MICRO-BIN COMPOST SYSTEM

Tongue & Groove Lumber Construction
With Pipe-On-Grade Aeration

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Assembly Procedures - Overview

General Comments:

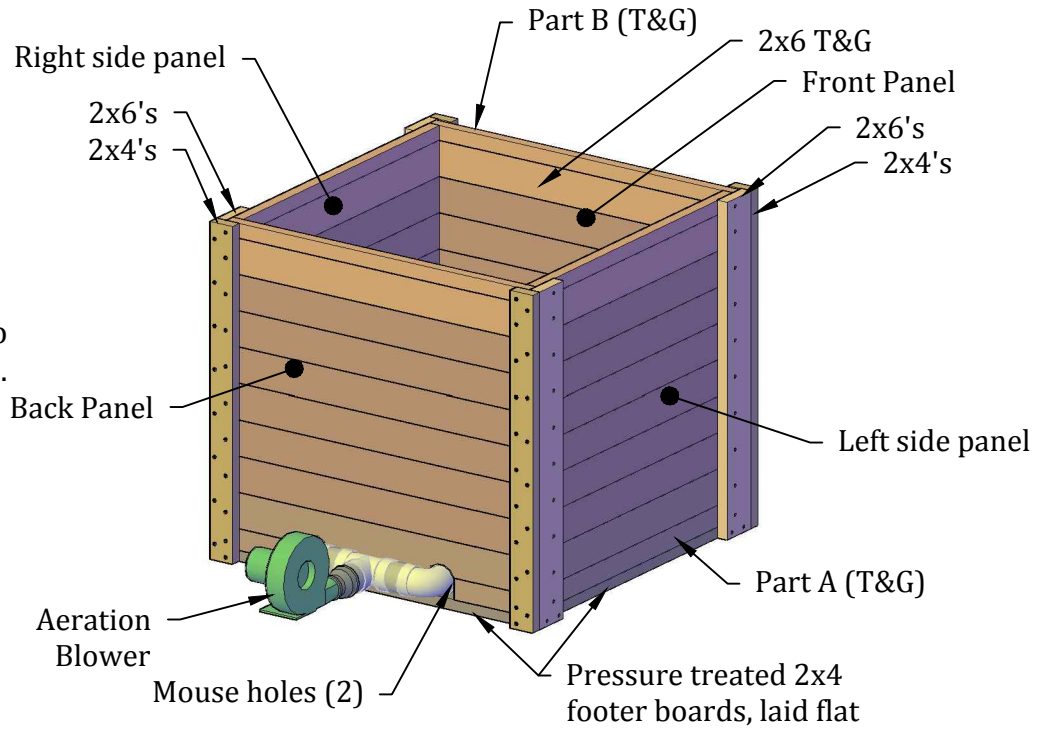
Construction Materials and Assembly Overview

This style of Micro-Bin is constructed using 2x6 tongue & groove lumber. The assembled Micro-Bin measures 4'x4'x4', and has a volume of 64 cubic feet, or approximately 2½ cubic yards.

The bin includes: pressure treated 2x4's on the bottom of the bin to prevent rotting of the wood that is in contact with the ground and to minimize air leaking out the bottom of the system (short-circuiting). The bin also includes vertical 2x4's and 2x6's used to fasten the panels together at the corners to form a rigid box.

The front boards are removable to make the bin easier to load and unload. The 2x6 T&G boards are stacked as the bin is filled, and secured at the top, once completely filled.

The back panel has two "mouse holes" cut in the base to allow the aeration pipes to pass through the box and provide a tight seal to prevent air leakage.



Installation and Set-up

When completed, the Micro-Bin should be placed on level ground. It can be either a paved surface or compacted soil.

The Micro-Bin should be located within 50-feet of electrical power, and relatively close to a source of water (i.e. hose bib).

The Micro-Bin should be located at least 50-feet away from surface water and 25-feet from the nearest property line.

It is recommended to provide sufficient room for two or three bins. Access for a farm tractor should also be provided if one is to be used to fill the bins and/or remove finished compost.

Start-up and Process Monitoring

Procedures for installing the aeration system, filling the Micro-Bin and monitoring the composting process are covered in detail in the Training Manual that is included with the O_2Compost Micro-Bin Kit.

MICRO-BIN COMPOST SYSTEM

Introduction to Aerated Composting

Aerated Composting is easy, when the following criteria are satisfied:

1) the mix of materials meets four target parameters; and

2) airflow is induced into the pile intermittently, to maintain aerobic conditions throughout the pile.

These concepts are discussed in detail in the Training Manual that has been provided with this Micro-Bin kit.

With aerated composting, fresh air (i.e., oxygen) is delivered uniformly throughout the compost pile using an electric blower (provided). This approach is referred to as Aerated Static Pile (ASP) Composting. This approach eliminates the need for pile turning during the first 30-days of the composting process.

The oxygen that is introduced into the compost bin stimulates the micro-organisms that are in the mix, and they in turn produce heat as a by-product of their metabolic process. With composting, our primary goal is for the pile temperature to exceed 131°F for a minimum of three days, in order to destroy pathogens, parasites, weed seeds and fly larvae in the mix. By maintaining aerobic conditions throughout the pile, we are also able to expedite the composting process and minimize the generation of offensive odors.

With ASP Composting, "hotter is not better". With a high energy mix, pile temperatures can reach 170°F or hotter, and this has the net effect of killing off large numbers of the beneficial micro-organisms and slowing down the composting process. Compost is self-insulating and once a pile gets hot it tends to stay hot. To cool the pile down to more moderate temperatures, we increase the airflow to displace the heat out of the pile and replace it with cooler ambient air. This is done by increasing the frequency and/or duration that the blower operates. Spontaneous combustion is not a concern with the O_2Compost Micro-Bin compost system.

To manage pile temperatures, the blower is set to operate intermittently, cycling on and off, 24-hours a day. The blower is controlled with a simple cycle timer (provided). The amount of airflow required to optimize the composting process depends on the amount of energy in the compost mix. A typical On/Off setting might be 2-minutes On and 30-minutes Off, but this will vary with the composition and age of the mix. Once the primary temperature goal has been met (i.e., 131°F for a minimum of three days), pile temperatures should range between 120° and 150°F. Pile temperatures will drop off as the pile ages.

With ASP Composting, there is a tendency to dry out the compost mix which can limit the biology of the system and in some cases suspend the composting process. In hot-dry climates and especially in severe cold climates, this tendency toward drying can be pronounced. Where drying may occur, operating the pile at hotter than ideal temperatures is preferred to excessive drying. It is also advisable to cover the Micro-Bin with a tight fitting lid (design provided) to help retain moisture in the compost mix.

With this Micro-Bin kit, airflow is distributed evenly across the base of the compost pile using a pair of solid and perforated air pipes (provided) that are placed directly on the ground. The aeration pipes are located toward the center of the Micro-Bin so that the compost mix between the pipes and bin walls minimize air leaks, and directs the airflow upwards. The air holes in the perforated pipe are generally oriented downward to minimize the amount of compost mix that gets into the pipes.

