-contact infrared thermometer or thermal camera
- Metal tray, leakage-detection paper and angle-adjustable platform
- Camera or smartphone with timestamp capability
- Sample labels, gloves, tongs and controlled waste container

Samples should be conditioned for at least 24 hours at a target temperature of 20-25°C and relative humidity of 40-65%. Actual conditions and any equipment limitations must be recorded.

5.4 Test Group A - Hydration and leakage

1. Record sample identification and dry weight.
2. Place the product on leakage-detection paper within a metal tray.
3. Add 40 ml, 50 ml or 60 ml according to the assigned condition.
4. Observe at 30 seconds, 1 minute, 3 minutes, 5 minutes, 15 minutes, 30 minutes, 1 hour, 2 hours and 4 hours.
5. Record free liquid, hydration uniformity, deformation, external dampness, leakage and ability to lift the unit without rupture.

Hydration score	Observation
0	Core remains substantially dry
1	Uneven or incomplete hydration
2	Substantial hydration with some dry zones
3	Uniform functional hydration - desired nominal response
4	Hydration accompanied by excessive free liquid

5.5 Test Group B - Single-butt extinguishment

1. Activate the sample using the assigned water volume and defined hydration period.
2. Prepare one cigarette in a consistent combustion condition.
3. Place the glowing end directly into contact with the hydrated core.
4. Record T1, T2 and T3, then observe for visible re-ignition at 30 seconds, 1 minute, 5 minutes and 10 minutes.
5. Record external-base and supporting-surface temperature, body damage, leakage and final result.

CRITICAL FAILURE CONDITIONS

Sustained flame in the product body, continued visible glowing after the defined intervention, visible re-ignition during the ten-minute observation period, uncontrolled leakage, structural rupture, instability or unsafe heat transfer.

5.6 Test Group C - Sequential-loading capacity

Condition	Cumulative loading	Replicates
C1	1 cigarette butt	4
C2	5 cigarette butts	4
C3	10 cigarette butts	4
C4	12 cigarette butts	4
C5	15 cigarette butts	4

Butts should be introduced sequentially at a consistent interval, initially proposed as 3-5 minutes, while recording access to the hydrated core, ash accumulation, overlap, wall and base condition, leakage, stability, ease of inserting the next cigarette and ease of lifting the complete unit.

5.7 Service-age, tilt and thermal observations

Service-age tests evaluate performance after waiting periods of 30 minutes, 1 hour, 2 hours and 4 hours following 50 ml activation. Selected units are also observed at 15-degree and 30-degree tilt for movement of free liquid, ash escape, sliding, tipping and loss of containment.

Temperature point	Timing
Activated contact zone / external base / sidewall / supporting surface	Before insertion; first contact; 10 s; 30 s; 1 min; 5 min

5.8 Structural-integrity score and result classification

Score	Condition
0	No visible structural change
1	Minor softening or cosmetic deformation
2	Noticeable deformation but unit remains stable and liftable
3	Major deformation or impaired handling
4	Rupture, collapse or loss of containment

A nominally acceptable result should remain within Scores 0-2. Results are classified as Pass, Conditional Pass or Fail. Invalid tests are retained in the record with the reason for invalidation and are repeated using reserve samples.

5.9 Data-record template

Record group	Required fields
Traceability	Sample ID, production batch, product version, date and operator
Activation	Dry weight, water volume, water temperature and hydration period
Environment	Ambient temperature, humidity and airflow condition
Cigarette	Test code, dimensions, burn condition and cumulative butt number
Performance	T1, T2, T3 and re-ignition observations
Physical response	Temperatures, leakage, tilt stability, structural score and ash escape
Evidence	Photograph references, video reference, deviation, final result and comments

SECTION 06

Development findings and claim status

Version 1.0 separates documented product characteristics, developer-observed historical findings and controlled confirmation results. No numerical result is inserted merely to complete a table or support a marketing claim.

6.1 Available findings

Parameter	Current finding	Evidence
Nominal width	90 mm	D1
Unit weight	4.9 g $\pm$ 0.1 g	D1
Paperboard / coating	210 gsm / 12 gsm PE	D1
Absorbent component	Water-absorbent resin / SAP	D1
Development units	More than 250	D2
Principal water reference	Approximately 50 ml	D2
Maximum internally demonstrated loading	Up to 15 cigarette butts	D2
Controlled extinguishment time	Pending traceable confirmation	D3 pending
Controlled re-ignition pass rate	Pending traceable confirmation	D3 pending
Controlled thermal and leakage profile	Pending traceable confirmation	D3 pending

6.2 Water-activation finding

Internal development testing established approximately 50 ml as the principal activation reference for the final 90 mm configuration. Practical observations included substantial hydration of the core, retention of usable internal space and acceptable developer-observed handling. This does not establish that exactly 50 ml is the only safe or effective volume under all conditions.

