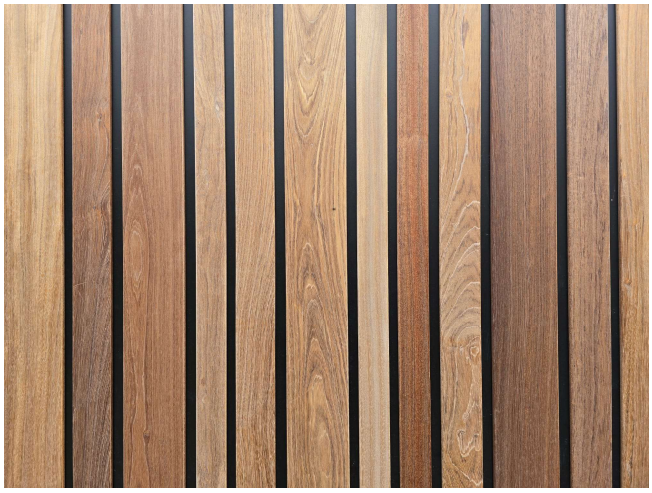

FORESTLINES®

PREMIUM

WHITEPAPER

A new generation of Circular, Fire-Safe &
Chemical Free Façade Engeneering

"Forestlines® is not merely a wood façade, it is a system engineered for purity, longevity and circularity"

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1. Executive Summary

Forestlines® introduces a new paradigm in biobased façade engineering.
Instead of relying on coatings, chemical fire retardants, polymers or composite binders, Forestlines® is built on material purity, structural stability, and complete mechanical demount ability.

The result is a façade system that is:

- Fire-safe without chemicals (End use – B-s1, d0 – EN 13501-1)
- Fully demountable and modular, enabling high-quality reuse
- Free of coatings, polymers, composites or microplastics
- Low maintenance, requiring no periodic schedule

Conservatively modelled in its LCA, with strong MKI performance

- Backed by hundreds of SBI tests, making it one of the most validated systems in Europe

Forestlines® is not a modified wood product.
It is a system engineered for long-term performance through simplicity and purity of materials.

Because of its chemical-free composition, pure material streams and high-quality reuse potential, Forestlines® aligns particularly well with stringent Scandinavian sustainability frameworks that prioritise material health and circularity over short-term carbon optimisation.

2. Design Philosophy

Forestlines® was engineered from the ground up according to one principle:

Achieve long-term fire, material and environmental performance without chemicals, coatings, or altered wood chemistry.

Core Principles

- Untreated wood only - no coatings, impregnation, or thermal/chemical modification
- Zero polymers - no adhesives, binders, resins or microplastics
- Mechanical demount ability - side-fixation preserves the wood during removal
- High-grade aluminium stability - ensures cavity control and repeatable fire performance
- Designed for reuse - 21 mm profiles reprofilable to 18 mm
- Fully compatible with recycled wood
- Conservative modelling across the LCA

3. System Architecture

3.1 Untreated Tropical Hardwood (e.g., Jatoba)

Selected for its:

- high density
- dimensional stability
- predictable pyrolysis
- natural durability

European species cannot reliably reach B-s1, d0 in ventilated façades without chemical treatments.
Jatoba offers inherently stable fire performance without additives.

Forestlines' weakest configuration retained its B-s1, d0 classification after one full year of EN 927-3 natural outdoor exposure, validated through a subsequent EN 13823 SBI test — the only decisive durability pathway within EN 16755.

3.2 Aluminium Stabilisation Profile

Aluminium provides:

- long-term geometric control (120+ years)
- cavity stability
- repeatability after decades
- full demount ability of wood profiles
- 95% closed-loop recyclability

The minimal aluminium content is applied in a fully separable manner and serves a single purpose: **unlocking the full performance potential of untreated wood**.

Powder coating (Qualicoat Seaside, approx. 85 µm) is chosen for high corrosion resistance with minimal environmental impact.
It burns off cleanly during remelting and does not impact recyclability.

