SECTION 07 21 00

THERMAL INSULATION - HEMPCRETE

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\*\* NOTE TO SPECIFIER \*\* US Hemp Building Association; Hemp Building Materials.
This section is based on the products of US Hemp Building Association, which is located at:1312 17th St., Unit 1597Denver, CO 80202Tel: 540-664-6499Email: [request info (info@ushba.org)](https://arcat.com/rfi?action=email&company=US%252BHemp%252BBuilding%252BAssociation&message=RE%253A%2520Spec%2520Question%2520(07210uhb)%253A%2520&coid=53965&spec=07210uhb&rep=&fax=)
Web: <https://ushba.org>
 [ [Click Here](https://arcat.com/company/us-hemp-building-association-53965) ] for additional information.
Join the trailblazers, the innovators, the builders, and the world changers as we form partnerships to create a robust new building industry in the USA. By joining the USHBA, you will be part of creating a unified and inclusive coalition of inspiring innovators within the hemp and construction industries to promote and support hemp as a readily accessible, environmentally sustainable, and economically viable option to traditional building materials. The USHBA will move hemp building into the forefront of the US construction industry through education, collaboration, networking, and advocacy. Hemp is the green building material the construction industry has been waiting for!
USHBA members represent the passion and energy behind this emerging industry. Committees focus on specific topics in the mission of the organization. Monthly meetings are held to discuss the efforts and progress of groups focusing on Codes & Certifications, Education, Supply Chain, Diversity & Inclusion, and Materials.
Regional teams have been established to coordinate local USHBA activities including representation at events and workshops. Join the revolution, become part of a better future.
The USHBA is trying to create the resources needed to connect people together and give them the information they need to succeed. Certain resources are open to everyone and others are reserved for members. Current resources include a map of structures that have used hemp building products, and blog posts. Upcoming resources include a supply chain map, a members forum, a members directory, and a collection of research on hemp building materials.

1. GENERAL
	1. SECTION INCLUDES

\*\* NOTE TO SPECIFIER \*\* Delete items below not required for project.

* + 1. Hempcrete thermal insulation and plaster finished substrate; cast, sprayed, blocks, and panels.
	1. RELATED SECTIONS

\*\* NOTE TO SPECIFIER \*\* Delete any sections below not relevant to this project; add others as required.

* + 1. Section 03 52 16 - Lightweight Insulating Concrete.
		2. 06 16 13 - Insulating Sheathing.
		3. Section 07 21 13 - Board Insulation.
		4. Section 07 21 16 - Blanket / Batt Insulation.
		5. Section 07 21 23 - Loose-Fill Insulation.
		6. Section 07 21 29 - Sprayed Insulation.
		7. Section 07 24 00 - Exterior Insulation and Finish Systems.
		8. Section 07 25 00 - Weather Barriers.
	1. REFERENCES

\*\* NOTE TO SPECIFIER \*\* Delete references from the list below that are not actually required by the text of the edited section.