6.3 Capacity and extinguishment findings

The final product configuration was internally tested with up to 15 cigarette butts. Historical trials demonstrated practical extinguishment when the glowing portion was placed into direct contact with the hydrated absorbent core. The historical records do not constitute a complete standardised dataset of extinguishment time, cigarette type, contact pressure, environmental condition and ten-minute re-ignition for every trial.

RECOMMENDED PUBLIC WORDING

Internal development trials demonstrated practical extinguishment of cigarette ends when the glowing portion was placed into direct contact with the hydrated absorbent core. The final configuration was evaluated with up to 15 cigarette butts under developer-observed conditions.

6.4 Residue containment, structure and leakage

The hydrated core is intended to help retain cigarette butts, loose ash, small combustion particles and residual moisture. The final architecture was selected after repeated evaluation of the interaction between water, absorbent material, coating and paperboard. No recurrent uncontrolled leakage was identified by the developer as a characteristic of normal internal use, but a statistically defined leakage rate remains pending controlled confirmation.

6.5 Thermal and service-duration boundaries

No developer-reported sustained ignition of the correctly activated final configuration was identified as a normal operating outcome. This does not establish a formal fire-performance classification, and the paper and polymer components must not be described as non-combustible. No fixed all-day service duration is claimed because moisture retention depends on temperature, sunlight, airflow, humidity and loading.

6.6 Controlled confirmation status

Test	Version 1.0 status
40 / 50 / 60 ml hydration and leakage	Protocol defined; traceable dataset pending
Single-butt extinguishment and 10-minute re-ignition	Protocol defined; traceable dataset pending
Sequential loading at 1, 5, 10, 12 and 15 butts	Protocol defined; traceable dataset pending
Service-age performance to four hours	Protocol defined; traceable dataset pending
Premium-version equivalence	Protocol defined; traceable dataset pending

A later revision may replace pending status with measured results. Version 1.0 remains a valid public technical report because it documents the development evidence, product architecture, claim boundaries and repeatable validation framework without fabricating data.

SECTION 07

Hospitality deployment and operational workflow

The product is intended to simplify ashtray deployment in selected managed hospitality and event environments. The operational objective is not merely to replace one material with another, but to restructure the service cycle.

Reusable workflow	Water-activated disposable workflow
Distribution → use → monitoring → collection → emptying → washing → drying → storage → redistribution	Dry storage → on-site activation → distribution → use → monitoring → complete-unit collection → controlled disposal

7.1 Storage and activation station

Dry products should remain in protective packaging, away from moisture, excessive heat, ignition sources and crushing. A high-volume venue may establish a dedicated activation station with dry units, a fixed-volume water dispenser, a clean tray, gloves, replacement stock and operating instructions. This equipment should remain clearly separated from food and beverage service tools.

7.2 Placement and monitoring

- Place on a level surface away from table edges and flammable decorations.
- Protect from strong wind, uncontrolled rain and direct sun where practical.
- Keep within designated smoking areas and where staff can inspect it.
- Replace before the hydrated core becomes obstructed, visibly dry, unstable, leaking or aesthetically unacceptable.
- Use the 10-12 butt range as a provisional routine replacement guide rather than treating 15 as a mandatory target.



Figure 9. Multiple activated units illustrating distributed deployment in managed hospitality environments. Conceptual illustration; not to scale and not presented as controlled validation evidence.

7.3 User and staff instruction

USER-FACING INSTRUCTION

WATER-ACTIVATED ASHTRAY. Place the glowing end directly into the hydrated base. Ensure the cigarette is fully extinguished. Do not intentionally burn the container.

1. Visually confirm that no cigarette remains actively glowing.
2. Allow additional cooling time where necessary.
3. Lift the complete unit from beneath without squeezing or tipping.
4. Place it in a designated cigarette-waste collection container.
5. Replace it with a newly activated unit where service continues.
6. Wash hands or change gloves after handling.

7.4 Branding and communication

The printable exterior can carry venue identity, disposal instructions, anti-litter messaging, sponsor graphics and multilingual safety communication. Branding should not obscure the direct-contact and full-extinguishment instructions and must comply with applicable restrictions on tobacco advertising.