MICRO-BIN COMPOST SYSTEM

Introduction, Continued

The composting process is divided into two phases: 1) the Active Phase; and 2) the Curing Phase. Active composting is primarily a bacterial driven process wherein the readily available forms of carbon (e.g., proteins and carbohydrates) are degraded very rapidly, resulting in high heat production. During the Active Phase, the system should be managed most closely to avoid the generation of offensive odors which could impact neighbors and passersby.

Curing is a fungal driven process that results in the breakdown of the more resilient forms of carbon (cellulose and woody materials) and changes the compost texture to a more soil like consistency. Curing is a cooler process and during this phase it is typical (and a good thing) to see mushrooms growing on the surface and a white fibrous material (Actinomycetes) growing throughout the compost. It is the Actinomycetes that give compost its “forest duff odor”.

The length of time required for the active and curing phases depends on the initial mix of materials, but as a general rule of thumb, Active Composting takes approximately 30 days and Curing takes an additional 30 to 60 days. In fact, the transition between Active Composting and Curing does not occur at a specific point in time but is instead a gradual process. The degree to which the curing process is complete can be determined most readily by evaluating how the compost smells. Well cured compost has a pleasant soil-like fragrance, with no remnant odors of the original raw feedstock materials. A sweet or smoky odor or the presence of ammonia all indicate that the composting process is not yet complete.

During the Active and Curing Phases, the pile volume will shrink considerably (often between 25% and 40% of the initial volume). Following the Active Phase, the compost may be removed from the bin, remixed and re-wetted if dry, and set aside to cure. It is always a good practice to cover the curing pile with a tarp to keep the compost from getting excessively wet from rainfall or snow, and to prevent contamination with wind-blown weed seeds. If placed directly on the ground, it is very likely that earthworms will colonize the pile, further improving the quality of the finished product.

Depending on the mix of materials being composted, the cured material may still be "lumpy and chunky". It may be used as-is or screened to produce a more uniform texture.

If the compost feedstocks are produced on a continual basis (Eg. horse manure) two or more bins are recommended. In this way, one bin can be actively composting while the second bin is being filled. The one blower/timer set that is provided with the kit can be easily moved between the bins. Additional aeration pipes can be purchased at your local Home Depot.

Learn by doing: Composting is a trial and error process and much like riding a bicycle or playing a musical instrument, it requires practice. The first batch or two may not be perfect, but don't worry - you cannot break your Micro-Bin Compost System. It will be very satisfying when you work through the variables and produce a high quality finished compost product. Refer to your Training Manual for further details.

O_2Compost is committed to your success. If you have any questions or concerns, you may contact us at: info@o2compost.com

MICRO-BIN COMPOST SYSTEM

Construction Notes & Materials List

CONSTRUCTION NOTES:

1. Noted construction and materials specifications are part of this design and shall govern construction of this project.
2. This project shall be constructed at an elevation so the grade slopes away from the bin to reduce the risk of flooding.
3. This project will be operated and maintained as described in the O_2Compost Training Manual.
4. Contractor shall minimize impacts from construction on existing structures, fencing and vegetation.
5. All dimensional lumber in the materials list shall be No. 2 hem-fir or equivalent grade lumber as supplies vary in different regions.
6. All nails, screws, and metal joint connectors shall be galvanized or coated to minimize corrosion.

UTILITIES:

O_2Compost does not make any representation of the existence or nonexistence of any public and/or private buried or overhead utilities. The exact location, depth, and/or height of all utilities shall be determined by the property owner and responsible utility. Any construction and/or O & M activities within the utility easement shall be in conformance with the utilities' requirements.

Always contact utility locating service prior to excavation .

Materials List	Quantity	Home Depot SKU#
2" x 6" x 12' tongue & groove lumber	6	476-581
• cut to 4' lengths		-
2" x 6" x 12' tongue & groove lumber	6	476-581
• cut to 3'-9" lengths		-
2" x 4" x 8' lumber	2	161-640
• cut to 3'-10 1/2" lengths	4	-
2" x 6" x 8' lumber	2	186-695
• cut to 3'-10 1/2" lengths	4	-
2" x 4" x 10' PT lumber	2	377-845
• cut to 4' lengths	2	-
• cut to 3' 5-1/2" lengths	2	-
1lb of 8 x 2-1/2" exterior grade wood screw	2	134-228
5/16 x 2-1/2" hex lag screw	16	267-234
5/16 hot-dipped galvanized cut washer	16	538-949
1/4-20x20mm zinc plated insert nuts	2	608-576
1/4"-20 x 70mm brass plated connecting bolts	2	610-109
1/4" x 1-1/4" fender washer	4	590-605
Exterior grade liquid nail	1	211-334
Aeration Equipment		
1/4HP blower 110V	1	Provided
Cycle timer	1	Provided
20" temperature probe	1	Provided
3" to 4" rubber (Fernco) fitting	1	Provided
4" Tee fitting	1	Provided
4" 90	2	Provided
4" Coupler	2	Provided
6" long 4" diameter solid pipe	1	Provided
4" End cap	2	Provided
12" long 4" diameter solid pipe	5	Provided
24" long 4" diameter perforated pipe	2	Provided

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Construction Procedures

Construction Procedures for the 4-foot by 4-foot Tongue & Groove Lumber Option

Step 1 - Purchase Micro-Bin Materials

- Purchase the lumber and hardware materials as specified in the Materials List. Refer to Sheet 5.
- Many lumber suppliers will cut lumber at little or no additional charge.
- Cut lumber to the lengths indicated on the Materials List.

Step 2 - Cut and Assemble the Bottom and Top Side Boards, Parts A & B.

- The objective of Step 2 is to provide a flat bottom edge and a flat top edge on all four sides of the Micro-Bin.
- Rip four Tongue and Groove (T&G) boards lengthwise, dividing each board into a 2-inch and a 3-inch wide section (Fig. 1A, Sheet 8).
- Note: The front and back boards measure 4-feet (48-inches) in length and the two side boards measure 3-feet 9-inches (45-inches in length). (Sheet 9).
- Using strong wood glue (e.g., "Liquid Nails"), attach the tongue half of each ripped board to the bottom side of a 2x6 T&G board of comparable length (Fig. 1B, Sheet 8). This assembly produces the four bottom boards (Part A).
- Using strong wood glue, attach the remaining groove half of each ripped board to the top side of a 2x6 T&G board of comparable length. This assembly produces the four top boards (Part B).