* + 1. ASTM International (ASTM):
			1. ASTM C5 - Standard Specification for Quicklime for Structural Purposes. BL104.3.5.
			2. ASTM C141/C141M - Standard Specification for Hydrated Hydraulic Lime for Structural Purposes. BL104.3.5.
			3. ASTM C177 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus. BA106.2.
			4. ASTM C206 - Standard Specification for Finishing Hydrated Lime. BL104.3.5.
			5. ASTM C518 - Transmission Properties by Means of the Heat Flow Meter Apparatus. BL106.2.
			6. ASTM C1114 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Thin-Heater Apparatus. BL106.2.
			7. ASTM C1363 - Standard Test Method for Thermal Performance of Building Materials and Envelope Assemblies by Means of a Hot Box Apparatus. BL106.2.
			8. ASTM C1707 - Standard Specification for Pozzolanic Hydraulic Lime for Structural Purposes. BL104.3.5.
			9. ASTM E84-21a - Standard Test Method for Surface Burning Characteristics of Building Materials. BL106.4.
			10. ASTM E96 - Standard Test Methods for Water Vapor Transmission of Materials. BL104.1.
			11. ASTM E2392 / ASTM E2392M - Standard Guide for Design of Earth Wall Building Systems. BL104.3.6.1.
		2. European Committee for Standardization (CEN):
			1. CEN EN 459 - Part 1: Building Lime. Definitions, Specifications and Conformity Criteria; Part 2: Test Methods. BL104.3.5.
		3. International Residential Code (IRC):
			1. Appendix BL.
	1. DEFINITIONS
		1. Binder: The material that binds the hemp hurd in a hempcrete mix.
		2. Bonding Coat: The initial thin layer of binder-rich granulated plaster used in lined applications of hempcrete construction to ensure adhesive and/or mechanical bonding. Also known as gobetis.
		3. Cast-In-Place: Installation of hempcrete mix by hand or by spraying into forms in its permanent location.
		4. Casting: Placing wet hempcrete into forms.
		5. Clay: Inorganic soil with particle sizes less than 0.00008 inch (0.002 mm) and having the characteristics of high dry strength and medium to high plasticity, used as a binder of other component materials in clay plaster.
		6. Clay Subsoil: Subsoil sourced directly from the earth, containing clay, sand, and silt, and containing not more than trace amounts of organic matter.
		7. Fiber Clumps: Long fibers that are attached to hemp hurd, or for other reasons, cause clumping of fibrous balls when agitated.
		8. Finish: Exposed surface material on the interior or exterior face of a hempcrete infill wall.
		9. Form: The material into which hempcrete infill, panels, or blocks are cast.
		10. Formwork: The system of forms, their bracing and fasteners assembled for casting of hempcrete infill.
		11. Hand Cast: Hempcrete infill cast by placing hempcrete mix into formwork and evenly tamping by hand or with a tool.
		12. Hemp: A class of the Cannabis sativa plant grown for industrial purposes in which the concentration of total delta-9 tetrahydrocannabinol (THC) in the flowering tops is equal to or less than the regulated maximum level established by authorities having jurisdiction.
		13. Hempcrete: Common usage term for non-structural hemp-lime.
		14. Hemp-Lime: A bio-aggregate composite consisting of hemp hurd and a lime-based binder. Also known as hempcrete.
		15. Hemp Hurd: The chopped woody core of the stalks of the hemp plant, stripped of its surrounding hemp fibers. Also known as hemp shiv or shive.
		16. Infill: Hempcrete placed between or around the structural or nonstructural framing of a building as insulation, thermal mass, and a substrate for finish.
		17. Lift: A horizontal layer of hempcrete infill.
		18. Lime: Lime is composed of calcium hydroxide, including Type N or S hydrated lime, hydraulic lime, natural hydraulic lime, slaked quicklime, or high calcium lime.
		19. Lined Application: Installation of a vertical hempcrete layer, lining a masonry or concrete wall.
		20. Natural Cement: Hydraulic cement made from naturally occurring limestone.
		21. Nonbearing: Not bearing the weight of the building other than the weight of the hempcrete infill and its finish.
		22. Plaster: Lime, or hempcrete plaster as described in this specification applied to the interior or exterior face of hempcrete walls.
		23. Pozzolan: A siliceous or alumino-siliceous material that when finely divided and combined with hydrated lime in the presence of water forms new chemical compounds with cementitious properties.
		24. Precast: Blocks or panels of hempcrete formed and cured before installation.
		25. Screeding: Removal of excess material to form a planar surface.
		26. Spray Applied: A method of pneumatic projection of hempcrete applied onto or into a form using compressed air.
		27. Tadelakt: A lime-plaster which is compressed, polished, and treated with oil-based soap to make it water-repellant.
		28. Unit Wall Weight: The unit wall weight is the calculated weight of a 1 x 1 ft (305 x 305 mm) section of wall surface area times the full wall thickness, including finishes. The unit wall weight is the sum of the weight of each constituent material times its volume, expressed as psf.
		29. Void: Any space in a hempcrete wall greater than 1/4 inch (6 mm) wide, 2 inches (51 mm) long and 2 inches (51 mm) deep.
	2. SUBMITTALS
		1. Submit under provisions of Section 01 30 00.
		2. Product Data:
			1. Manufacturer's data sheets on each product to be used.
			2. Preparation instructions and recommendations.
			3. Storage and handling requirements and recommendations.
			4. Typical installation methods.

\*\* NOTE TO SPECIFIER \*\* Delete if not applicable to product type.