7.5 Suggested field pilot

Pilot parameter	Recommended starting point
Duration	7-14 days
Locations	2-5 designated smoking areas
Units	100-250 ashtrays
Recorded variables	Activation time, replacement interval, average butt count, leakage, structural failures, staff feedback, user misuse, waste volume and weather conditions

A field pilot should compare the activated disposable workflow with the venue's existing reusable-ashtray process. Environmental, litter-reduction or labour-saving claims should not be finalised without comparative operational data.

SECTION 08

Material composition and end-of-life limitations

The unused product is a fibre-dominant composite article containing natural pulp paper, polyethylene and water-absorbent polymer, together with printing or production materials where applicable [4,5]. It is not a mono-material paper product.

8.1 Plastic-free, biodegradability and compostability claims

A plastic-free claim is not appropriate because the documented construction includes polyethylene and superabsorbent polymer. No biodegradability or compostability claim is made because the complete product has not been certified under a defined standard and the used unit contains cigarette filters, ash, moisture and combustion residue.

Acceptable wording	Wording not used
Paper-based; fibre-dominant; water-activated ash-containment system	Plastic-free; zero plastic; 100% natural; polymer-free
Material composition transparently disclosed	Biodegradable, compostable or environmentally harmless without complete-product evidence
Controlled disposal after use	Conventionally recyclable after use without local acceptance

8.2 Recyclability and used-product condition

The dry unused article cannot automatically be assumed to be compatible with conventional paper recycling because it includes a polyethylene coating and superabsorbent polymer. After service, cigarette filters, ash, tobacco residue, absorbed water, odour and combustion by-products create additional contamination and hygiene limitations. The used unit should not enter paper recycling unless an authorised local operator expressly confirms acceptance.

8.3 Environmental claim boundary

The product may provide operational and litter-control value where it increases receptacle availability, helps contain residue or avoids washing and redistribution in temporary locations. These potential benefits cannot automatically be converted into lower-carbon, lower-water-use, reduced-plastic or circularity claims. Such claims require transparent comparative system data.

8.4 Future material pathways

- Lower-polymer moisture-barrier systems
- Alternative fibre-compatible absorbent structures
- Reduced material mass and improved component separation
- Higher recycled-fibre content where technically appropriate
- End-of-life pathways designed with specific waste operators

Any material change must be revalidated for water retention, structural integrity, heat exposure, leakage, storage, printing, manufacturing consistency and extinguishment performance. A material should not be substituted solely because it appears environmentally preferable in isolation.

END-OF-LIFE POSITION

The current product is best described as a fibre-dominant, polymer-containing, single-use cigarette-waste containment article intended for controlled disposal after use.

SECTION 09

Safety, documentation and compliance scope

Safety assessment must distinguish between the unused dry article, the water-activated product during intended use and the used article containing cigarette butts, ash, moisture and combustion residue. Documentation applicable to the unused article does not automatically establish the behaviour or waste classification of the activated or used system.

9.1 Existing documentation package

The current package includes a product specification, an MSDS and a technical-documentation package identifying supporting Eurofins, SGS and coating-related documents [4-6]. These documents may support selected material or analytical statements within their defined scope. They do not independently establish extinguishment, re-ignition prevention, safe capacity, service duration, activated structural performance or universal market approval.

9.2 Material-safety boundary

The available MSDS describes the unused product as a solid manufactured article and states that it is not classified as a hazardous substance or mixture under the referenced GHS approach. It also states that the product is intended for ashtray use and should not be intentionally burned [5]. This does not mean that smoke from burning product components is harmless or that used cigarette waste requires no hygiene control.

9.3 Water-assisted extinguishment principle

United States Fire Administration guidance advises that cigarettes should be put out completely and that water should be placed on ashes and cigarette butts before disposal [7]. The Ekoroll system applies this general water-assisted principle through a hydrated absorbent medium. Alignment with general safety guidance is not official approval or endorsement of the product.

9.4 Fire-safety and use boundary

Product position	Boundary
Intended use	Controlled receipt and water-assisted extinguishment of cigarette butts and ash in a correctly activated unit.
Not claimed	Fireproof, non-combustible, flame-proof, fire-certified or guaranteed to prevent fires.
Not intended for	Charcoal, candles, combustible liquids, fireworks, deliberate ignition, food preparation or general waste.

9.5 Market and regulatory scope

This report is not a market-authorisation document. Commercial deployment can be affected by general product-safety legislation, fire-safety and smoking-area rules, waste-management requirements, tobacco-advertising restrictions, environmental-claim rules, workplace requirements and importer or distributor obligations. Suitability must be evaluated by the responsible economic operator in each market.

