



## Wall Spray Manual for Greenfiber® Stabilized All Borate Insulation

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# Wall Spray Manual For Greenfiber® Stabilized All Borate Insulation

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Greenfiber® Stabilized All Borate Insulation is sprayed into open wall cavities to provide thermal insulation and sound control. The purpose of this manual is to provide application requirements for the proper installation of Greenfiber® Stabilized All Borate Insulation in vertical assemblies when applied using Wall Spray.

Non-standard or unusual wall configurations (i.e., other than 2x4 and 2x6 walls) can affect thermal and sound properties and require special installation considerations. These types of designs should be analyzed and, if necessary, tested prior to plan review. For non-standard walls, contact a Greenfiber® technical service representative for assistance.

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## Requirements

- The contractor crew must read and understand this manual before installing Greenfiber® Insulation.
- The insulation contractor must have a quality assurance process that ensures in-field compliance with the installation instructions set forth by the manufacturer.

## Recommended Equipment, Crew Size And Material

- Two hopper insulation blowing machine with vacuum
- 2.5 inch, two jet water nozzle
- 25 or 40 series jets with maximum orifice capacity size of .002
- Motorized wall scrubber
- MP20 water pump system or equivalent
- Three-person crew
- Greenfiber® INS735 or INS745

## Equipment

### Two Hopper Insulation Machine

A two hopper insulation machine is a complete system, mounted on a truck or enclosed trailer, that consists of a dry hopper and a recycle hopper. This system allows for control of density and moisture. Separate hoppers and material gates with individual adjustments provide greater control of the installation process.

A Wall Spray truck is self-contained and includes the following:

- Auxiliary electrical power
- A powerful recycle vacuum
- 150-200 feet of 3 inch hose
- 10 feet of 2.5 inch hose
- 200 feet of 4 inch vacuum hose
- Hose reels
- Water nozzle
- Wall scrubbers
- Water pump
- Heated water tank
- 200 feet of high pressure water line

## 2.5 Inch, Two Jet Wall Cavity Nozzle

The wall cavity nozzle consists of:

- A tube to give direction and pattern to the material.
- Two jets for injecting water into the material and completing the shape of the material pattern.

## Machine Settings

### Hopper Gate Settings and Adjustments

Test insulation blowing machine settings prior to the first installation due to the inherent variability of installation equipment, ambient conditions, machine condition, maintenance, and installer technique. Adjust settings to accommodate the machine's ability to deliver product and the installer's technique. Material gate settings will vary from one machine to another. Adjust settings to apply a sufficient volume of material.

### Air Pressure Setting

Adjust air pressure to get sufficient velocity needed to carry the material to the wall. Start with air pressure at a high level and decrease air pressure in small increments to the desired rate of flow. Using this method will avoid the potential of material plugging the hose due to insufficient air flow. The amount of air pressure needed will vary depending on:

- Length and condition of the hose
- Condition of insulation machine
- Height of vertical climb from truck to application area
- Volume of material being pushed through the hose

### High Pressure Water Pump

The minimum water pressure for a Wall Spray water pump must be 200 pounds per square inch (psi).

### The “Pass”

When holding the nozzle, place one hand under the nozzle with the valve down. With the other hand, grasp the blower hose and the water hose about 18” to 24” behind the nozzle.

The pass is the spray application of insulation into a cavity by successive layering in a side to side motion. Consistent rhythm and accuracy are the keys to proper application.

The speed of the pass determines the thickness. Fast passes produce thin layers. A smooth thin layer is very stable and is the desired method. Slow passes produce thick layers and will not achieve optimum adhesion. This could cause a weak area that would not support the material that will be installed on top of it. Contain the pass to a single wall cavity.

### Wall Spray - Getting Started

#### Preparation

1. Remove all debris from the floor within ten feet of the walls to be insulated. This prevents construction debris from damaging the machinery when vacuuming the excess material off the floor.
2. Fill cavities less than one inch in width with minimal expansion foam.



3. Cover tubs, drains, fireplaces, wooden doors, open ducts and windows with poly. Cover any duct registers.
4. Cover electrical boxes with tape.
5. Ensure that all air sealing measures have been completed.



### Installation

1. For breathing protection, use a NIOSH approved N95 or higher disposable or reusable particulate respirator (reference ASTM C 1015-06).