3.3 Zero-Coating, Minimal-Maintenance Strategy

Forestlines® is designed to:

- age naturally
- avoid film-forming layers
- eliminate chemical degradation
- require no maintenance for technical performance

Aesthetic maintenance is optional.

4. Fire Performance Without Chemicals

Forestlines® uniquely combines:

- untreated wood
- no fire retardants
- no coatings
- validated fire reaction performance after natural weathering

4.1 Why No Fire Retardants?

Chemical fire retardants:

- degrade under UV, moisture and rainfall
- rapidly lose effectiveness outdoors
- contaminate recycling streams
- introduce polymers or salts
- violate natural material-cycle principles

Forestlines® avoids all such degradation mechanisms.

4.2 Test Validation

Independent testing includes:

- Hundreds of EN 13823 SBI tests
- EN 927-3 → validated B-s1, d0 retention
- Variation tests (gaps, moisture content, tolerances, geometry, etc.)

Forestlines® is one of Europe's most rigorously validated biobased façade systems.

5. Durability & Material Stability

5.1 Natural Wood Durability (Use Class 3)

Independent research has demonstrated that Jatoba achieves Durability Class 1 under EN 113-2, within Use Class 3 as defined by EN 335 (exterior application, not in ground contact).
This means that untreated, unmodified, natural wood reaches the highest possible durability classification for its application category, without any chemical treatment.

SBR guidelines indicate a reference lifetime of approximately 70 years for hardwoods in Durability Class I/II when installed in Use Class 3.
Forestlines® adopts a deliberately conservative approach by modelling a 60-year service life for the timber component.
Given the system's highly favourable installation conditions (including optimal ventilation, stress-controlled fixation and suitability for soffits and ceiling applications) this 60-year assumption should be viewed as highly conservative relative to both guideline values and real-world experience.

In Forestlines®, this inherent biological durability is further optimised through:
• Controlled ventilation and cavity behaviour
• Stress-minimising side fixation
• The aluminium stabilisation profile preventing deformation pathways
• The absence of coatings that could trap moisture

This synergy allows Jatoba to express its full long-term durability potential in exterior façades.

5.2 Wood Stability

The interaction between dense hardwood and the aluminium stabilisation profile provides:

- Prevention of cupping, twisting and gapping
- Reduced internal stress concentrations
- Elimination of screw-face cracking
- Safe and effective use of recovery sizes (short & narrow)
- Predictable and stable façade geometry over decades

Stability is essential not only for aesthetics but also for fire performance, circularity and real reuse.

5.3 Aluminium Lifetime

SBR guidance for metal substructures in ventilated façades indicates that aluminium can achieve service lifetimes of 120 years or more.

The profile provides stabilisation but carries no structural building loads, and in ventilated façade conditions it remains dimensionally stable and fully functional throughout this period.
In ceiling applications, where exposure to rain, UV and thermal cycling is minimal, the real-world lifetime is typically even longer and often extending well beyond the modelled 120–130 year range.

Forestlines® applies this conservatively by modelling a minimum of 120 years for the connector.

Because the connector is made from pure, fully separable aluminium, it enables closed-loop recycling without any loss of material performance.

6. Sustainability

Paulussen Houthandel BV is FSC® and PEFC® certified and an official partner of FSC® Netherlands.
The Jatoba used in our LCA originates from an FSC® concession with a 35-year harvesting rotation, where only a few trees per hectare are selectively harvested. Scientific study confirms that biomass in these forests is fully restored after approximately 22 years, more than a decade before harvesting returns to the same compartment. This constitutes controlled, regenerative forestry, maintaining ecological integrity and biodiversity. It is neither deforestation nor forest degradation.

Forestlines® actively promotes the use of Lesser-Known Timber Species (LKTS).
Of the roughly 58,000 wood species worldwide, only a few dozen are commercially used in the BENELUX. The stable geometry and controlled mechanical fixation of Forestlines® enable these species to be applied safely and predictably, increasing biodiversity both in the forest and in the built environment.

