THE BIO FIBER CONSTRUCTION SYSTEM

A Complete Overview for Building Professionals

Bio Fiber Industries 1437 S Jackson Street Seattle, Washington 98144 206.697.7831
info@biofiberindustries.com biofiberindustries.com

ABOUT THIS DOCUMENT

This overview is designed to give architects, builders, developers, and building owners a complete picture of the Bio Fiber construction system: what it is, how it works, what it replaces, and where it performs best.

It is intended as a starting point, not a complete specification document. Technical spec sheets, installation guides, and project-specific documentation are available upon request.

If you have questions after reviewing this overview, the next step is a project review. Our team will assess fit, provide relevant documentation, and outline a path forward for your specific application.

[biofiberindustries.com/construction-system]

SECTION 1: THE PROBLEM THIS SYSTEM SOLVES

Modern construction faces a wall assembly challenge that is getting harder to manage, not easier.

Energy codes are tightening on a three-year cycle. Air leakage requirements are stricter. Continuous insulation is now mandatory in most climate zones. Thermal bridging through structural framing is a documented, measurable performance problem. And the documentation burden for demonstrating whole-assembly compliance is growing with every code cycle.

The conventional response to each of these challenges has been to add another layer. A separate air barrier. A separate vapor retarder. Continuous insulation board on the exterior of the sheathing, a finish substrate to close the assembly from the inside. The result, in most

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commercial and multifamily buildings today, is a seven-layer wall; each layer with its own specification, its own trade, its own installation sequence, and its own interface condition that must perform correctly for the whole assembly to work.

They rarely all do.

Bad materials rarely cause moisture problems in wall assemblies. They're caused by systems that don't work together. Thermal bridging through steel framing degrades whole-assembly R-values by as much as 30 percent, even when continuous insulation is present. Air barrier continuity fails most often at layer interfaces, not within layers. And the documentation required to demonstrate compliance at the system level, as the 2021 and 2024 IECC increasingly require, is significantly more complex when the assembly is a stack of independently specified components.

The Bio Fiber construction system was designed to address that problem directly.

SECTION 2: WHAT THE BIO FIBER SYSTEM IS

The Bio Fiber construction system is an integrated wall assembly; a set of hemp fiber-based components engineered to work together as a unified system, consolidating the performance functions of multiple conventional layers into a single, documented solution.

It is not a single product. It is a system.

The distinction matters because the performance of a wall assembly is determined by how the components interact, not just by how each component performs in isolation. A system-designed assembly is specified, installed, and documented as a whole. A conventionally layered assembly is specified component by component, and its integrated performance is often unknown until it is tested in the field.

The Bio Fiber system delivers:

- Thermal resistance meeting or exceeding current energy code requirements
- Vapor permeability that manages moisture without a separate dedicated layer
- Air management continuity built into the assembly rather than dependent on a separate membrane
- Fire-resistant performance meeting commercial and multifamily benchmarks
- A documented, system-level compliance path that simplifies code submissions

All from American-made hemp fiber; sourced, processed, and manufactured domestically.

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SECTION 3: THE MATERIAL FOUNDATION

Every component in the Bio Fiber system begins with industrial hemp fiber, specifically hemp hurd, the woody inner core of the hemp stalk, and hemp bast fiber, the long outer fiber that gives hemp its structural strength.

These are not new materials. Hemp fiber has been used in construction for centuries, and a growing body of peer-reviewed research has documented its performance properties in modern building science terms.

Thermal Performance: Hemp-based insulation materials demonstrate thermal conductivity values competitive with conventional mineral wool, delivering meaningful R-values in a vapor-permeable assembly. Unlike closed-cell spray foam or rigid foam board, hemp fiber insulation allows the wall to breathe, managing moisture diffusion rather than blocking it entirely.

Moisture Management: Hemp fiber is hygroscopic, meaning it absorbs and releases moisture in response to changes in relative humidity. This is not a weakness; it is an engineered advantage. Research has demonstrated that hemp-based wall assemblies can absorb moisture without compromising thermal performance, and release it as conditions change, moderating indoor humidity naturally. This behavior reduces the risk of interstitial condensation and mold growth without requiring a precisely calibrated vapor retarder installed at the right location for each climate zone.

Thermal Mass: Hemp fiber's combination of thermal resistance and thermal mass produces a wall that slows the rate at which outdoor temperature changes affect the building's interior. This dampening effect reduces peak HVAC loads and improves occupant comfort, particularly in mixed climates where daily temperature swings are significant.

Durability: Hemp fiber is naturally resistant to pests, rot, and long-term structural degradation. It does not off-gas volatile organic compounds. It does not support mold growth under normal moisture conditions. And its carbon sequestration properties, hemp absorbs and stores carbon during growth and throughout the life of the building, make it one of the few building materials that contributes positively to a building's environmental performance over its entire lifecycle.