Step 3 - Cut Two Mouse Holes in One of the 48-inch Long Part A Assemblies

- The "Mouse Holes" allow the two aeration pipes to pass through the back wall of the Micro-Bin, and provide a relatively tight seal against the pipe to minimize air leaks.
- Using a section of 4-inch diameter pipe (provided with the Micro-Bin kit), scribe two circles on one of the 48-inch long Part A assemblies, at the locations shown (Sheet 10 and in Detail 2 on Sheet 13). The bottom of each circle should touch the bottom edge of Part A.
- Using a straight edge, extend two vertical lines downward from the sides of the circle to the bottom edge of Part A (intersecting the bottom edge at right angles).
- With a hand-held jig saw, cut out the two Mouse Holes. Discard the cut pieces.

Step 4 - Attach the Back and Side Part A Assemblies to a Pressure Treated Footer Board

- The pressure treated footer boards help to: 1) prevent rotting of the wood that is in direct contact with the ground, and 2) seal in the airflow and minimize air leaks.
- The 2x4 footer boards lay flat on the ground and are attached to a corresponding Part A Assembly such that the outer edge of the footer board is flush with the outer side wall of the Micro-Bin. As a result, the footer boards extend roughly 2-inches toward the inside of the bin (Fig. 2, Sheet 8).
- Note: On both sides of the Micro-Bin, the Part A assemblies extend beyond the ends of the footer boards, 2-inches toward the rear of the Micro-Bin and 1 $\frac{1}{2}$ -inches toward the front (Fig. 3, Sheet 8).
- Note: On the front of the Micro-Bin, the Part A assembly and the footer board are not attached. This allows for the removal of the front boards when emptying out the bin.
- On the back and sides of the Micro-Bin, attach the footer boards to the Part A assemblies using strong wood glue and 2 $\frac{1}{2}$ -inch long hex-head lag screws (Sheet 12 and Detail 3 on Sheet 13).
- Pre-drill the pilot holes on each footer board using a $\frac{1}{4}$-inch drill bit. Then counter-bore each hole on the underside of the footer boards using a 1-inch drill bit to a depth of $\frac{3}{8}$-inch. By doing this, the heads of the lag screws will be recessed, allowing the footer boards to sit directly on the ground.
- Insert each 2 $\frac{1}{2}$ -inch lag screw with a flat washer, using a socket wrench - hand tighten.

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Construction Procedures, Continued

Step 5 - Assemble and Pre-Drill Micro-Bin Corners

- The Micro-Bin corners: 1) connect the back and side panels; and 2) provide two channels on the front to insert individual boards to form the completed box.
- Each corner is comprised of one 2x4 and one 2x6.
- Note: Staining or painting the component parts of the Micro-Bin is best done at the completion of Step 5.

- Screw the corner assemblies together using 2 $\frac{1}{2}$-inch wood screws installed through the face of the 2x4 and into the edge of the corresponding 2x6.
- Pre-drill the 2x4's to facilitate this assembly process.

Step 6 - Connect the Four Base Panels to the Four Corner Assemblies

- Connect the back footer board assembly (i.e., with the two mouse holes) to the two back corner assemblies, using 2 $\frac{1}{2}$-inch wood screws inserted through the back 2x4's. (Fig. 3 on Sheet 8).
- Next, connect the front footer board to the two front corner assemblies, using 2 $\frac{1}{2}$-inch wood screws inserted through the front 2x4's and the side 2x6's.
- Last, connect the two side base panels to the back and front corner assemblies, using 2 $\frac{1}{2}$-inch wood screws inserted through the side 2x6's.

Step 7 - Connect the Back and Side Panel Boards

- The back and side panel boards are screwed to the corner assemblies.
- The front boards (i.e., "slip boards") are not screwed to the corners, making it possible to remove them when filling and emptying the Micro-Bin.

- Add a back board and then the side boards, securing each board to the corner assemblies using 2 $\frac{1}{2}$-inch wood screws.
- The ends of the side boards should butt up tightly against the back boards.
- Add the back and side boards layer by layer.
- Make sure the individual boards fit tightly together. Using a scrap piece of 2x6 and a hammer or mallet, tap the side boards to seat them into place.
- On the front side, a channel is formed between the inside of the two corner assemblies and the ends of the side boards. When attaching the side boards to the front corner assemblies, provide a $\frac{1}{2}$-inch gap to allow for easy installation of the front slip boards.
- Use the Part B assemblies from Step 1 as the top boards on all four sides.

Step 8 - Install Wood Inserts to Secure the Top Front Panel, Part B.

- Because the front slip boards are not connected to the vertical corner assemblies, the top of the box may tend to lean outward when the Micro-Bin is full. Too produce a rigid box when the bin is full, the top front board is connected to the front corner assemblies using wood inserts and removable connecting bolts (Detail 1, on Sheet 13).

- Drill a1 $\frac{1}{2}$-inch deep, $\frac{3}{8}$-inch diameter hole through the front 2x4 corner board on both the left and right sides, and into the fourth full board from the bottom and the top full slip board.
- Remove the slip boards, to expose the pilot hole.
- Drill a 1 $\frac{1}{2}$-inch deep hole in the respective front boards using a $\frac{11}{32}$-inch drill bit, and install the wood insert from the "inside" side of the board following the manufacturer's instructions. Note that it will help to secure the wood insert with a small amount of wood glue.
- Reinstall the front board and secure it using the removable connecting bolts (with washers).