* + 1. Verification Samples: Two representative units of each type, size, pattern, and color.
		2. Shop Drawings: Include details of materials, construction, and finish. Include relationship with adjacent construction.
	1. QUALITY ASSURANCE
		1. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with a minimum of 2 to 3 years documented experience.
		2. Installer Qualifications: Company specializing in performing Work of this section with minimum two years documented experience with projects of similar scope and complexity.
			1. Tradesman: Trained by Manufacturer or manufacturer approved training program for the following work results.
				1. Casting.
				2. Spraying.
				3. Precast Blocks.
				4. Panels.
		3. Source Limitations: Provide each type of product from a single manufacturing source to ensure uniformity.

\*\* NOTE TO SPECIFIER \*\* Include mock-up if the project size or quality warrant the expense. The following is one example of how a mock-up might be specified. When deciding on the extent of the mock-up, consider all the major different types of work on the project.

* + 1. Mock-Up: Construct a mock-up with actual materials in sufficient time for Architect's review and to not delay construction progress. Locate mock-up as acceptable to Architect and provide temporary foundations and support.
			1. Construct mock-up separate and free standing from the main structure.
			2. Mock-up Size: Sufficient to be representative of the final installation.
			3. The intent of a mock-up is to demonstrate quality of workmanship and visual appearance.
			4. If the mock-up is not acceptable, rebuild the mock-up until satisfactory results are achieved.
			5. Retain mock-up during construction as a standard for comparison with completed work.
			6. Do not alter or remove mock-up until work is completed or removal is authorized.
	1. PRE-INSTALLATION CONFERENCE
		1. Convene a conference approximately 4 to 6 weeks before scheduled commencement of the Work. Attendees shall include Architect, Contractor and trades involved. Agenda shall include schedule, responsibilities, critical path items and approvals.
	2. PRECONSTRUCTION TESTING
		1. Preconstruction Testing Service: Engage a qualified testing agency to perform preconstruction testing on each hempcrete mixture.
		2. Testing Samples: for determining thermal performance and compressive strength,
			1. Three samples of the proposed hempcrete mix shall be placed moist to completely fill a 6 x 6 x 12 inch (152 x 152 x 305 mm) form, a 6 inch (152 mm) diameter x 12 inch (305 mm) length form or other approved form, following the application method and procedure that will be used during construction.
				1. The samples should be as homogeneous as possible and representative of the final product. When making hand cast samples it is recommended to make at least three layers that are compacted successively. Ensuring the density of the sample is within the expected density range for installation is essential for accurate results.
			2. Samples shall be removed from the forms within 24 hours after hempcrete placement or per the binder manufacturer's specifications.
			3. Samples shall be cured/dried for a minimum of 14 days in indoor ambient conditions before density determination.
		3. Thermal Performance:
			1. The unit R-value of hempcrete may be determined with one of the following tests by an approved laboratory: ASTM C518, ASTM C1363, ASTM C177, or ASTM C1114.
		4. Mechanical Performance:
			1. Infill Integrity and Ability to Hold a Plaster Finish: Must be demonstrated with a minimum compressive strength of 29 psi (0.2 MPa) ensuring the infill has sufficient integrity to carry its own weight and its plaster finish.
	3. DELIVERY, STORAGE, AND HANDLING
		1. Store and handle in strict compliance with manufacturer's written instructions and recommendations.
		2. Protect from damage due to weather, excessive temperature, and construction operations.
	4. PROJECT CONDITIONS
		1. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's recommended limits.
			1. During Installation and Curing:
				1. Maximum Installation Temperature: 80 degrees F (38 degrees C).
				2. Minimum Installation Temperature: 40 degrees F. (4 degrees C).
				3. Allow installation outside temperature limits with adequate protection according to manufacturer guidelines.
	5. WARRANTY
		1. Manufacturer's standard limited warranty unless indicated otherwise.
1. PRODUCTS
	1. MANUFACTURERS
		1. Acceptable manufacturers need to be approved by the US Hemp Building Association, which is located at: 312 17th St. Unit 1597, Denver, CO 80202; Phone: 540-664-6499; Email: \_\_\_\_\_\_\_\_; Web: https://ushba.org
		2. Acceptable Manufacturers:
			1. \_\_\_\_\_\_\_\_.
			2. \_\_\_\_\_\_\_\_.
			3. \_\_\_\_\_\_\_\_.

\*\* NOTE TO SPECIFIER \*\* Delete one of the following two paragraphs; coordinate with requirements of Division 1 section on product options and substitutions.