Forestlines® also maximises material efficiency:

- Recovery sizes (short and narrow boards) can be used without technical limitations, increasing the yield per log
- The continuous aluminium connector reduces cutting losses significantly at project level

Thus, wood is used in the optimal form, optimal application and with optimal yield, supporting ecological and material sustainability.

7. Circularity & High-Quality Reuse

Forestlines® is engineered for genuine reuse.

7.1 Enablers of Reuse

- Side-fixation → undamaged visible face
- 21 mm → 18 mm reprofile for second life
- No coatings, no chemicals, no polymers
- Aluminium structure reused for 120+ years

7.2 Current EPD Modelling

- EN 15804 + NMD require incineration modelling
- Reuse crediting requires a documented chain
- Forestlines® is developing a purchase guarantee for recovered wood (expected 2026)

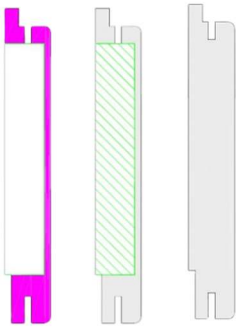
Recovered profiles retain usable dimensions, increasing reuse feasibility.

7.3 Second-Life Strategy and Module D Interpretation

Forestlines® currently shows a relatively high Module D benefit.
This is driven by two factors:

• Closed-loop aluminium recycling, which yields significant end-of-life credits
• Biomass energy recovery from the wooden component under today's EPD modelling rules, which require incineration as default (EN 15804 / NMD)

However, the system is engineered to delay incineration by several decades through high-quality reuse of the timber profiles.
During production, Forestlines® intentionally uses 17% more planed wood, resulting in a 21 mm profile instead of the common 18 mm. This additional thickness enables the profile to be mechanically resurfaced at end of life. The weathered surface can be removed, after which a clean, rectangular 18 mm profile is obtained, a dimension that meets the requirements of a very large share of the façade market.



As a consequence, the wooden profiles are technically suited for a second life, rather than being directed to energy recovery.
Current EPD frameworks do not yet model this high-quality reuse pathway, but upcoming revisions are expected to incorporate real reuse scenarios.
Forestlines® is preparing documentation chains to support this transition.

This approach shifts the end-of-life scenario from biomass energy (incineration) toward material preservation, strengthening the long-term circularity of the system.

8. Lifetime & LCA Modelling

8.1 120-Year Reference Service Life

Required by the Dutch NMD.

8.2 60-Year Wood Replacement (Conservative)

- SBR factor (ISO 15686) suggests ~70 years
- real-world performance often exceeds this
- ventilated cavity & absence of coatings extend life

8.3 CO_2 Accounting

- GWP-total (A–D): ~ +20 kg CO_2-eq/m²
- Biogenic Storage: ~ –24 kg CO_2-eq/m²

Values always communicated separately.

9. Comparative Positioning (Non-Numeric)

Aspect	Forestlines®	Typical Biobased Systems
Chemical fire retardants	No	Often required
Coatings	No	Frequently required
Microplastics	No	Present in composites
Wood modification	No	Common
Demount ability	High	Low
High-quality reuse	Yes	Rare
Long-term B performance	Stable	Declining

Frameworks such as A+ increasingly penalise composite, modified or polymer-bound systems. Forestlines® avoids these dependencies by design.

10. Future Developments

Upcoming developments include:

- Increased hardwood material efficiency
- Further optimisation of aluminium connectors
- Formalised and documented reuse networks
- Refinement of conservative EPD modelling

All improvements follow the system philosophy: realistic, conservative and material-pure.

11. Conclusion

Forestlines® sets a new benchmark in biobased façade engineering:

- Inherently fire-safe without chemicals
- Modular, demountable and circular by design
- Backed by unprecedented test validation
- Aligned with advanced sustainability frameworks

Forestlines® is not merely a wood façade, it is a system engineered for purity, longevity and circularity.

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