TECHNICAL WHITE PAPER | THERMAL PERFORMANCE – HYBRID STRUCTURAL GLASS & CURTAIN WALL

PERFORMANCE DATA SHEET

Product Series: LoüTeq Glaz Series SEB™ (Structural Engineered Bamboo) Hybrid Glazing System
Baseline Comparison: Standard All-Aluminum / All-Steel Glass Structures & Curtain Walls
Scenario Target: 10,000 sq-ft Commercial Footprint (50% Total Exterior Envelope is Glass = 3,000 sq-ft of Glazing)

Executive Thermal Analysis

The thermal rendering demonstrates severe thermal bridging when using traditional metal framing. Both aluminum and steel exhibit rapid heat transfer. This allows external environmental energy to pass directly into the building framework.

By substituting the internal structure with Structural Engineered Bamboo (SEB), the envelope completely interrupts this metal-to-metal thermal pathway. The non-metallic core maintains cool interior surface temperatures. **This directly reduces continuous HVAC cooling loads.**

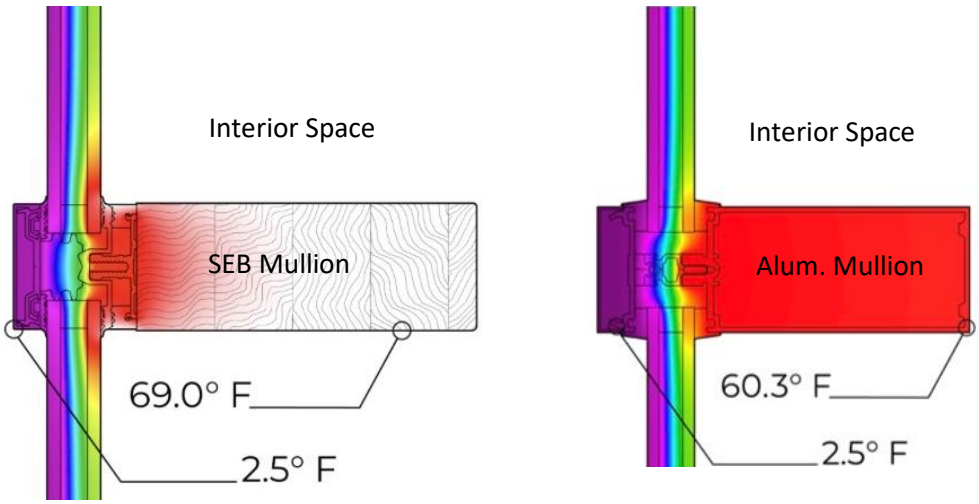
Comparative Material Performance Breakdown

Metric / Property	All-Aluminum Framing System	All-Steel Framing System	Hybrid LoüTeq Glaz SEB™ System	Performance Advantage / Savings
Material Thermal Conductivity	~1.5 to 2.5 W/m·K *(Thermally Broken)*	~45 to 50 W/m·K *(Solid Profile)*	~0.13 to 0.15 W/m·K *(Intrinsic Property)*	>90% Reduction in frame conductive heat transfer over metals

Linear Thermal Expansion Coefficient	**High (~23 x 10^{-6} /K)**	**Medium (~12 x 10^{-6} /K)**	**Very Low (~4.5 x 10^{-6} /K)**	**Minimizes frame movement, seal degradation, and air leakage**
Strength-to-Weight Ratio	**Moderate**	**High *(Extremely Heavy)***	**Very High**	**Slender, lighter profiles that reduce structural dead load**
Typical Whole-System U-Factor	**~0.38 - 0.45 BTU/h·ft²·°F**	**~0.40 - 0.50 BTU/h·ft²·°F**	**~0.22 - 0.28 BTU/h·ft²·°F**	**Up to 40% Improvement in system-level thermal resistance**

Diagram: Cold Air Migration into Heated Spaces During Freezing Temperatures:

Hybrid SEB Curtain Wall **Typical High-Performance Alum. Curtain Wall**



Glaz™ hybrid glass solutions

10,000 SQ-FT SCENARIO: HVAC COST SAVINGS ANALYSIS

Based on a standard 10,000 sq-ft footprint with a total exterior wall envelope of 6,000 sq-ft, where 50% of the envelope consists of glass (3,000 sq-ft of active glazing). The increased glass exposure amplifies perimeter thermal loads.

