hempitecture®

Product Guide
Hempcrete - Cast in Place

hempitecture.com
208.218.8698

Hempitecture Inc.
421 E 500 S. #100 Jerome, ID 83338

Contents

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Overview

Storage

Store hempcrete materials, including hemp core and lime, in a dry environment, protected from direct sun exposure. Moisture will begin the calcification process of lime, so it is critical that the lime binder is stored in a 100% dry location. The shelf life of Hempitecture HEMPBINDER is 1 year if stored properly.

Safety

Wear protective clothing, gloves and eye protection to avoid injury when handling, mixing and during installation. Hempcrete is abrasive to skin and lungs due to the lime content in the binder. Always follow OSHA guidelines.

Preparation

Hempcrete is a nuanced building material system that requires intensive preparation and planning to execute. This is best undertaken with coordination between architects, structural engineers, as well as the contractors completing the work. Hempitecture recommends hempcrete projects be undertaken by professionals.

Installation

Installation of hempcrete is based on planning, framing, form boarding, accurate mixing, and tamping the mixed material in place. Hempcrete is climate sensitive. It's critical that during the curing process of hempcrete, it is protected from direct sunlight to avoid drying too quickly. Within this guide we will cover best practices for installing hempcrete.

Scan for helpful resources

Check out tips & tricks working with Hempcrete, and install videos.

Advantages

Humidity Control / Moisture Management

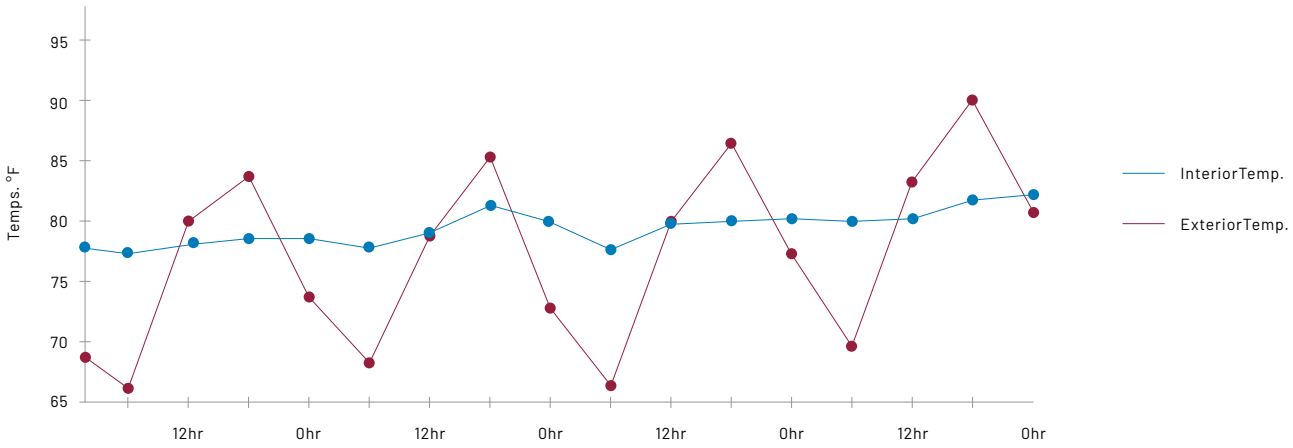
Humidity control of hempcrete insulation is one of the most advantageous elements of this material when compared to other insulation products. Hempcrete is vapor permeable which allows vapor to diffuse through it & increases the drying potential of the building envelope. In addition, Hempcrete is able to absorb up to 20% of its weight in water before losing its insulating values. This results in better thermal performance in your structures while also minimizing the risk of mold developing from moisture related issues.

Thermal Inertia or Phase Shift

Thermal inertia is the ability of a material to store heat or cold. The more dense a material is, the higher its thermal absorption capacity. Cast in place hempcrete is a relatively dense material & therefore has a higher inertia than other conventional insulation materials. Hempcrete should be thought of as a system, not a product. It is a wholistic approach to building a thermal envelope.

Closely related to thermal inertia, is the phase shift capacity of a material. This determines the temperature fluctuations in a building, from external temperature fluctuations. Hempcrete has a significant impact on maintaing a stable indoor temperature, despite external temperature fluctuation. This results in a reduction of heating costs in cooler seasons & climates, but also air conditioning, in warmer weather.