MICRO-BIN COMPOST SYSTEM

Construction Figures

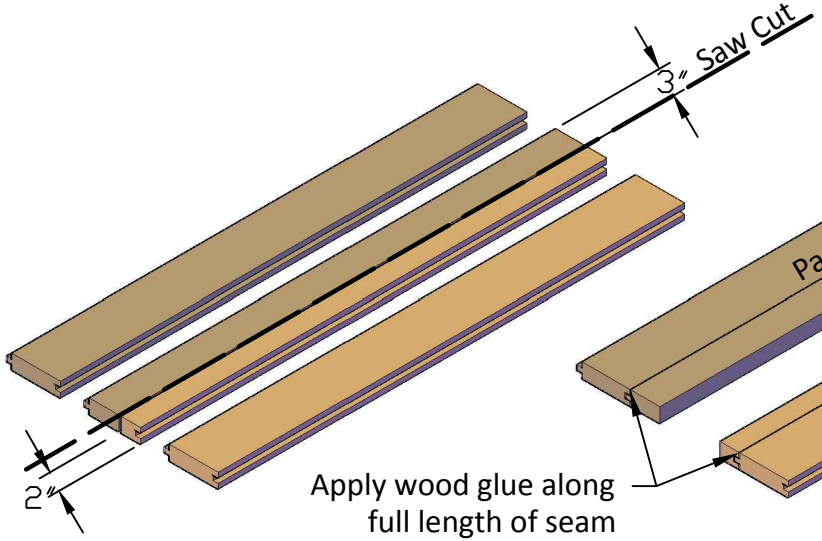


Figure 1A

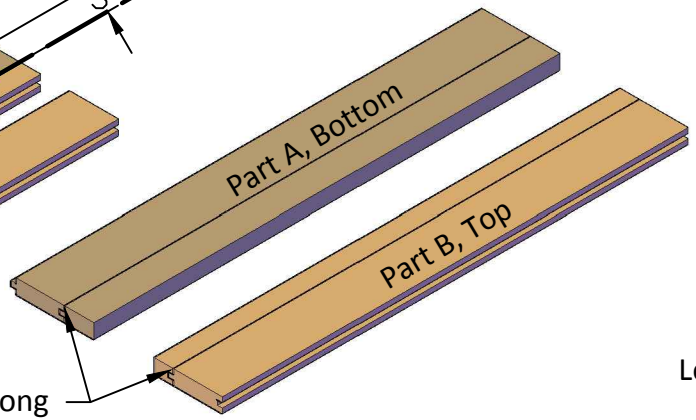


Figure 1B

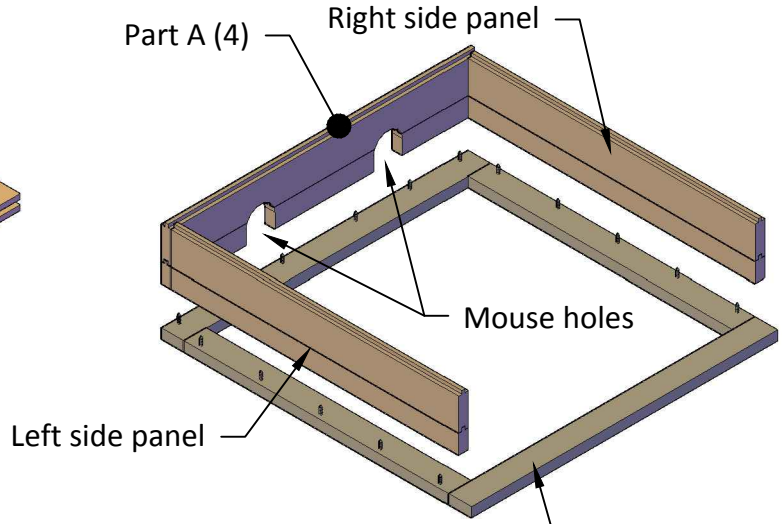


Figure 2

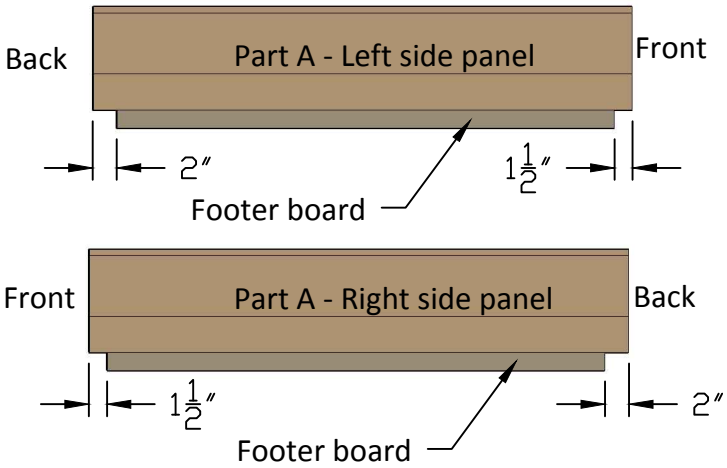


Figure 3

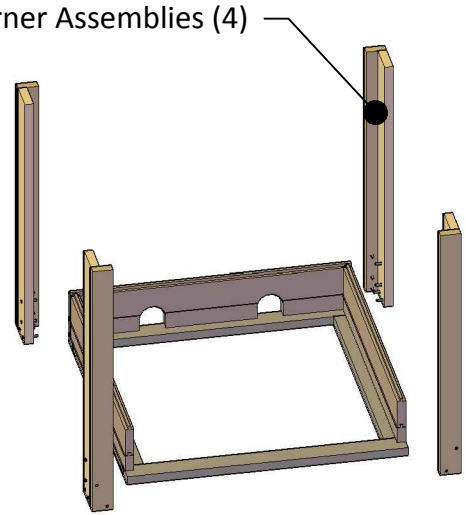


Figure 4

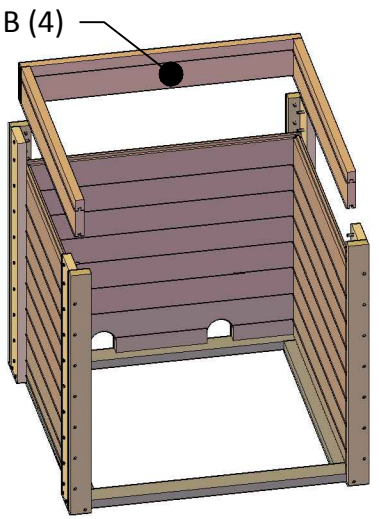
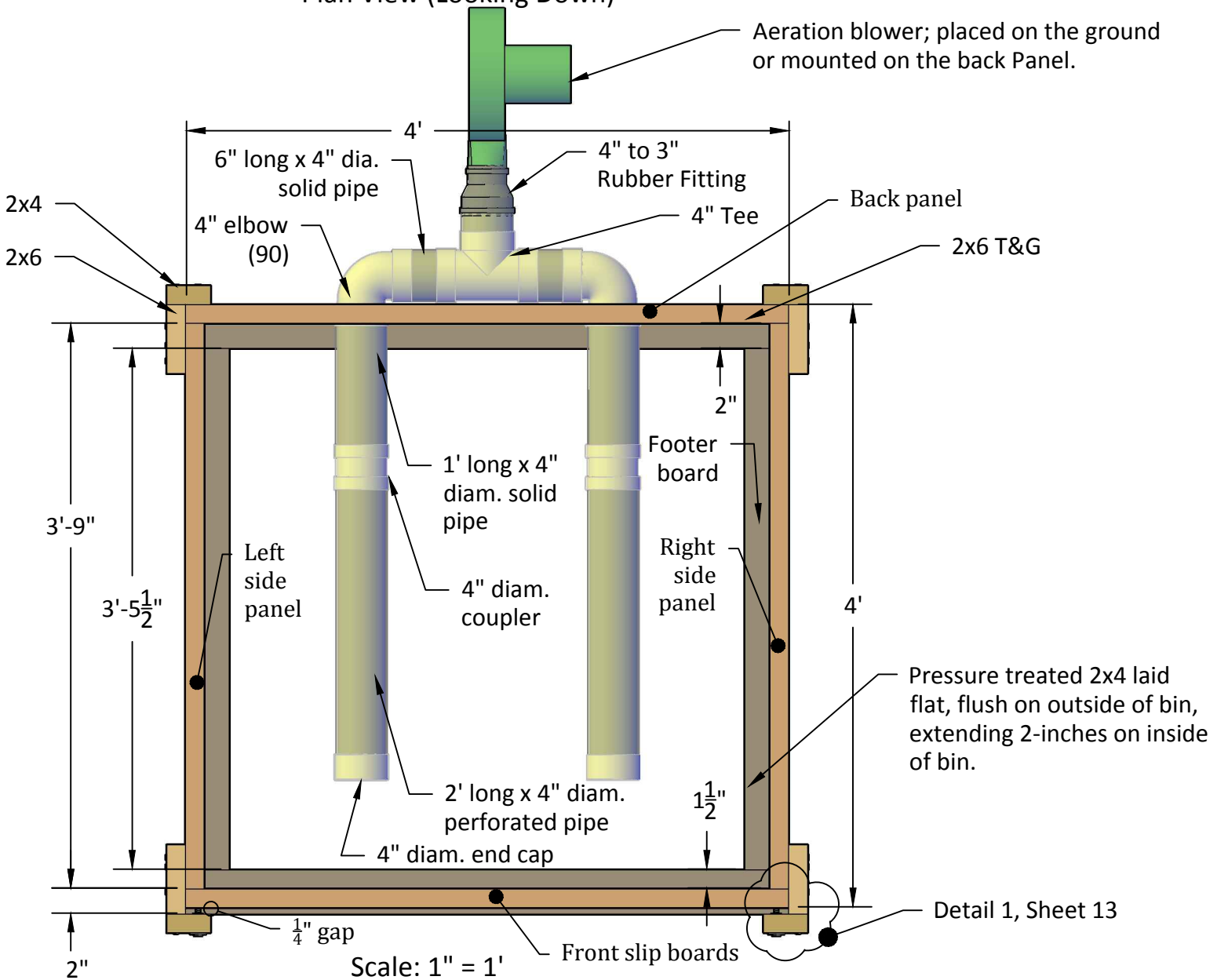