Domestic Supply Chain: All Bio Fiber system components are sourced and processed in the United States. This is not incidental; it is a deliberate supply chain decision that ensures consistent material quality, reduces logistics risk, and supports American agricultural and manufacturing infrastructure.

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SECTION 4: SYSTEM COMPONENTS

The Bio Fiber construction system includes four primary components, each designed to perform independently within its intended application and together as an integrated assembly.

WALL PANELS

What they are: Pre-formed hemp fiber wall panels engineered for structural performance, thermal resistance, and air management in a single layer.

What they do: Wall panels are the primary structural and thermal element of the Bio Fiber system. They provide the wall's load-bearing capacity, its thermal resistance, and its primary contribution to air management continuity, consolidating functions that in a conventional assembly would require separate framing, sheathing, insulation, and air barrier layers.

What they replace: Structural framing + sheathing + cavity insulation + separate air barrier in many commercial and multifamily configurations.

Primary applications: New commercial construction, above-grade walls in multifamily projects, and design-build projects where wall assembly specifications occur early in the design process.

[Note: Confirm available panel dimensions, structural load ratings, and any specific fire or energy code test documentation for inclusion in the final document.]

BLOCKS

What they are: Hemp fiber blocks for infill construction, retrofit applications, and masonry-style builds requiring precision placement and consistent thermal performance.

What they do: Bio Fiber blocks provide the thermal and moisture management performance of the hemp fiber system in a format suited to infill, retrofit, and masonry-style construction. They are installed similarly to CMU block but deliver insulation value, vapor permeability, and moisture regulation as inherent material properties, without requiring separate insulation layers.

What they replace: CMU block or conventional infill plus a secondary insulation layer in infill and retrofit configurations.

Primary applications: Commercial and industrial infill walls, building envelope retrofits, masonry-style construction, and phased renovation projects where the existing structure is retained.

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[Note: Confirm block sizes, compressive strength data, and any relevant ASTM or equivalent test data for inclusion.]

INSULATION

What it is: Hemp-based insulation for continuous insulation requirements, cavity fill, and thermal bridging reduction, available in formats suited to both new construction and retrofit applications.

What it does: Bio Fiber insulation delivers the continuous insulation performance required by the 2021 and 2024 IECC while maintaining the vapor permeability that closed-cell spray foam and rigid foam board eliminate. It can be installed as a continuous exterior insulation layer to address thermal bridging through framing members, or as cavity fill in applications where the panel or block system is not the primary wall component.

What it replaces: Rigid foam board (XPS, EPS, polyiso) or mineral wool continuous insulation, while adding vapor permeability and moisture buffering that synthetic CI products do not provide.

Primary applications: Continuous insulation layer in commercial and multifamily walls, cavity fill in retrofit and renovation applications, thermal bridging reduction at framing members and structural connections.

[Note: Confirm available formats (batt, roll, loose-fill, or board) and R-value per inch for inclusion.]

COMPATIBLE FINISH SYSTEMS

What they are: Plaster and finish systems designed to work with the Bio Fiber wall assembly from the inside out, closing the assembly with compatible materials that preserve the moisture management behavior of the hemp fiber system.

What they do: Compatible finish systems provide the interior and exterior finish substrate for the Bio Fiber assembly. Unlike standard gypsum board or cement board, these finish systems are selected for vapor permeability and long-term performance, ensuring that the finish layer does not create an unintended vapor barrier or moisture trap within the assembly.

What they replace: Standard interior and exterior finish substrates in configurations where maintaining whole-assembly vapor permeability is a design requirement.

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Primary applications: Interior finish layer in Bio Fiber panel and block assemblies, exterior plaster systems in applicable climate zones and building types.

[Note: Confirm specific compatible finish products, application guidance, and whether proprietary or third-party finish systems are recommended.]

SECTION 5: WHERE THE SYSTEM FITS

The Bio Fiber construction system is designed for professional construction across a range of building types and project stages. It is not a niche application; it is engineered for the project types and compliance environments that architects, builders, and developers navigate every day.

NEW CONSTRUCTION

ADU / Accessory Dwelling Units: ADU construction demands maximum performance from minimum wall depth. The Bio Fiber system's layer consolidation is particularly valuable where wall thickness, thermal performance, and code compliance are all competing for the same inches. A single integrated assembly replaces the multi-layer stack without sacrificing performance at the envelope.

Single-Family Residential: The Bio Fiber system provides a code-compliant thermal envelope for new single-family construction, meeting current residential energy code requirements while simplifying wall assembly specifications and reducing the number of trade interfaces within the wall assembly.

Multifamily: Multifamily projects face overlapping compliance timelines, tight margin tolerances, and the coordination complexity of building the same wall assembly across a high unit count. The Bio Fiber system's documented, repeatable performance and simplified installation sequence are particularly well-suited to multifamily applications where consistency across units matters.