2. Greenfiber’s Material Data Safety Sheet (MSDS) requires the use of safety eyewear when installing this product. The insulation contractor is responsible for managing housekeeping and engineering controls below nuisance dust levels. Follow all OSHA guidelines for safety requirements including 29 CFR 1926.501 Duty to Have Fall Protection. Various other local, state and federal rules and guidelines may apply.
3. Remove the plastic packaging and load the dry hopper with Greenfiber® Stabilized All Borate Insulation. Do not allow packaging to go through the hopper.
4. The person spraying the insulation should position themselves sideways to the wall. Hold the nozzle three feet from the cavity being insulated. Point the nozzle at a slightly downward angle toward the bottom of the first cavity. Turn the insulation equipment on with the remote control.
5. When the material begins to flow, engage the water jets by opening the valve on the bottom side of the wall nozzle.
6. Begin the side to side layering of the material into the cavity using the center of the cavity as a pivot point. Remember that the speed of pass must match the volume of material. Speed up or slow down the “pass” to fill the cavity.



7. Once you have layered the first foot from the bottom beyond the stud face of several cavities, continue spraying the first cavity by slowly leveling the nozzle with the plane of the floor. It is important to fill the cavity completely as you move upward. Continue layering the Greenfiber® Insulation into the cavity, maintaining a level nozzle until you are within six to eight inches of the top.
8. When you are within six to eight inches of the top of the cavity, step in closer towards the cavity and continue spraying. Increase the speed of the pass as the top of the cavity fills. Do not apply more than is required to fill the area. Excessive overspray could cause the top to sag.

**Stepping toward the wall optimizes the following:**

- Increases velocity and therefore, increases density (packs tightly into the wall).
  - Concentrates the material by reducing the range of spray which allows attachment to the bottom of the top plate.
  - Avoids separation of material from top plate.
8. After completing a cavity, quickly move the nozzle to the bottom of the next cavity.
  9. Complete five cavities before starting wall scrubbing. Begin scrubbing the wall upward from the bottom of the cavity.



10. Vacuum loose material from the floor back to the recycle hopper. The machine will mix the reclaimed product with dry product for reapplication to the wall.
11. Teamwork is important for consistent and productive Wall Spray application. While the equipment is engaged and material is flowing through the hose, another crew

member must be scrubbing walls and adding Greenfiber® Stabilized All Borate Insulation bags to the dry hopper, while the third crew member is vacuuming the excess material.

**Wall Spray Instructions And Techniques**  
**Moisture Control and Verification**

1. The primary control factor for spray-applied Greenfiber® Stabilized All Borate Insulation for vertical wall assemblies is the material moisture content at the time of drywall installation. Do not cover the insulation until the insulation moisture levels, measured and documented after a minimum period of 24 hours from the time of installation, reach a reading of 25% or less.
2. Some climate zones may require a vapor retarder per Code. If a Class I retarder is used, then cover the insulation only when the insulation moisture levels, measured and documented after a minimum period of 24 hours from the time of installation, reach a reading of 25% or less.
3. Greenfiber® requires maintaining applied moisture content below 35% during wall application.



4. Use of the GE Protimeter Mini® BLD2000 partnered with a GE extended probe part number BLD5070 is recommended.
5. Several factors affect the drying rate for Greenfiber® Stabilized All Borate Insulation. Additional drying time may vary due to these conditions:
  - Climate conditions:
    - The outside temperature is below freezing.
    - The humidity is above 80%.
  - Depth of cavity is greater than standard (3.5 and 5.5 inches).
  - Permeability of adjacent building products. Again, in any and all circumstances, do not cover the insulation until the insulation moisture levels, measured and documented after a minimum period of 24 hours from the time of installation, reach a reading of 25% or less.
6. Do not use kerosene or other fossil fuel heaters to try to accelerate the drying of Greenfiber® Stabilized All Borate Insulation. All fossil fuel heaters emit extreme amounts of moisture causing increased relative humidity and drying time; electric heaters, however, may be used. Open windows and provide air circulation in order to move moisture to the outside.

### Special Considerations

- On walls higher than eight feet, use a ladder to maintain a level application angle with the wall nozzle.
- Higher areas may require scaffolding.

### Material Velocity

Material velocity can be changed by adjusting the air to product mixture.

- If the material velocity is too low, the density will be too light and the material may not support itself.
- If the material velocity is too high, the material will rebound off of the wall of the cavity.

Adjust the air to product mixture so that the material reaches the cavity with sufficient force to adhere without an excessive amount of material falling out. This loose material is referred to as “roll off” in this manual.