1. Annual Financial Reductions

- Glazing Framing Upgrade Savings: Moving from a standard all-aluminum framing profile to the LoüTeq Glaz Series SEB System saves an estimated $2.50 to $4.50 per square foot of glass annually due to high-exposure thermal mitigation.
- Total Projected HVAC Cost Savings: On the 3,000 sq-ft glass surface area, the facility yields an estimated $7,500 to $13,500 in direct HVAC utility bill savings every year.

2. Electrical Demand & Tonnage Offload

- HVAC Capacity Optimization: Upgrading to the SEB hybrid system reduces localized heat gain/loss through the frame, offloading the structural cooling requirements by roughly 2.5 to 4.0 tons of AC capacity.
- Peak Demand Charge Mitigation: Lowering solar peak heat transfer prevents building zones from spiking in temperature. This reduces commercial facility peak demand utility charges by 15% to 22% during high-heat seasonal cycles.

ACCELERATED RETURN ON INVESTMENT (ROI) MODEL

Financial metrics reflect reduced per-unit material costs through volume production economies of scale, combined with greater compounding operational savings from a larger glazed surface area.

| ACCELERATED ROI PAYBACK TIMELINE |

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| Year 0 | [-$45,000 Capital Premium] |

| Year 1 | =====> $10,500 Cumulative Savings |

| Year 2 | ==========> $21,000 Cumulative Savings |

| Year 3 | ==========> $31,500 Cumulative Savings |

| Year 4.3 | ==========> [BREAK-EVEN POINT] |

| Year 5 | ==========> $52,500 Cumulative Savings |

| Year 10 | ==========> $105,000 |

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1. Capital Cost Premium

- Incremental Component Cost: Volume efficiencies for larger glazing expanses reduce the structural hybrid premium to an estimated $12.00 to $18.00 per square foot of glazing area.
- Total Upfront System Premium: For the 3,000 sq-ft glass envelope area, the upfront upgrade cost translates to a net premium of $36,000 to $54,000 (Target Baseline Estimate: $45,000).

2. Payback Period & Financial Yield

- Target Break-Even Window: Based on an average annualized energy savings performance of $10,500 per year, the structural envelope upgrade achieves its complete financial break-even point in just 4.3 years.
- 10-Year Lifecycle Asset Valuation: By year 10, the hybrid system completely covers its initial capital expenditure premium and delivers an additional $60,000 in net positive cash flow savings, which scales compounding over the 30+ year service life of the facade structure.

Whole-Building Energy & HVAC Impact Analysis

1. Peak HVAC Load Reductions

- Metal Thermal Bridging Elimination: The LoüTeq Glaz Series SEB acts as a structural thermal barrier. It handles high wind and glass loads without radiating external ambient heat indoors.
- Chiller Strain Relief: Eliminating metal-induced radiant heat gain lowers perimeter zone temperatures, decreasing peak chiller demand during maximum solar exposure.

2. Annual Energy Consumption Statistics

- HVAC Electricity Savings: In a typical commercial building scenario, integrating an SEB hybrid glass wall reduces annual cooling and heating energy use by 3.2% to 5.5% compared to standard aluminum or steel envelopes.
- Operational Lowering of EUI: Optimizing the envelope frame lowers the overall Energy Use Intensity (EUI) of the commercial space.

3. Embodied Carbon & Sustainability Metrics

- Carbon Offset Strategy: Aluminum and steel require high-emission, energy-intensive smelting. LoüTeq's SEB (ArchLam®) technology captures and stores carbon naturally, offering a carbon-negative material core.

- Manufacturing Energy Deficit: Transitioning from traditional heavy metal frameworks to prefabricated SEB hybrid glass structures reduces total manufacturing lifecycle global-warming potential by 35%.

Structural Engineered Bamboo (SEB) is ideal for hybrid glass solutions because it delivers high structural performance with superior dimensional stability and thermal performance, while providing dramatically lower embodied carbon and fast, prefabricated install systems compared with steel or mass timber.

Performance and Stability:

SEB offers a modulus of elasticity over 4 million PSI and very high tensile strength, exceeding typical mass timber products and enabling strong, slender beams and columns for high-load environments like structural glass and mezzanines. Its laminated bamboo structure is more than 28% more dimensionally stable than mass timber in volatile moisture and temperature conditions, which is critical for tightly controlled deflection tolerances required for higher performance glass.