Example of phase shift in summer with strong inertia.



Multiple Materials in One

Hempcrete, as a biobased, thermally insulating wall system, produces and displaces multiple materials in one. In summary, the use of hempcrete eliminates the need for drywall, it serves as the thermal insulation, and eliminates all thermal bridging in the envelope. This is because cast in place hempcrete encapsulates structural members. This encapsulation also protects wood based structural framing materials. Beyond producing multiple materials in one, additional benefits include being better protected against common pests & rodents, preserving the efficiency of the thermal envelope & structural integrity.

Acoustically Insulating

Hempcrete is naturally sound absorbing. It increases interior acoustic comfort, while also achieving thermal comfort. By achieving both factors of comfort with a single material, the resulting enclosed thermal envelope offers a multitude of benefits.

A Novel Approach to the High Performing Home

Hempcrete is not new across the world. It is however a newer building approach in the United States. This means that most contractors are generally unfamiliar with the nuances of installing hempcrete. Despite that, it is a novel approach to building homes that will last over 100 years.

Sustainable Buildings - Zero Carbon

Industrial hemp contributes to soil regeneration & requires little water, fertilizer or pesticides. During it's growth, industrial hemp is estimated to absorb 9.8 tons of co2 per acre, thus reducing the carbon footprint of hempcrete & the structures that use it. Additionally, the limestone based binder will calcify over time, actively pulling carbon dioxide out of the atmosphere until the wall is fully cured.

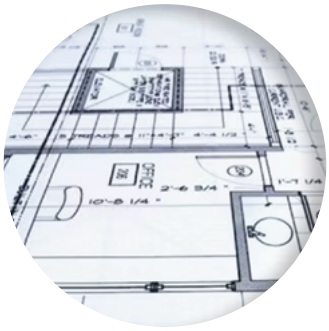
Beneficial for Health

Made 100% of natural biobased materials, hempcrete is a healthy building approach because it contains no VOC's (Volatile Organic Compounds) and is red-list ingredient free.

Preparation

Getting Ready for your Build

Hempcrete requires planning from the earliest stages of your building project. This means that hempcrete must be considered during your design phase. Dependent on your climate zone, you may chose to size your hempcrete walls anywhere between 8" to 12". With a thermal resistance ranging from R2.2 / in to R2.5 / in, the cumulative wall mass results in a highly energy efficient assembly.



Architectural Design

It is absolutely critical to work with a qualified architect who understands how hempcrete should be integrated into a a building project. Hempitecture does not offer guidance on architectural design guidelines. We have wall design resources available in this guide that should serve as a reference for designing a hempcrete wall system. If you opt to take on a hempcrete project without the design guidelines of a qualified architect, you assume all risks and challenges associated with a hempcrete building project.