Typical problems related to pass speed:

Symptom	Cause
Very thick build up near edge of the studs	Moving the nozzle too slowly as the installer reverses direction back across the cavity
Center of the cavity is too shallow	Moving the nozzle too quickly through the center of the cavity
Material falling out of the cavity	Moving the nozzle too slowly

Slightly change the distance of the nozzle from the cavity for minor material velocity adjustments. This will impact the density and appearance of the finished product.

### Depth of Overspray

Overspray is the material that extends beyond the stud face and is removed with a wall scrubber. Spray one inch of overspray beyond the cavity to ensure there will be no shallow spots and to provide enough reclaimed material to be mixed with dry material for uniformity of continued spraying.



### Maintaining Spray Integrity

When spraying a wall cavity, the bottom of the next cavity often builds up with loose material from the roll off of the previous cavity. Spraying on top of this loose material hinders the integrity of the layering process and of the appearance of the finished product along the bottom section of the cavity.

To create a good foundation in each cavity, spray one foot above the floor several cavities ahead (or the entire room) before completing the first cavity.



### Netting

Netting is a non-woven polyester material used as a backing in wall cavities against which to spray. It is a durable material and has very little stretch. Common areas that may require netting include interior walls and knee walls. Staple netting one to two inches apart. Stretch netting tightly to prevent bulging.

When applying drywall to netted and insulated wall areas, it is important that the drywall be installed first on the sprayed side of the cavity. If applied first on the netting side, the material could break loose and affect the thermal/sound performance.

### Special Applications

#### Insulating Behind Cabinets, Mirrors, Tubs, and Shower Enclosures



Identify and prepare areas of exterior walls that will require Dry Dense-Pack application. Install Dry Dense-Packed Greenfiber® Stabilized All Borate Insulation into all exterior wall sections of bathrooms, kitchens and other rooms where added vapor transport impediments, such as cabinets, mirrors, tubs, and shower enclosures are located. If unsure

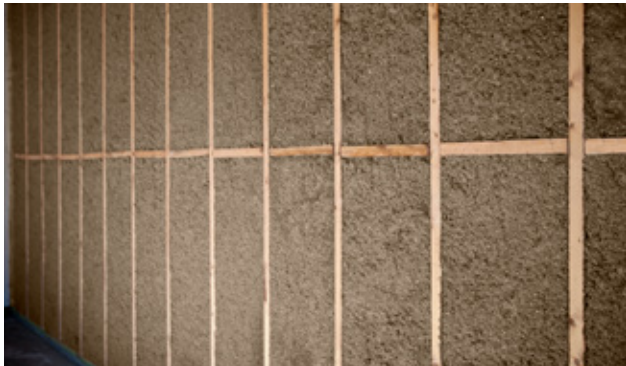
where impediments are located, Dry Dense-Pack the entire exterior wall section(s).

Dry Dense-Packed Greenfiber® Stabilized All Borate Insulation is required for installation in these special applications in vertical wall assemblies using the netted/Dry Dense-Pack application. Do not use reclaimed material in this application. For complete Dry Dense-Packing instructions, see Greenfiber's Dry Dense-Packing Wall and Floor Assemblies.

### Cross-Bracing

Install cross-bracing to support the weight of the insulation in the following situations:

- When spraying 2x6 cavities taller than 8 feet, install cross-bracing at 4' to 5' vertical intervals.
- When spraying 2x4, 24" on center cavities taller than 8 feet, install cross-bracing at 4' to 5' vertical intervals.



### Horizontal Blocking and Window Sills

Treat horizontal blocking and window sills like top plates (see Wall Spray-Getting Started, Installation step 7).

### Pipes, Wires and Receptacle Boxes

Treat pipes, wires and receptacle boxes running parallel with the floor, like top plates (see Wall Spray-Getting Started, Installation step 7).

If these obstructions are running vertically, spray the area between the stud and the obstruction using the same procedure as in a normal cavity.

### Repairing Cavities

Repair shallow spots, damaged areas and top plate gaps in cavities, following these steps:

1. If there is a shallow spot or damaged area, lightly tamp the area and repair with quick layered passes of the nozzle to fill the area.
2. If there is a gap on the underside of a top plate or any horizontal framing, push the material in with a trim broom. Pre-condition the repair area by slightly aiming the nozzle up from below the repair area. With a faster than normal pass speed, layer across the repair area to fill the gap.
3. Scrub all repaired areas.

### Band Joists

1) To insulate band joists, follow these steps:

- Pre-condition the band joist with a light water spray.
- Direct the first pass to the top corner.
- Turn the nozzle sideways.
- Make a 24" wide pass.
- Make each layer about one inch thick.
- Raise the nozzle with each pass to be more perpendicular with band joist.
- Completely fill the bottom edge to support the material above.
- Repeat another one inch layer starting at the top, working down.