Figure 5

MICRO-BIN COMPOST SYSTEM

Plan View (Looking Down)



Scale: 1" = 1'

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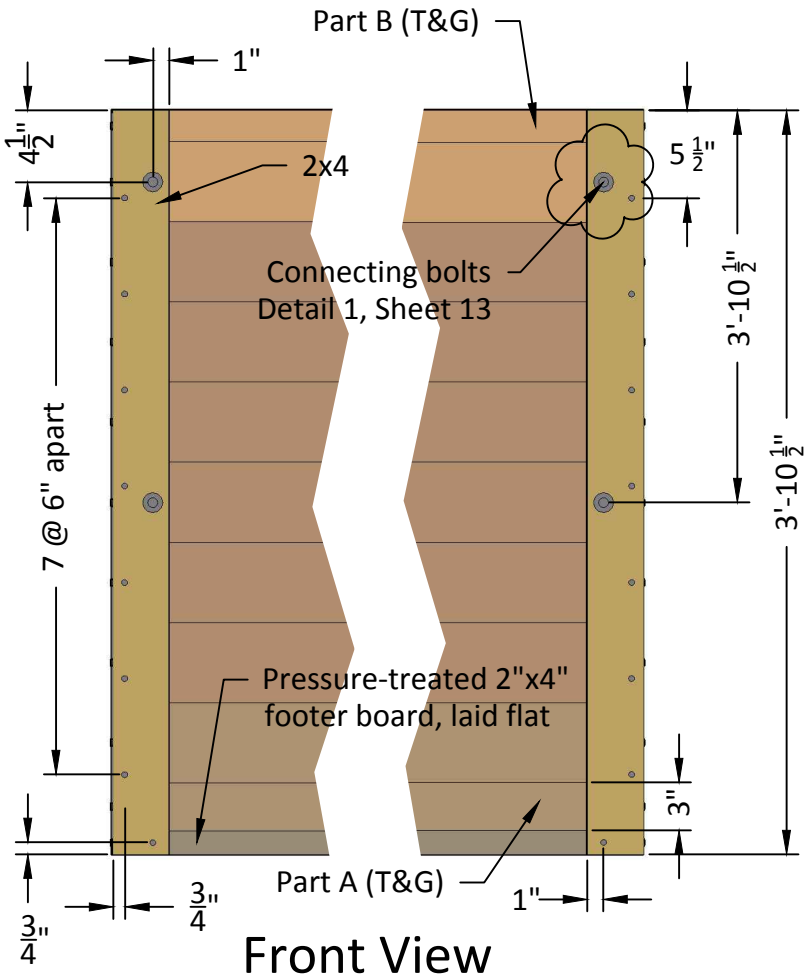
		Designed by: Derrick Santos, EIT	Micro-Bin 4x4 T&G	9 of 15