Structural Engineering

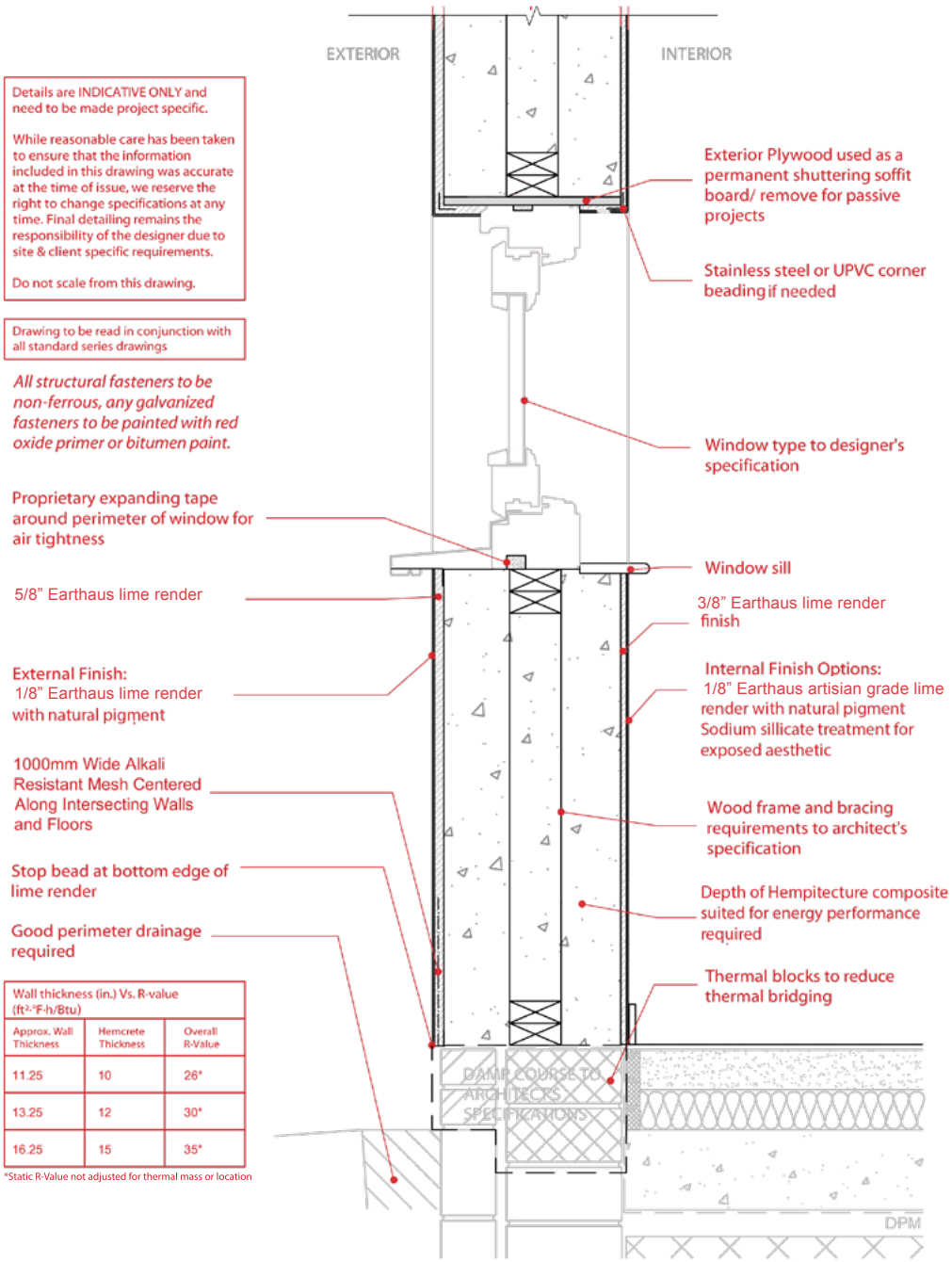
Once the architectural design phase is complete, a qualified structural engineer should be brought in to design the shear & racking design of a hempcrete building. In general, diagonal bracing or moment frames are required to give the building shear strength. This is because hempcrete wall assemblies must remain vapor open, which means you cannot use conventional shear panels such as OSB, Plywood, etc. Hempcrete once cured has a weight of approximately 22 lbs / cubic feet. This should also be factored into the design. Interior walls should be considered for shear strength, which is atypical from conventional construction practices.

Contractor Alignment

Once the architectural and structural design phases are complete, it is important to have contractor alignment on how a hempcrete project is to be successfully carried out. In general, installing hempcrete is quasi-masonry and quasi-carpentry. This is because hempcrete is mixed in concrete style mixers, and the walls themselves are formed using 3/4" OSB that is temporarily attached to hold the hempcrete in place. Additionally, other trades should be briefed on the nuances of hempcrete building methods. For instance, all wiring must be run through conduit and this conduit must be installed before the hempcrete. This allows the wiring to be run through the conduit after the walls are constructed.