* + 1. Substitutions: Not permitted.
		2. Requests for substitutions will be considered in accordance with the provisions of Section 01 60 00.
	1. SYSTEM DESCRIPTION
		1. Hempcrete: A bio-composite non-load bearing building material used in the creation of walls, and roof construction. It is lightweight, breathable, with excellent thermal resistance.
			1. Hempcrete is cast or sprayed around a timber or steel frame that carries the vertical loads of the roof and upper floors.
			2. The high thermal performance and air-tightness means single skin structures are sufficient and do not require additional insulation layers. This avoids the need for cavity wall construction. The ability of the walls to breathe and to store heat allows for passive self-regulation of the temperature and humidity within the building, often reducing heating and air conditioning requirements.
	2. PERFORMANCE AND DESIGN REQUIREMENTS
		1. General: Buildings with hempcrete walls using the prescriptive provisions in this appendix are limited to one-story. Multi-story buildings are allowed with an approved engineered design by a registered design professional.
		2. Performance Requirements:
			1. R Value: At least 1.6 per inch.
			2. Coverage: 10 cu ft (0.283 cu m) of Hempcrete will cover 10 sq ft (0.929 sq m) of a typical 12 inch (305 mm) thick Hempcrete wall.
			3. Flame Spread Index according to ASTM E84 or UL 723: 25 or less for a Class A rating.
			4. Smoke Development Index according to ASTM E84 or UL 723: 25 or less for a Class A rating.
			5. Comply with the International Residential Code (IRC), Appendix BL unless modified by this specification.

\*\* NOTE TO SPECIFIER \*\* Delete article not required.

* 1. HEMPCRETE MATERIALS
		1. Hempcrete Mix Design: Typically begins with a desired unit thermal resistance value (R-value/inch). The constituent materials of hemp hurd, binder, and water must comply with the following.
			1. Hemp Hurd: The chopped woody core of the stalks of the hemp plant, stripped of its surrounding hemp fibers. Also known as hemp shiv or shive. See Section BL103.2.1 of the IRC.
				1. Hemp hurd used in construction must match the specifications of the hemp hurd in the approved test samples.

\*\* NOTE TO SPECIFIER \*\* The binder unites the mix and provides hygrothermal properties, managing moisture throughout the matrix while providing thermal mass that complements the thermal insulation of the hemp hurd. This appendix requires lime (with or without additives) as a binder, though other binders have been used in construction.

* + - 1. Binder: A material, usually lime, that binds the hemp hurd in a hempcrete mix.
				1. Unites the mix and provides many of its hygrothermal properties, safely managing moisture throughout the matrix while providing thermal mass that complements the thermal insulation of the hemp hurd.
				2. Acceptable Binders, Singular or in Combination:

Hydraulic lime.

A combination of Hydrated lime and Pozzolans.

Pozzolans: A siliceous or alumino-siliceous material when finely divided and combined with hydrated lime in the presence of water forms new chemical compounds with cementitious properties.

Includes but is not limited to:

Metakaolin.

Volcanic ashes.

Clay brick dust.

Hydrated lime and pozzolans should always be used in combination with each other and never used separately.

Proprietary Binders: A single material or a combination of materials, Details of proprietary binders are not required to be disclosed.

Binders used in construction must match the specifications of the binders used in the approved test samples.

\*\* NOTE TO SPECIFIER \*\* Water can have an effect on the reaction rate of hempcrete. This is especially true if water additives are used to affect the reaction rate or performance of the material. If water additives are used, they must match those used in the approved test samples.

* + - 1. Water and Water Additives: Must match what was used in the approved test samples specified in this section.
	1. HEMPCRETE FINISH MATERIALS
		1. Hempcrete Finish Materials: Interior and Exterior Surfaces are to be protected with a finish with a vapor permeance rating of 30 perms or greater tested in accordance with Procedure B of ASTM E96.
			1. Exterior: Lime plaster.
				1. Plaster Thickness: 3/4 inch (19 mm) on the exterior, and installed in not less than two coats, or per binder manufacturer's instructions.
				2. Juncture of Dissimilar Substrates: with Section BL104.5 of the IRC.

Bridging: To be installed onto and across dissimilar substrates prior to plaster application on the interior or exterior.