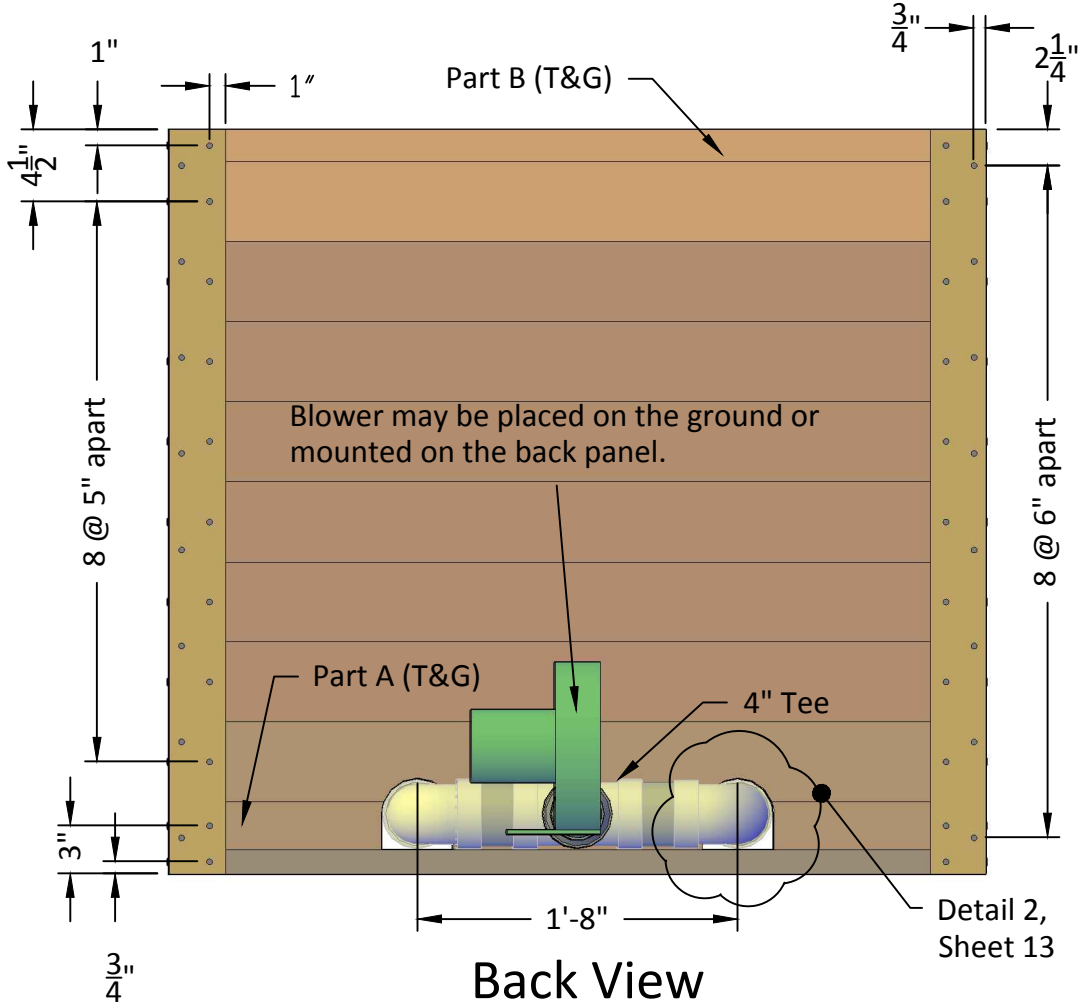
MICRO-BIN COMPOST SYSTEM

Front & Back Views



Front View

Scale: 1"=1'



Back View

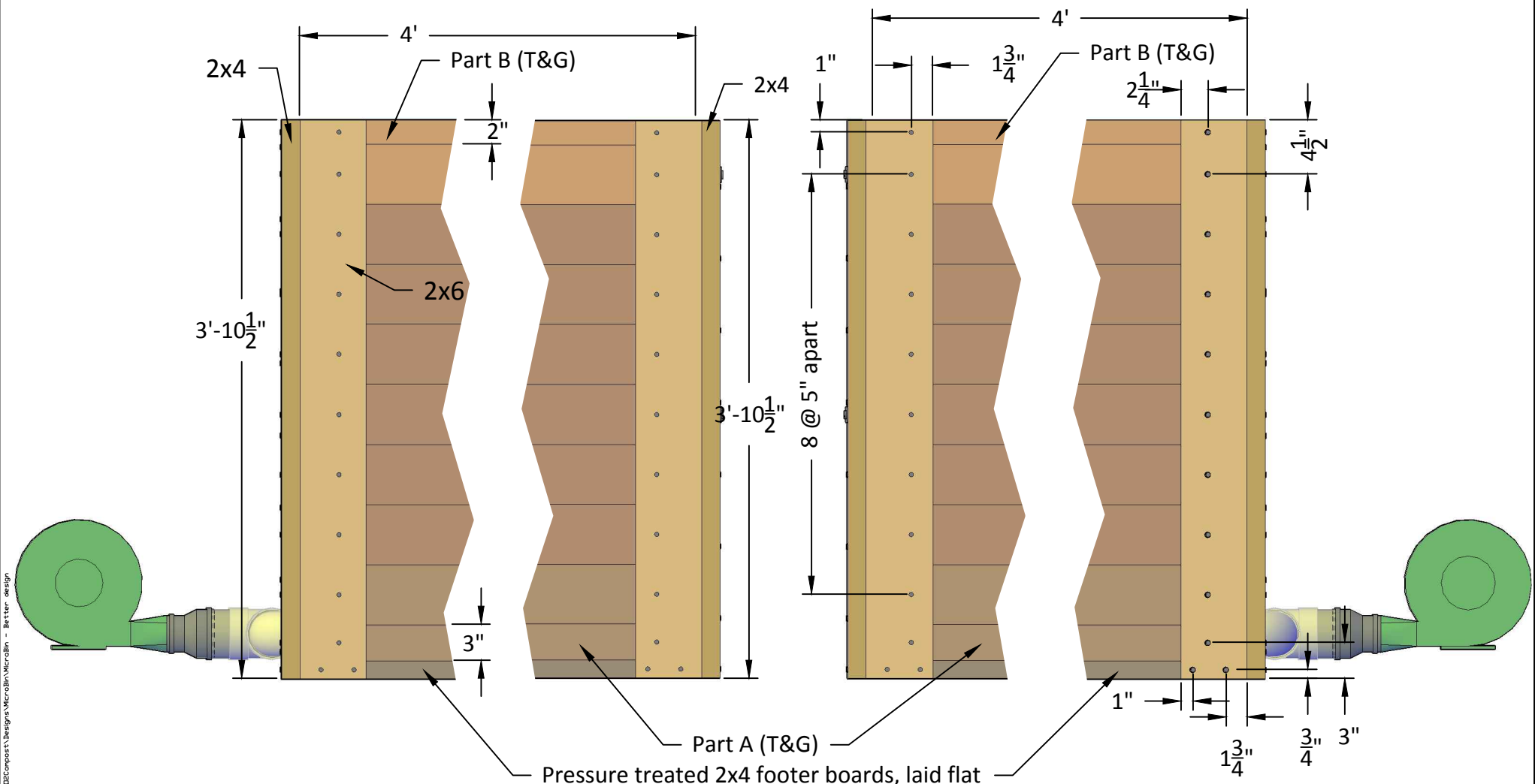
Scale: 1"=1'

NOTE: Rip two of the 2"x6"x4' T&G and two of the 2"x6"x6' T&G boards length-wise to create four bottom boards @ 3" (Part A) and four top boards @ 2-½" (Part B). Board (A) will have tongue on top and board (B) will have groove on the bottom.

NOTE: Insert nuts and connecting bolts are used to attach the top board (Part B) to the bin sides during the composting process. Remove connecting bolts to release the front boards to empty the bin.

MICRO-BIN COMPOST SYSTEM

Side Views



Left Side View

Scale: 1"=1'

Right Side View

Scale: 1"=1'