Preparation; Getting Ready for your Build

Frame on Center Design Guidelines

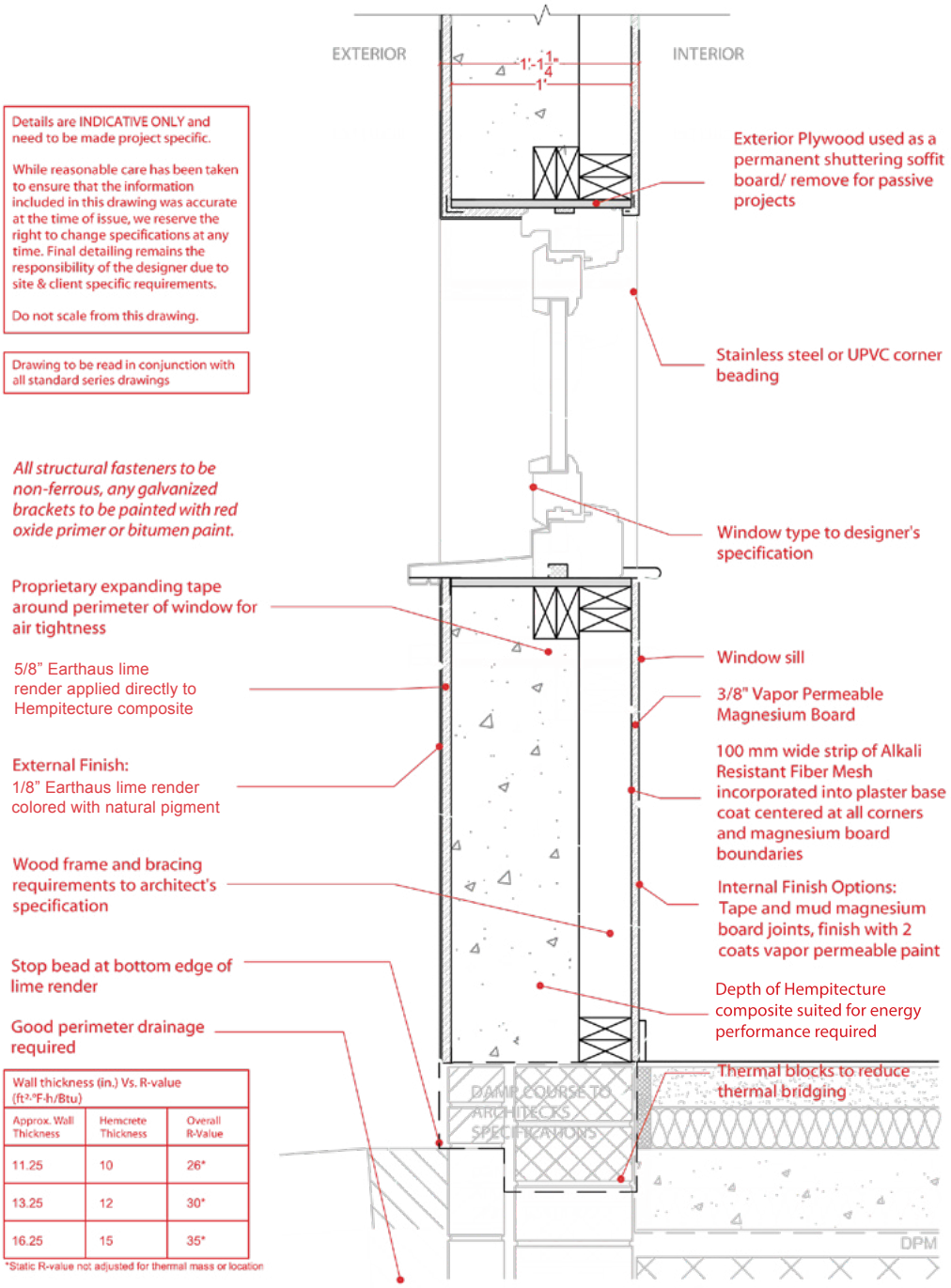


Standard Wall Section with Internal Frame

This wall assembly is common for hempcrete, however all details should be confirmed by an architect. There are numerous modifications that can be made to this wall section, dependent on finished aesthetics, window selection, etc.

Preparation; Getting Ready for your Build

Frame to Inside Design Guidelines



This wall assembly is less common for hempcrete than frame on center, however all details should be confirmed by an architect. There are numerous modifications that can be made to this wall section, dependent on finished aesthetics, window selection, etc.

Mixing
How to Mix Hempcrete

Hempitecture HEMPBINDER is a specifically formulated lime and pozzolan product capable of binding together building grade hempcore for high-performance hempcrete wall systems.The application of HEMPBINDER and Hemp core relies on a precise mixing process that adequately combines the different elements.These instructions are simply a guide. It is up to the on site installation team to properly mix and install hemp and lime.We highly recommend that you seek training, or have a background in hands-on construction before attempting to complete your own project.