Acceptable Bridging Materials:

Expanded metal lath

Woven wire mesh

Welded wire mesh

Fiberglass mesh

Burlap

Approved Material: \_\_\_\_\_\_\_\_\_.

* + - * 1. Non-Plaster Exterior Cladding:

No less than 3/8 inch (10 mm) exterior plaster is permitted behind exterior cladding in accordance with Section BA104.6 of the IRC.

Cladding may be any type allowed by the code, but it must be installed with a minimum 1 inch (25 mm) ventilation space to facilitate the drying of any moisture that penetrates the cladding.

The space must be open at the top and bottom to promote convective air movement and have insect screening.

Furring: Creates ventilation spaces and provides a means for fastening the cladding. Though typically vertical furring may be in any direction as long as the intended ventilation is provided.

The requirements of this specification for non-plaster exterior cladding constitute the essential elements of what is known as a rain screen.

Water-Resistive and Air Barriers: When vapor permeable, is permitted to be applied directly to hempcrete when exterior cladding is installed.

Vapor Permeability: Must be 30 perms or greater.

Barriers must be continuous and placed between the hempcrete and furring.

Plaster on the hempcrete can be used as an air barrier if continuous between the hempcrete and furring and a minimum of one coat 3/8 inch (10 mm) thick.

The required minimum 1 inch (25 mm) clear ventilation space must be maintained.

* + - * 1. Other Approved Erosion-Resistant Finishes:

Ensure compatibility with underlying plaster.

Create samples to test for compatibility.

\*\* NOTE TO SPECIFIER \*\* Portland cement plasters are prohibited as an erosion-resistant finish over clay plasters, and not recommended in general over hempcrete infill, as they significantly reduce vapor permeability and have a history of causing delamination.

* + - * 1. Portland cement plasters: Not acceptable.

\*\* NOTE TO SPECIFIER \*\* Any plaster permitted in Sections BL104.3.1 through BL104.3.9.

* + - 1. Interior Plasters: To be applied directly to the hempcrete infill surface without reinforcement.
				1. Juncture of Dissimilar Substrates: with Section BL104.5 of the IRC.

Bridging: To be installed onto and across dissimilar substrates prior to plaster application on the interior or exterior.

Acceptable Bridging Materials:

Expanded metal lath

Woven wire mesh

Welded wire mesh

Fiberglass mesh

Burlap

Approved Material: \_\_\_\_\_\_\_\_\_.

Bridging is to extend 3 inches (76 mm) or more on both sides of the juncture.

* + - * 1. Plaster Thickness: Not less than 1/2 inch (13 mm) on the interior and installed in not less than two coats, or per binder manufacturer's instructions.
				2. Plasters on Hempcrete Walls: Permitted to be installed directly on hempcrete infill without lath or reinforcement.
				3. Plaster must be installed with a minimum of two coats. The second coat fills and/or bridges cracks in the first coat.
			1. Membranes: If a vapor barrier is required, installation between the hempcrete and plaster requires mesh or other lath. The mesh or lath substitutes for the typical bond between plaster and hempcrete which is interrupted where a membrane is installed.
			2. Lath and Mesh for Plaster: As required for bridging across dissimilar substrates.
			3. Plaster Additives: To increase plaster workability, durability, strength, or water resistance.
				1. Plaster Vapor Permeance Rating: Greater than 30 perms.
				2. Additives Containing Polymers: Prohibited.
			4. Plaster Reinforcing Fibers: Increase plaster layer durability. Fibers are often used on the initial layers of plaster and are less common on the finish layer of plaster.
				1. Acceptable Fibers:

Hemp fiber.

Chopped straw.

Sisal.

Animal hair.

Fiberglass.

* + - 1. Lime Plaster: Any plaster with a binder primarily composed of calcium hydroxide and contains sufficient lime to fully bind the sand or other aggregate and permitted to contain pozzolans.
				1. Type N or S hydrated lime, complying with ASTM C206.
				2. Hydraulic lime, complying with ASTM C1707.
				3. Natural hydraulic lime complying with ASTM C141 and CEN EN 459.
				4. Slaked quicklime complying with ASTM C5.
				5. Lime Plaster provides a durable, vapor-permeable finish that can be readily repaired, has moderate compressive strength, and is compatible with Hempcrete because they both contain lime.
			2. Clay Plaster: Any plaster having a clay or clay subsoil binder. Such plaster is to contain sufficient clay to fully bind the sand or other aggregate.
				1. Samples of clay plaster are to be made to ensure a stable, non-cracking plaster before application.
				2. Clay Subsoil Requirements: To be in accordance with the Figure 2 Ribbon Test and the Figure 3 Ball Test in the appendix of ASTM E2392/E2392M.