Commercial & Industrial: Large-footprint commercial and industrial buildings represent the greatest opportunity for whole-building energy performance improvement. The Bio Fiber system's commercial configurations are engineered for scale, with the documentation, fire-resistance performance, and energy code compliance pathways that commercial owners and developers require.

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RETROFIT & RENOVATION

Existing buildings present constraints that new construction does not: existing structural systems, occupied spaces, and phased project timelines that require the wall assembly to adapt to what's already there.

The Bio Fiber system is designed with retrofit realities in mind. Hemp fiber insulation and blocks can be integrated into existing wall assemblies to improve thermal performance, address moisture issues, and meet energy code compliance requirements for building envelope renovations, without requiring a complete gut renovation or full structural replacement.

Retrofit applications include:

- Commercial building wall insulation upgrades for energy code compliance
- Industrial building envelope thermal improvement
- Existing residential wall cavity fill and continuous insulation addition
- Moisture and mold remediation in walls with documented hygrothermal performance problems

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SECTION 6: PERFORMANCE SUMMARY

The Bio Fiber system is designed to meet the performance demands of professional construction. The following summary reflects the system's core performance categories. Specific test data and technical documentation are available upon request.

[Note: Insert confirmed test data, ratings, and certifications in each category before publishing. Placeholder language is used where specific data is pending.]

FIRE RESISTANCE

The Bio Fiber wall assembly is designed with fire performance as a core system requirement. The system meets fire resistance benchmarks required for commercial and multifamily building applications.

[Insert specific fire rating (Class A designation, ASTM E119 test results, UL listing, or equivalent) when confirmed.]

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ENERGY EFFICIENCY

Bio Fiber wall assemblies are configured to meet the continuous insulation and thermal performance requirements of current energy codes, including the 2021 IECC, 2021 WSEC, and Title 24, across commercial, multifamily, and residential applications.

Hemp fiber's combination of thermal resistance and thermal mass produces effective whole-assembly performance that conventional R-value calculations alone do not fully capture. The thermal dampening effect of hemp fiber assemblies reduces peak HVAC loads and improves occupant comfort beyond what the nominal insulation value suggests.

[Insert assembly R-value range and specific code compliance pathway documentation when confirmed.]

VAPOR PERMEABILITY

Unlike closed-cell spray foam or rigid vapor barriers, the Bio Fiber system is vapor-permeable by design. The assembly allows moisture to move through the wall in response to changing conditions, moderating indoor humidity, reducing the risk of interstitial condensation, and eliminating the need for a precisely placed dedicated vapor retarder in many climate zone configurations.

This is a meaningful departure from conventional CI assemblies, which address thermal bridging at the cost of vapor permeability. The Bio Fiber system addresses both without trading one for the other.

MOISTURE & MOLD RESISTANCE

Hemp fiber's hygroscopic behavior, its ability to absorb and release moisture without compromising thermal performance, provides inherent moisture management capability that synthetic insulation materials do not replicate. The system is designed to manage the moisture conditions it will encounter over the life of the building, not just at the time of installation.

Hemp fiber does not support mold growth under normal moisture conditions and does not degrade when exposed to the moisture cycling that all building envelopes experience over time.

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DURABILITY

The Bio Fiber system is designed for the lifecycle of the building. Hemp fiber is naturally resistant to pests, rot, and long-term structural degradation. It does not off-gas VOCs. It does not lose performance as it ages. And its carbon sequestration properties mean that the environmental benefit of the material continues throughout the life of the building, not just during construction.

AIR MANAGEMENT

The Bio Fiber wall assembly is designed to contribute to whole-assembly air leakage control, supporting compliance with the continuous air barrier requirements of the 2021 and 2024 IECC without relying on a separately installed fluid-applied or sheet membrane to carry the entire air management function.

[Insert specific air leakage test data or compliance pathway documentation when confirmed.]

SECTION 7: LAYER REDUCTION: CONVENTIONAL VS. BIO FIBER

One of the most practically significant advantages of the Bio Fiber system is the reduction in wall assembly complexity it enables.

The table below illustrates the difference between a conventional seven-layer commercial wall assembly and a Bio Fiber-integrated assembly that performs equivalent functions.

CONVENTIONAL WALL ASSEMBLY

Layer	Function
1. Structural framing	Load bearing
2. Sheathing	Racking resistance, substrate
3. Air barrier membrane	Air infiltration control
4. Vapor retarder	Moisture diffusion control

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5. Cavity insulation	Thermal resistance
6. Continuous insulation board	CI requirement, thermal bridge reduction
7. Interior substrate/finish	Interior closure

Total: 7 layers. Multiple trades. Multiple interfaces. Multiple compliance documentation requirements.