9.6 Recommended supporting document set

1. Product Specification
2. Material Safety Data Sheet
3. Functional Validation Protocol - EKR-TP-2026-02
4. Functional Validation Dataset - EKR-TD-2026-02
5. Technical Report - EKR-TR-2026-02
6. Applicable analytical and coating documents
7. Batch and production traceability record
8. User and staff operating instructions
9. Packaging and labelling specification

SECTION 10

Risk assessment and failure-mode controls

This preliminary use-risk assessment is based on the intended operating sequence, product architecture, historical development observations and foreseeable misuse. It is not a substitute for a legally required market-specific risk assessment or independent fire-safety assessment.

10.1 Qualitative risk model

Dimension	Low	Medium	High
Severity	Minor operational inconvenience or cosmetic effect	Loss of containment, product damage or limited exposure requiring intervention	Potential ignition, burn injury, uncontrolled hot waste or significant failure
Likelihood	Unlikely under correct intended use	Foreseeable where preparation or monitoring is inconsistent	Expected where a key operating requirement is ignored

10.2 Preliminary risk-control table

Hazard / failure	Foreseeable cause	Required controls
Use without water	Operator omission or unclear instruction	Visible ADD WATER instruction, measured activation step and staff training
Insufficient water	Unmeasured pouring or leakage	Nominal 50 ml dispenser and activation inspection
Excessive water	Uncontrolled filling or rain	Fixed-volume dispenser, shelter and rejection of visibly overfilled units
Poor cigarette contact	Butt placed on accumulated dry material	Direct-contact user instruction and staff monitoring
Re-ignition	Residual heat or movement away from wet core	Observation, extinguishment confirmation and controlled collection
Overfilling	Delayed replacement	Provisional 10-12 butt replacement guide and visual inspection
Structural softening	Long service time, rain or excess water	Protected placement and defined service monitoring
Base leakage	Damage, defect or prolonged exposure	Pre-use inspection, leakage testing and suitable collection surface
Tipping / sliding	Uneven surface, wind or impact	Level placement, wind protection and distance from table edges
Premature disposal	Butt remains hot	Confirm no visible glow before transfer to cigarette-waste container
Mixing with food-service equipment	Poor operational separation	Dedicated activation and collection equipment
Child access	Inadequate location control	Controlled designated smoking areas and supervision

10.3 Safety-critical controls

1. Add approximately 50 ml of water before use.
2. Verify that the absorbent core is hydrated.
3. Place the glowing cigarette end directly into the wet medium.
4. Do not intentionally ignite the product.
5. Replace before overfilling, drying, leakage or structural deterioration.
6. Confirm that no butt remains glowing before collection.
7. Lift the used unit from beneath without squeezing.
8. Follow the designated cigarette-waste procedure.



Figure 10. Conceptual handling illustration. This image does not represent a controlled leakage or tilt-validation result. Conceptual illustration; not to scale and not presented as controlled validation evidence.

10.4 Risk-review triggers

The assessment should be reviewed whenever the paperboard grade, coating, absorbent formulation, absorbent quantity, geometry, production method, printing system, recommended water volume, capacity statement, service duration, target market or user instruction changes. Any change affecting the functional architecture should trigger at least limited revalidation.

SECTION 11

Limitations and future validation

11.1 Version 1.0 limitations

1. The historical programme included more than 250 units, but not every unit was tested using one standardised protocol.
2. Complete numerical records are not available for every development-stage trial.
3. The approximately 50 ml reference and 15-butt maximum require structured confirmation across defined conditions.
4. A complete extinguishment-time, ten-minute re-ignition and thermal dataset is pending.
5. Wind, rain, low humidity, elevated temperature and multi-batch repeatability require further study.
6. No comparative life-cycle assessment has been performed.
7. No complete-product compostability, biodegradability, conventional recyclability or independent fire classification is claimed.

11.2 Controlled confirmation priorities

Priority	Work item
1	50 ml single-butt extinguishment and ten-minute re-ignition
2	Sequential loading at 5, 10, 12 and 15 cigarette butts
3	Leakage and structural integrity over four hours
4	External-base and supporting-surface temperatures
5	40 ml and 60 ml operating-margin comparison
6	Outdoor airflow and accelerated drying
7	Second-production-batch repeatability

11.3 Independent validation pathway

After internal confirmation, an independent programme may assess witnessed extinguishment, re-ignition, heat transfer, leakage, coating integrity, material composition, restricted substances and product-use instructions. The laboratory must receive the complete activated-system description; testing the dry article alone would not represent the intended operating configuration.