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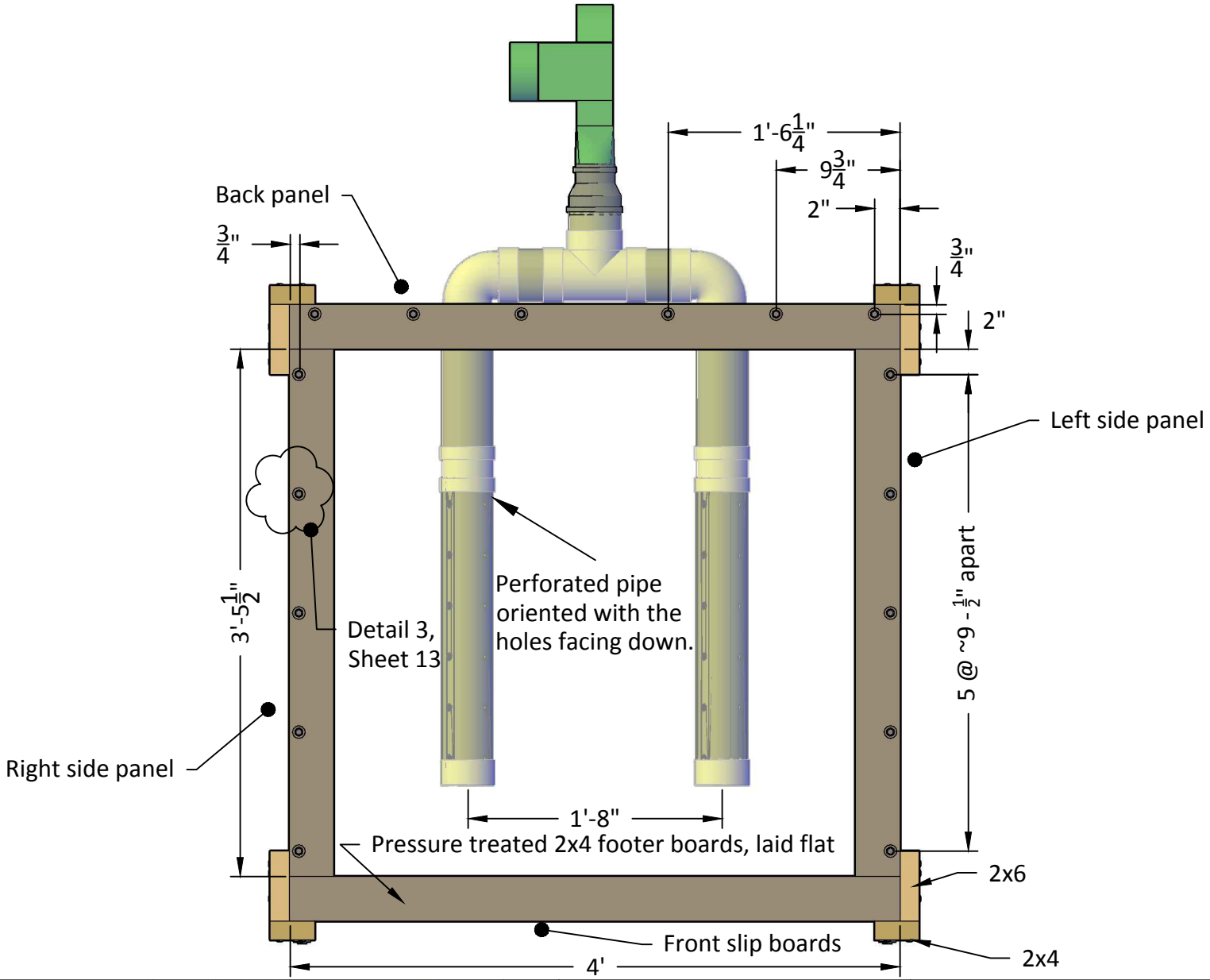
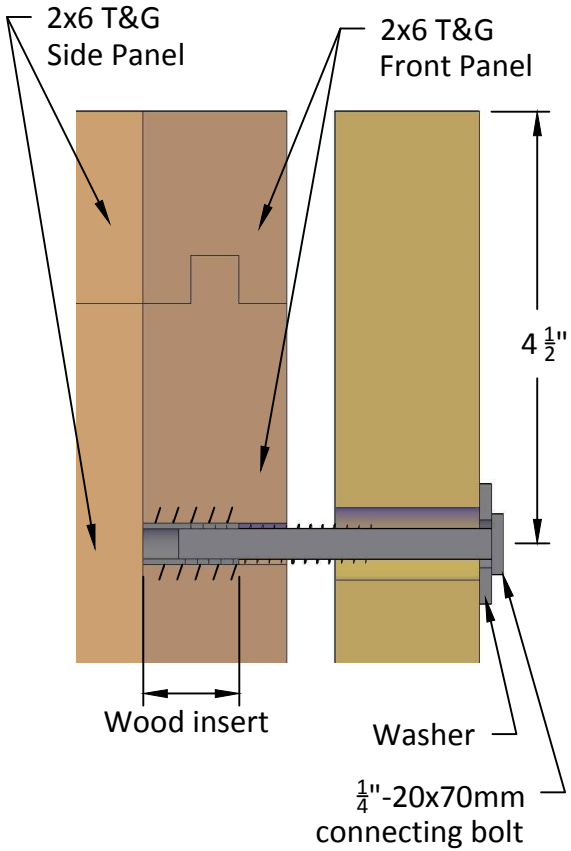
Bottom View (Looking Up)



MICRO-BIN COMPOST SYSTEM

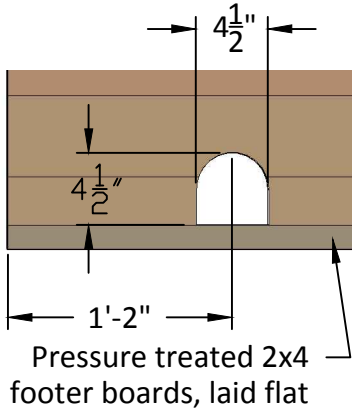
Details (Looking Up)



Detail 1

Scale: 6" = 1'

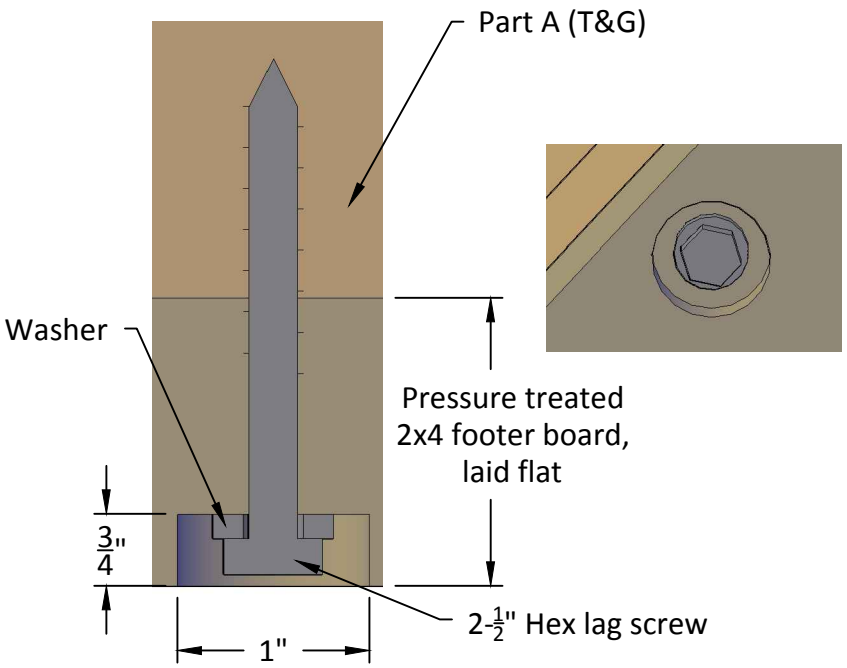
Note: Apply a pea-size liquid nail in the hole and thread insert nut all the way in. Allow to dry prior to threading connecting bolt.



Detail 2

Scale: 1" = 1'

Note: Cut "mouse holes" with jig saw.