BIO FIBER INTEGRATED ASSEMBLY

Component	Functions Consolidated
Wall Panels	Load bearing + thermal resistance + air management
Insulation (where required)	CI requirement + thermal bridge reduction + vapor permeability
Compatible Finish	Interior closure + vapor-compatible substrate

Total: 3 components. Fewer trades. Fewer interfaces. System-level compliance documentation.

The practical implications of layer reduction extend beyond the materials themselves:

Fewer trade handoffs: Each interface in a conventional assembly is a potential schedule dependency. An integrated system compresses the installation sequence and the coordination burden that comes with it.

Simplified documentation: Whole-assembly compliance documentation is more straightforward when the assembly is a system than when it is a stack of independently specified products.

Reduced performance gap risk: Most wall assembly performance failures originate at the interfaces. Fewer layers means fewer interfaces and fewer opportunities for the assembly to deviate from specified performance.

Consistent quality across the project: A system-designed assembly is easier to install correctly and consistently than a multi-layer assembly where each trade makes independent decisions about execution.

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SECTION 8: WHO THIS IS DESIGNED FOR

The Bio Fiber construction system is designed for building professionals making wall assembly decisions on real projects with real compliance requirements.

ARCHITECTS & SPECIFIERS: The Bio Fiber system streamlines the specification document and reduces the number of interface conditions that must be detailed and coordinated. Fewer layers means fewer questions about trade responsibility, fewer material substitution risks during value engineering, and a more straightforward path to demonstrating whole-assembly compliance under the current energy code. Technical spec sheets and installation documentation are available in formats suited to project submittal requirements.

GENERAL CONTRACTORS & BUILDERS: The Bio Fiber system means a shorter installation sequence with fewer trade handoffs on the wall. Every interface in a conventional assembly is a potential schedule dependency. An integrated system compresses that sequence, reduces the number of inspections required during wall assembly, and delivers more predictable installed performance than a stack of independently specified layers.

DEVELOPERS & BUILDING OWNERS: The Bio Fiber system provides a wall that is documented as a system from the start, with predictable performance throughout the building's life. For developers managing multiple projects or unit counts, the consistency and repeatability of a system-designed assembly reduces coordination overhead and long-term performance risk. For owners focused on operational costs, the energy efficiency and moisture management performance of hemp fiber translate directly to lower utility costs and reduced long-term maintenance burden.

DESIGN-BUILD FIRMS: Design-build teams control both specification and execution, which means they absorb the cost and scheduling consequences of wall assembly complexity more directly than any other project delivery model. The Bio Fiber system's layer consolidation is designed to reduce that burden at both ends of the process: simpler to specify in design, simpler to execute in the field.

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SECTION 9: SUPPORTED BY RESEARCH AND INDUSTRY PARTNERS

The Bio Fiber system is not a concept; it is a construction system being developed, validated, and deployed in collaboration with research institutions, government agencies, and industry partners.

Research & Academic Partners: Bio Fiber's material science and building performance work is supported by Washington State University, one of the nation's leading institutions for agricultural technology research and building energy codes.

Government Partners: Bio Fiber has received support from the State of Washington, the Washington State Department of Commerce, and the USDA, reflecting recognition of industrial hemp's potential as a domestic building material at both the state and federal levels.

Industry & Innovation Partners: Bio Fiber is supported by the Clean Tech Alliance, Find Ventures, Urban Impact, and the Washington State Microenterprise Association, a network of cleantech, investment, and community development organizations aligned with Bio Fiber's growth and commercialization goals.

[Note: Add any specific grants received, research findings cleared for public use, pilot project references approved for mention, or program affiliations that can be named here. Even brief callouts, i.e., "Recipient of [Program Name] grant" or "Participating in [Cohort Name]", meaningfully strengthen this section.]

SECTION 10: NEXT STEPS

The Bio Fiber Construction System Overview is the starting point. The next step depends on where you are in your project.

If you're evaluating fit: Download the Project Readiness Checklist to assess whether your current project is a strong candidate for the Bio Fiber system.

[biofiberindustries.com/resources]

If you're ready to specify: Request the System Spec Sheet for detailed technical specifications, assembly configurations, and documentation formatted for project submittals.

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[biofiberindustries.com/resources]

If you're ready to talk about a project, submit your project details for review. Our team will assess fit, provide relevant specs, and outline next steps. No pressure, no obligation.

[biofiberindustries.com/construction-system]

If you'd prefer to talk directly, schedule a call with the Bio Fiber team.

biofiberindustries.com 206.697.7831 info@biofiberindustries.com

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Bio Fiber Industries is a social purpose corporation based in Seattle, Washington, dedicated to full-cycle, responsible, and regenerative solutions from American-grown industrial hemp. The construction system is one application of a broader materials innovation mission: building better buildings with better materials, made here.

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