11.4 Comparative operational and environmental research

A future study could compare reusable ashtray collection, washing and redistribution with the water-activated disposable workflow. System boundaries should include material production, transport, activation water, cleaning water, detergent, staff operations, breakage or loss, waste transport and end-of-life treatment. Until such work is completed, the report limits itself to operational and containment observations.

SECTION 12

Public disclosure and intellectual-property boundary

12.1 Public information

- Product name, intended use and broad system architecture
- Nominal dimensions, unit weight and broad material categories
- Packaging quantities and approximate activation-water reference
- Historical evaluation of more than 250 units and maximum internally demonstrated loading
- Public validation methodology, limitations and non-confidential results

12.2 Confidential information

- Detailed dielines, production drawings and tooling data
- Supplier-specific process conditions and confidential material trade names
- Exact absorbent-core formulation, particle distribution and placement tolerances
- Unpublished cost structure, customer terms and confidential prototype records
- Quality-control tolerances not approved for public release

12.3 Purpose of publication

The publication establishes a dated technical record, communicates the development framework, distinguishes evidence from marketing claims, provides a repeatable validation methodology and supports technical review by customers, researchers and partners. It is not intended to disclose every detail required to manufacture the product.



Figure 11. Conceptual illustration of the hydrated absorbent medium and its intended residue-contact function. Conceptual illustration; not to scale and not presented as controlled validation evidence.

SECTION 13

Conclusion

The Ekoroll Disposable Paper Ashtray is a water-activated, fibre-dominant containment system developed for cigarette-butt and ash management in controlled hospitality and event environments. The final product configuration combines a 210 gsm paperboard body, a 12 gsm polyethylene moisture-resistant layer, a water-absorbent polymer core, a nominal width of 90 mm and a unit weight of 4.9 ± 0.1 g [4].

More than 250 units were functionally evaluated during iterative development. Developer-generated trials identified approximately 50 ml as the principal activation reference and demonstrated extinguishment and containment of up to 15 cigarette butts under the internal development conditions. These findings demonstrate product-development maturity but are not independent fire-safety certification.

The technical contribution lies in the integration of a lightweight paper-based container, moisture management, a hydrated receiving medium, repeated cigarette-butt containment and complete-unit collection. The product is accurately described as paper-based and fibre-dominant rather than plastic-free, compostable, fireproof or conventionally recyclable after use.

PRINCIPAL CONCLUSION

A disposable ashtray should not be evaluated solely by its material category or physical capacity. Its performance depends on the combined interaction of product architecture, activation water, absorbent-core behaviour, direct user contact, staff monitoring and end-of-use handling.

Author and organisation

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SECTION 14

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SECTION 15

Appendix A - Functional validation record sheet

The following template is intended for traceable controlled confirmation under EKR-TP-2026-02. Original photographs and videos should be retained separately from edited promotional media.

Record group	Fields
Traceability	Sample ID; production batch; version; date; operator
Product state	Dry weight; visual inspection; damage or exclusion reason
Activation	Water volume; water temperature; activation start; hydration period
Environment	Ambient temperature; relative humidity; airflow condition
Cigarette article	Test code; length; diameter; filter; burn condition
Performance	T1 flame; T2 glow; T3 smoke; re-ignition at 30 s, 1 min, 5 min and 10 min
Thermal	Contact-zone, external-base and supporting-surface temperatures
Containment	Leakage, ash escape, tilt response and structural-integrity score
Evidence	Photo references; video reference; deviations; final result; comments

Suggested sample identification

TRACEABILITY CODE

EKR-AST-[BATCH]-[SAMPLE]. Examples: EKR-AST-B01-001, EKR-AST-B01-002 and EKR-AST-B01-003.

Result classification

Classification	Definition
Pass	All critical safety and containment criteria are met.
Conditional Pass	Primary function is achieved but a non-critical limitation is observed and disclosed.
Fail	A critical failure occurs, including body ignition, re-ignition, uncontrolled leakage, rupture, instability, inability to extinguish under the defined direct-contact condition or unsafe handling.
Invalid	The procedure or test article deviated materially; the record is retained and the test repeated.

SECTION 16

Appendix B - Visual communication note

The images used in this report are public technical and conceptual illustrations supplied for communication purposes. They are not presented as photographs from a controlled laboratory dataset unless expressly stated.



Figure 12. Illustrative user-facing visual concept for public communication; not technical validation evidence. Conceptual illustration; not to scale and not presented as controlled validation evidence.

Future revisions may replace or supplement conceptual illustrations with traceable test photographs linked to EKR-TD-2026-02. Such evidence should show sample identification, measured water volume, timestamps and unedited post-test conditions.

END OF REPORT