Detail 3

Scale: 1' = 1'

Note: Counter-bore with a 1" diameter bit at 3/8" deep followed by pre-drilling a 1/4" diameter bit at 2" deep.

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Cover Construction Procedures (optional)

Micro-Bin Cover Construction Procedure

Step 1 - Cut the 2x2's.

- Cut four 1-foot long 2x2's with ends chamfered at 45°, cut three 4-foot long 2x2's, cut two 3'-10 $\frac{1}{2}$" long 2x2's, and cut two 1-foot long 2x2's.

Step 2 - Assemble the frame.

- Orient and square two 4'-long 2x2's and two 3'-10 $\frac{1}{2}$"-long 2x2's, shown on Sheet 15.
- With a $\frac{1}{8}$" diameter drill bit, drill pilot holes to a depth of 2 1/2" at the end of the 4'-long 2x2 and into the end of the 3'-10 $\frac{1}{2}$" 2x2, keeping a distance of $\frac{3}{4}$" from the edges.
- Screw 2x2's together with a 2 $\frac{1}{2}$"-long wood screw and repeat on remaining three corners.
- Place the third 4'-long 2x2 across the middle of the frame from one 3'-10 $\frac{1}{2}$" 2x2 to the other 3'-10 $\frac{1}{2}$" 2x2.
- With a $\frac{1}{8}$" diameter drill bit, drill a $\frac{1}{8}$" pilot hole at the ends of the 4'-long 2x2, keeping a distance of 3/4" from all edges.
- Screw together using a 2 $\frac{1}{2}$" wood screw.
- Orient a 45° chamfered 1-foot long 2x2 in the corner of the frame.
- With a $\frac{1}{8}$" diameter drill bit, pilot hole the ends of the chamfered 1'-long 2x2, keeping a distance of 1-$\frac{1}{2}$" from the end.
- Screw the corner supports to the frame with a 2-$\frac{1}{2}$" wood screw.
- Repeat on the remaining three corners.

Step 3 - Install the hinge supports. (Optional)

- Place a 1'-long 2x2 side-by-side to one of the 3'-10 $\frac{1}{2}$" 2x2 with its end butted against the 4'-long 2x2.
- With a $\frac{1}{8}$" diameter drill bit, drill 3 pilot holes into the 3'-10 $\frac{1}{2}$" 2x2 and into the 1'-long 2x2, keeping a distance of 3" from the ends of the 1-foot long 2x2.
- Screw2x2's to the frame using 2 $\frac{1}{2}$" wood screws.

Step 4 - Install the fabric cover.

- Lay a waterproof fabric, such as a tarp, over the entire frame.
- Starting at the 4'-long 2x2, use a staple gun to temporarily hold the fabric in place while keeping the fabric taut.
- Pull the fabric taut over to the other 4'-long 2x2 and staple in place to create a firm "roof-like" cover.
- Staple the remaining edges of the fabric along the 3'-10 $\frac{1}{2}$" 2x2.
- On the underside of the cover frame, attach 1x2's using wood screws to "sandwich" the fabric between the 2x2's and 1x2's.
- Trim excess fabric to create a clean edge.

Step 5 - Install the hook and strap hinge. (Optional)

- Using a drill bit slightly smaller than the diameter of the hinge screw, drill a pilot hole to a depth the length of the screw through the 4'-long 2x2 and into end of the 1'-long 2x2 (installed earlier in Step 3).
- Thread the hinge screw into the hole.
- Repeat on the other hinge support and keep the hinges oriented in the same direction.

Step 6 - Install the cover over the bin.

- Place the bin cover over the compost bin with the hinges on the backside of the back panel.
- Drill into the back of the back panel using a 3/16" drill bit at the same locations as the holes found on the hinge.
- Secure the hinge strap with $\frac{1}{4}$" x1 $\frac{1}{4}$" hex lag screws and washers.

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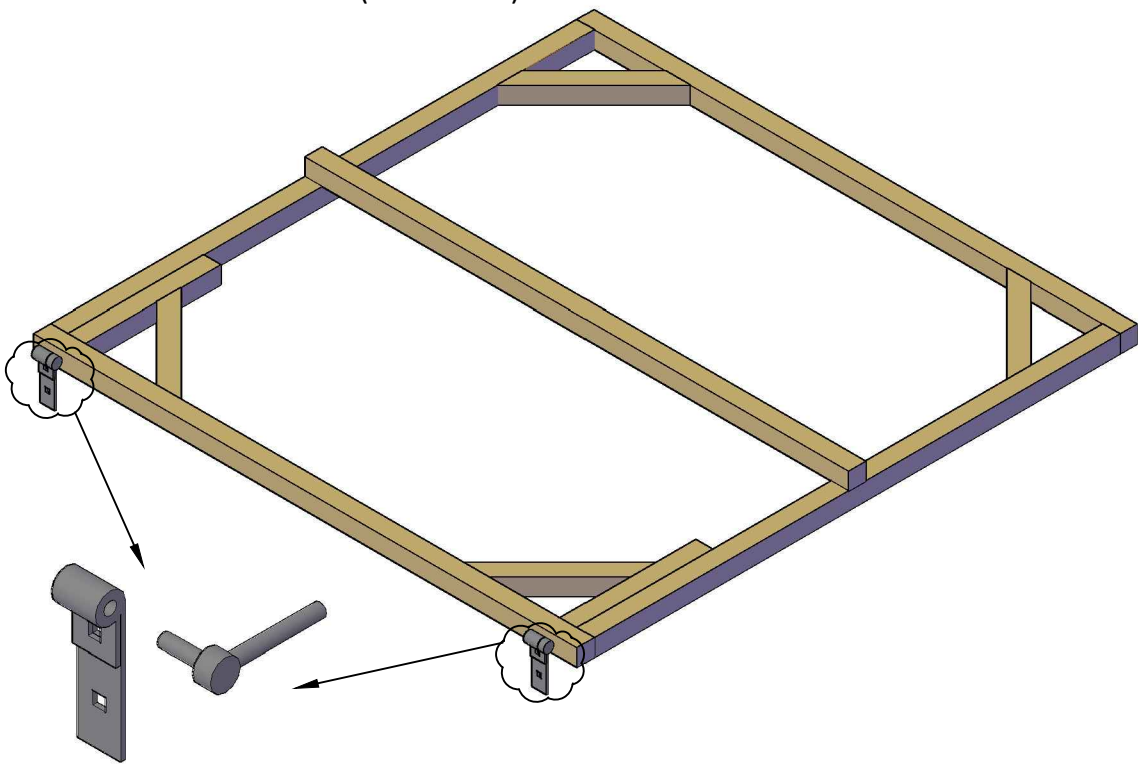
Cover Details (optional)

Cover with a water proof fabric such as a tarp, pulled taut and secured on the underside with 1x2's (not shown).



Hook & Strap Hinge (optional).
Home Depot SKU#717684