- Repeat the third time as before.
- Build the cavity as thick as needed.
- Avoid overfilling.
- Pack the material with a trim broom to maximize stability, if needed.

2) If a floor joist is too close to the band joist:

- Net between the two joists creating a pocket for Dry Dense-Packing against the exterior wall.
- Create entry holes in the netting approximately every six to eight feet to ensure insulation fills entire cavity.
- Detach nozzle from the hose.
- Insert the hose into the netted cavity and Dense-Pack the area completely with dry Greenfiber® Stabilized All Borate Insulation at a minimum of 3.5 lbs/ft<sup>3</sup>.

### Maintaining Nozzles

Keep the outside of the nozzle clean. Material build up will create a random pattern, causing an unstable wall cavity, and slow down the installation process.

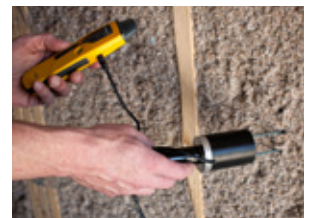
The jets are "quick change tips" which can be removed easily. Check for consistent water stream from both jets. If a jet gets plugged, release it from the nozzle by pushing down and turning to clean. Use a wooden toothpick or broom straw to clean by pushing the restricting particle into the inside of the jet. Push the debris from the outside inward. Flush the jet with water from the nozzle. Do not use hard materials like steel or brass to clean the jet.

### Moisture Testing Guidelines

Moisture readings for standard wall assemblies (2x4 and 2x6) are determined by a measurement at mid-depth, halfway between the studs.

### Testing Procedure

1. Gently insert the dual pin probe halfway up the wall unit and centered between the two studs. Insert to mid-depth into the wall using a slight side to side motion.
2. Withdraw the probe ¼ inch before taking and recording the reading. This prevents product over-compaction at the tip from giving a false conductivity reading.
3. Continue this same procedure for each randomly selected testing location.
4. Verify machine settings by taking the first installed measurement after spraying 200 square feet. Take two additional measurements from two separate rooms of Wall Spray application.
5. Record the data on a quality control moisture measurement control log. One suggested form is the Greenfiber® Stabilized All Borate Insulation Installation Control Log, attached.
6. If a moisture reading exceeds 35% at installation, do not continue Wall Spray application until the equipment is adjusted properly.



For inquiries about moisture meters or installation equipment, contact your Greenfiber® technical representative. If the meter does not show proper calibration using the standard moisture content clips, the manufacturer will need to inspect the moisture meter.

## Troubleshooting Guide for Wall Spray

Symptom	Cause	Solution
Material not adhering to walls	Insufficient water and/or too much material flow	Increase pump pressure, not to exceed 250 psi or close material feed gate a little at a time. Pressure should be higher with 40 series jets than 25 series jets.
	Standing too far from wall	Stand closer to the wall, approximately three feet.
	Too much air pressure	Lower air pressure in small increments.
	Nozzle upside down	Water line should be on bottom.
Material falling out of wall	Too much water	Install smaller jets or lower pump pressure gradually.
	Too much recycle	Maintain approximately 60% dry to 40% recycle ratio.
	Improper spray technique	Make sure nozzle is perpendicular to the wall surface except at the bottom of the cavity.
		Refer to section above for correct application technique.
		Spray one layer on top of the previous layer making sure each pass goes from one stud to the other.
	Non-standard framing	2x6 framing, taller than 8 feet high should have cross-bracing every 4' to 5'.
		2x4 framing, 24" oc taller than 8 feet high should have cross-bracing every 4' to 5'.
Spraying too far out past the face of the studs	Keep overspray to about 1 inch past the face of the studs.	
Gaps or smiley faces at the top of the cavity	Installed moisture content is above 35%	Adjust recycle and dry mixture to maintain moisture level between 25% and 35%.
	Improper spray technique	Step in closer and speed up the pass. Do not spray too far past the face of the studs. Excess build up of material will cause the tops to pull loose or fall out.
	Improper wall scrubbing	Operate wall scrubber from the bottom of the cavity upward.
Coverage	Density is too high	Inspect nozzle angle, air pressure, water pump pressure, jet size and distance from wall.