HEMPBINDER and building grade hemp core are combined together in a 1.5 to 1 ratio by weight. HEMPBINDER is 50lbs per bag, making it ideally suited to be combined with (1) 33 lb bag of building grade hempcore. If you are using European hempcore in 44lb bags, it is your responsibility to weigh out the hempcore components separately for each batch. Approximately 6 gallons of water are used for every batch. This water ratio can vary depending on your climate, mixing consistency, and other on site variables such as solar exposure, humidity, etc.

There are various mixers capable of mixing hemp and lime. We recommend IMER mixers or Eterra skidsteer mounted bucket mixers for ensuring best consistency. If you opt for a mixer of your own choosing, you must work with it to figure out the best batching and mixing process that is specific to that mixer. For instance, standard mortar mixers from your local rental yard may be able to be used, but they might not accept a full bag of hemp and lime.

Mixing Instructions

1. Add building grade hemp core to the mixer
2. Add HEMPBINDER to the mixer
3. Turn on the mixer and allow it to dry mix for approximately 2 to 3 minutes. Cover the mixer with a damp cloth for dust.
4. Once dry mixing is complete, begin to add water. Water should be added slowly and methodically. Adding too much water at once will result in improper distribution of water. Add 2 gallons and allow the water to be mixed through. Add 2 more gallons, allow the water to be mixed through. Add the final amount of water and allow it to be mixed through.
5. After thorough mixing is complete, take a hand full of hempcrete and compress it into a ball. You should be able to toss the ball in the air 2 to 3 feet. Upon catching the mixture, it should remain somewhat cohesive. If not, you may need some excess water in your mixture.
6. After thorough mixing is complete discharge the mixer into buckets and prepare to place the mixture in the shuttering formboard system.
7. Workability time is about 30 minutes. Hempcrete should be kept out of direct sunlight.

Forming

Forming your walls

Form boarding is one of the most essential techniques for ensuring a smooth, consistent wall. We recommend using 3/4" OSB ripped down into 2' high segments. The form boards should be secured to the structural framing at the desired distance from the frame using structural screws, such as Timberlock screws, with precut PVC pipe spacers. For instance, depending on the depth of your wall, you may cut your spacers to 4" to hold the form boards off uniformly at 4" off framing. The structural screws should be completed with a fender washer, and screwed directly into the frame adjacent to the PVC pipe spacer. Be sure to not hit any embedded conduit or plumbing

It is critical that the first course of form boards are installed level. You will stack the next course of form boards on top of the first course. You will not remove the first course of form boards until you have filled up the second course of form boards 50%. For instance, for your first 2' lift, do not remove the bottom form board until you have poured approximately 3' of hempcrete. Ensure that the structural screws are not bowing in the form boards. We recommend that you watch "The Basics of Hempcrete on the Hempitecture YouTube Channel to get a better understanding of formboarding techniques.

Essentials

3/4" OSB

Use 3/4" OSB as temporary form boards. 3/4" is rigid enough to not bow as a result of packing the hempcrete into place.

TimberLOK Screws with Fender Washer

Structural screws such as TimberLOK or equivalent should have a fender washer placed on them, and be installed through the form board to secure it to the structural frame. The fender washer is helpful for removal of the screw when removing the form board.

PVC Spacers

PVC Spacers should be pre-cut and used as spacers to float your form board off your structural frame to create the desired cavity size for hempcrete installation. The size of your spacer is dependent on the depth of your wall and the size of framing, such as 2x4 or 2x6 framing.

Packing

Packing Hempcrete

Packing hempcrete requires patience, consistency, and extreme dilligence. One of the most common mistakes made when packing hempcrete is pouring too much hempcrete in the wall at once. Hempcrete should be poured into the form boarded cavity 2" at a time. The 2" of material should be leveled out, and then firmly tamped into place using a tamping tool. Special attention should be paid to objects in the wall such as electrical boxes, plumbing, vents, etc. It is critical to ensure that the material underneath these penetrations is packed to avoid loose spots that will fall out after the form boards are removed.

Specific focus should be paid to packing firmly along the surface of the form boards. The center of the wall should be tamped into place as well, but with less pressure than along the form board surface. By firmly packing along the surface, you are creating an ideal surface for lime plaster application. The higher you work up the hempcrete wall, the more difficult it will become to pack. Think of building your walls in consisent levels, with each level being built off the previous one. Completing the top of wall, especially with pitched roofs or rafter overhangs is the most challenging aspect. It is ideal to leave roof sheathing off over the wall cavity so the hempcrete can still be cast in place vertically, without the overhead limit imposed by a completed roof overhang.

Essentials

Packing Tools

Packing tools can take many shapes and forms. You can use cut offs of 2x4's, or build your own custom packing tools such as those pictured here.

Distribution Tools

Transporting hempcrete into walls in tight locations can be challenging. Dust pans of various sizes are valuable tools for scooping and pouring hempcrete into the form boarded cavities. Buckets can be used where there is more space.

Buckets

Rubbermaid 3 gallon buckets are an ideal way to transport hempcrete from the mixing station to the wall. A 3 gallon bucket filled with hempcrete is about the maximum an average person can carry. The rectangular shape allows you to lean the bucket against the form and dispense material.

Tools

Suggested for Installation

Hempcrete requires a plethora of tools to successfully complete the various steps and stages of a project. As you begin to work with hempcrete, you will learn what tools work best for you. For mixing, a proper mixer is one of the most important tools you will need. Hempitecture is a distributor of Eterra and IMER mixers. For form boarding, you will need a variety of carpentry based tools. These tools include impact drivers, table saws, skillsaws, various bits, small prybars such as a catspaw, and a tool bag to keep all the necessary tools on you at all times.

Packing tools are generally a do-it-yourself approach. We like to make our own hempcrete packing tools with broom handles that are secured to a wooden press block. This press block should be approximately two inches wide, and on one end we recommend a tapered edge so you can get into tighter locations such as underneath an electrical box, or around the form board screw.

A utility knife is suggested for opening the HEMPBINDER pallets & hemp core bags. A tape measure and a level is suggested for accurately measuring & installing form boards.

Skilsaw for cutting form boards

Skidsteer mounted bucket mixer or IMER

Utility Knife (1" Blade)

Measuring Tape

Table Saw

Cutting Blade (Hardie Board/ Metal Blade)

This is a guide. It is up to you.

Before you undertake a hempcrete project, you should be well educated in the undertaking that is building with hemp and lime. It is a marvelous building strategy, but it requires significant amounts of labor, know how, and determination.

With the right team, education, and training, you can achieve incredible results with hemp and lime as a building material. We suggest you watch instructional videos, read instructional books, and absorb information from reliable sources. Different books and sources may recommend different mixing, forming, or packing techniques. The mixing techniques outlined in this guide must be followed.

Please visit our YouTube Channel to see in greater detail the methods and techniques we have used to build over 15 hempcrete projects across the United States.

Disclaimer

Thank you for choosing HEMPBINDER, our innovative limestone and pozzolon binding material designed for creating a non-structural cementitious, insulating biocomposite by binding the wooden core of hemp stalks, known as hemp core. We value your interest in our product, and we want to ensure that you have a clear understanding of its limitations and the factors that may affect its performance.

Please note that while we strive to provide a high-quality product, we cannot guarantee its performance in every situation. The following disclaimer outlines the limitations and factors that may impact the performance of HEMPBINDER:

Variability of Climactic Conditions: HEMPBINDER's performance may vary based on the specific climactic conditions it is exposed to during installation and over time. Factors such as temperature, humidity, and exposure to extreme weather conditions can influence the product's performance.

Nature of Architectural and Structural Design: The performance of HEMPBINDER can be influenced by the architectural and structural design of the project. Factors such as load-bearing requirements, structural integrity, and compatibility with other building materials may impact the overall performance of the biocomposite.

Methods and Techniques of Installation: Proper installation techniques are crucial for achieving the desired performance of HEMPBINDER. The methods, techniques, and workmanship employed during the installation process can affect the durability and effectiveness of the product.

Exclusion of Material Manufacturing Defects: This disclaimer does not apply to any material manufacturing defects. We stand behind the quality of our product and will address any legitimate claims arising from such defects in accordance with our warranty policy.

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Hempitecture Inc. 421 E 500 S. #100
Jerome, ID 83338

hempitecture.com
208.218.8698
sales@hempitecture.com

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