\*\* NOTE TO SPECIFIER \*\* The primary purpose of requiring a minimum of two coats for clay plaster is to prevent or minimize through cracks. Minor cracks sometimes occur in the first coat, and the second coat fills or bridges those cracks. The use of two coats also aids in drying clay plaster. Unlike plasters with cement or lime binders that hydrate (chemically combine with water) or cure to develop their hardness and strength, clay plasters achieve this by drying, often a slower process.

* + - * 1. Applied Thickness: Not less than 3/4 inch (19 mm) thick and applied in not less than two coats.
1. EXECUTION
	1. EXAMINATION
		1. Do not begin installation until the substrates have been properly constructed and prepared.
			1. Contact with Metal: Metal in contact with hempcrete shall be stainless steel or primed and painted with epoxy, oil, bituminous paint, or other approved coating. Water based paints shall not be used.
				1. Electrical and telecommunication wiring, panels, and boxes, mechanical ducts, plumbing pipes, and other mechanical, electrical, and plumbing components in or in contact with hempcrete shall be isolated in sleeves, pipes, conduits, or tubing made of plastic, or painted as specified, or separated from hempcrete with an approved alkaline-resistant material.
		2. Verification of Conditions:
			1. Prior to Hempcrete Placement: Before placing, verify installation of forms, accessories, bracing, structure, and embedded items is complete and required inspections are completed.
			2. The structure of buildings using hempcrete infill must be in accordance with the IRC and Sections BL103.3.1 through BL103.3.9 or with an engineered design by a registered design professional and approved by authorities having jurisdiction.
		3. If substrate preparation is the responsibility of another installer, notify Architect in writing of unsatisfactory preparation before proceeding.
	2. PREPARATION
		1. Clean surfaces thoroughly prior to installation.
		2. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
	3. INSTALLATION
		1. Install in accordance with manufacturer's instructions, approved submittals, and in proper relationship with adjacent construction.
			1. Hempcrete shall be installed in accordance with the following sections of the IRC.
				1. Section BL103.6.1: Mix and mixing.

Ratio of Hemp Hurd to Binder to Water: Match the specifications of the approved test samples.

Water to Binder Ratio: Not less than 1:1. Not greater than 2:1 by weight or by binder manufacturer's recommendations.

Hemp Hurd, Binder, and Water: To be thoroughly and uniformly mixed by manual or mechanical means.

* + - * 1. Section BL103.6.2: Formwork for hand cast and spray-applied methods.

Forms: Must not deform under lateral pressure from installed wet hempcrete.

Permanent Forms: Remain after curing as a finish or substrate for another finish.

Material: Reed mats, or other approved materials with an open weave to be installed on only one side.

Sheet Materials: Must not be used as permanent forms.

Exception: Permanent forms of any material shall be permitted at the jambs, heads, and sills of openings.

Removable Forms: Removed within 24 hours after hempcrete placement or per the binder manufacturer's specifications.

Exception: Removable forms temporarily supporting hempcrete infill above wall openings shall not be removed for a minimum of 3 days or per binder manufacturer's specifications.

* + - * 1. Section BL103.6.3: Hand Cast. Installed in uniform lifts not greater than 4 inches (102 mm) in height. Each lift shall be tamped to achieve stable walls free of voids.
				2. Section BL103.6.4: Spray-applied. Forms to be installed on one side in accordance with Section BL103.6.2

Mixing: In accordance with Sections BL103.6.1 or the spray equipment manufacturer's instructions.

Installation: Hempcrete to be sprayed from the base up and per the spray equipment manufacturer's and/or binder manufacturer's instructions.

Screeding: Excess hempcrete to be removed by screeding per the spray equipment manufacturer's and/or binder manufacturer's instructions.

* + - * 1. Section BA103.6.5 - Precast Blocks.

Block Dimensions:

Minimum Thickness: 3 inches (76 mm) in all dimensions

Maximum Thickness: Limited by the average unit wall weight limit of 65 lbs per sq ft (317 kg per sq m).