# Installation Control Log for Greenfiber® Stabilized All Borate Insulation

Completed By \_\_\_\_\_ Date \_\_\_\_\_ Time \_\_\_\_\_  
 Builder Name \_\_\_\_\_ Development \_\_\_\_\_  
 Development \_\_\_\_\_ Contractor \_\_\_\_\_  
 Address \_\_\_\_\_ Truck Number \_\_\_\_\_  
 Lot # \_\_\_\_\_ Lead Installer \_\_\_\_\_

## Wall Spray Moisture Readings

Install insulation at minimum of 2.7 pcf. Take one moisture reading from three different rooms per house.

Lot #			
Reading #	1	2	3
Room			
Sq. Ft. of Wall			
Moisture Reading			

## Dry Dense-Pack Core Sample Density

Install Dry Dense-Packed Greenfiber® Stabilized All Borate Insulation in all exterior wall sections in bathrooms, kitchens and other rooms where added vapor transport impediments such as cabinets, mirrors, tubs and shower enclosures are located. If unsure where impediments are located, Dry Dense-Pack the entire exterior wall section(s). Do not use reclaimed material in this application. Install insulation at a minimum of 3.5 pcf. Take core samples from the top, middle and bottom of the first cavity to ensure proper technique and consistent density.

Reading	Top	Middle	Bottom
Exterior Wall			
Core Sample Weight			
Density Reading			

### Notes

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# Wall Spray Insulation Best Practices



Today's condensed building cycles require careful attention to these installation best practices and Greenfiber's instructions to ensure proper product performance. Greenfiber® offers the following instructions for attaining the highest quality results and performance for installing 2x4 and 2x6 wall insulation. For complete Wall Spray installation instructions, please see Greenfiber's Wall Spray Manual.

## Coverage Charts

- 1) Consult the Greenfiber® Stabilized All Borate Insulation Fact Sheet for the current Wall Spray coverage chart.
- 2) For Wall Spray application, install Greenfiber® Stabilized All Borate Insulation in walls at a minimum density of 2.7 pounds per cubic foot.
- 3) Bag coverage is dependent upon density and moisture levels. As the density and moisture levels increase, the coverage per bag decreases.

## Drying Time

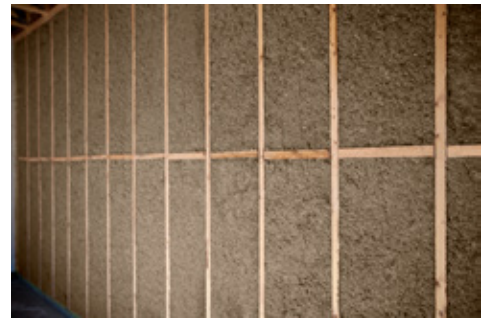
- 1) Drying time varies due to local climate conditions including temperature, humidity and the installed moisture. Do not cover the insulation until the insulation moisture levels, measured and documented after a minimum period of 24 hours from the time of installation, reach a reading of 25% or less in accordance with Greenfiber's Wall Spray Manual.
- 2) Some climate zones may require a vapor retarder per Code. If a Class I retarder is used, then cover the insulation only when the insulation moisture levels, measured and documented after a minimum period of 24 hours from the time of installation, reach a reading of 25% or less.
- 3) Install Dry Dense-Packed Greenfiber® Stabilized All Borate Insulation in all exterior wall sections in bathrooms, kitchens and other rooms where added vapor transport impediments, such as cabinets, mirrors, tubs, and shower enclosures are located. If unsure where impediments are located, Dry Dense-Pack the entire exterior wall section(s).

## Cross-Bracing

- 1) Install cross-bracing to support the weight of the insulation in the following situations:
  - a) When spraying 2x6 cavities taller than 8 feet, install cross-bracing at 4' to 5' vertical intervals.
  - b) When spraying 2x4, 24" on center cavities taller than 8 feet, install cross-bracing at 4' to 5' vertical intervals.

## Non-Standard Wall Configurations

- 1) Non-standard or unusual wall configurations (i.e., other than 2x4 and 2x6 walls) can affect thermal and sound properties and require special installation considerations.



These types of designs should be analyzed by a design professional and, if necessary, tested prior to plan review. For non-standard walls, contact a Greenfiber® technical service representative for assistance.

## Quality Assurance Process

- 1) The insulation contractor must have a quality assurance process that ensures in-field compliance with Greenfiber® installation instructions.
- 2) For Wall Spray applications, record and maintain on a quality control log three moisture readings, one from three different rooms per house.
- 3) For Dry Dense-Pack applications, record three core sample weights on a quality control log, from the top, middle and bottom, of the first cavity to ensure proper technique and consistent density.



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