Casting: In accordance with Sections BL103.6.1 through BL103.6.6 as applicable, or by other means that produce approved blocks.

Mortar: To consist of lime and sand or other aggregate with a ratio of not less than 1:1 and not greater than 1:3, or other approved mortar. The lime shall be hydrated Type N or S, or, hydraulic lime mixed with a pozzolan or hydraulic component.

Installation: A running bond between and around wall framing members. Mortar is to fill all voids between blocks and shall not be less than 1/8 inch (3 mm) thick. Spaces between blocks and framing must not be more than 3/4 inch (19 mm) and filled with mortar.

Hempcrete Block Veneer:

Not to exceed 50 lbs per sq ft (244 kg per sq m) of veneer only unit wall weight.

Limited to 5 inch (127 mm) thickness.

Anchored to the supporting wall studs in accordance with Section R703.8.4 of the IRC or secured with approved ties and fasteners to an approved backing.

Metal Ties and Fasteners: Stainless steel or primed and painted with epoxy, oil, bituminous paint, or other approved coating. Water based paints shall not be used.

* + - * 1. Section BL103.6.6: Hempcrete panels. Hempcrete panels shall require an approved design by a registered design professional.

Panels to be built by the hand cast or spray applied method in this specification.

When fabricated off site, panels are to be cured per the manufacturer's instructions before transportation to the project site.

* + - * 1. Section BL103.6.7: Lined applications.

Interior and exterior hempcrete lined applications are to be installed in accordance with the following:

General: Prior to installation, the concrete or masonry walls receiving the installation shall be clean, and free of loose mortar.

Lined Installations on Basement Walls: Require an approved design by a registered design professional.

Exterior Applications: Hempcrete to be 8 inches (203 mm) above exposed earth or paved areas.

Attachment of Precast Blocks to the Receiving Wall: shall be in accordance with Section BL103.6.5.5.

Attachment of hempcrete panels to the receiving wall shall be in accordance with Hempcrete block veneer in this specification.

Formwork. To be in accordance with Section BL103.6.2.

Permanent Formwork: Not to be allowed on the non-receiving wall side.

Thin Lining: From 3 to 4-1/4 inches (76 to 121 mm) thick.

Hand Troweled Hempcrete: Installed over a bonding coat.

Spray-Applied Hempcrete: Bonds sufficiently to the receiving wall without a bonding coat.

Medium Lining: Exceed 4-3/4 inches (121 mm) and are not greater than 6-1/2 inches (165 mm) thick.

Hand Cast or Spray-Applied: 1-1/2 x 1-1/2 inch (38 x 38 mm) dovetail shaped vertical anchorage rails to be attached with the narrowest face to the receiving wall, spaced not less than 20 inches (508 mm) and not greater than 32 inches (813 mm), with fasteners not less than 2 ft (610 mm) and not greater than 3 ft (914 mm) apart.

To be installed over a bonding coat on the receiving wall.

Thick Lining: Exceeds 6-1/2 inches (165 mm) and not greater than 8 inches (203 mm) thick or per the binder manufacturer's specifications.

Hand Cast or Spray-Applied: 1-1/2 x 2-1/2 inch (38 x 64 mm) vertical anchorage rails attached with the 2-1/2 inch (64 mm) face parallel to the receiving wall and spaced not less than 20 inches (508 mm) and not greater than 32 inches (813 mm).

Anchorage Rails: Fastened to and separated from the receiving wall with 2 inch (51 mm) spacers not less than 3 ft (914 mm) and not greater than 4 ft (1,219 mm) apart.

Minimum Anchorage Rail Thickness: Between the exterior face of vertical anchorage rails and finished face of hempcrete to be 3 inches (76 mm) or in accordance with the binder manufacturer's specifications.

To be installed over a bonding coat on the receiving wall.

* 1. FIELD QUALITY CONTROL
		1. Field Inspection: Coordinate field inspection in accordance with appropriate sections in Division 01.

\*\* NOTE TO SPECIFIER \*\* Include if manufacturer provides field quality control with onsite personnel for instruction or supervision of product installation, application, erection, or construction. Delete if not required.

* + 1. Manufacturer's Services: Coordinate manufacturer's services in accordance with appropriate sections in Division 01.
	1. CLEANING AND PROTECTION
		1. Clean products in accordance with the manufacturers recommendations.
		2. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION