Horticulture

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Constructing a Small Self-Venting Garden Tunnel

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Introduction

This garden tunnel is designed to trap solar radiation during the day, creating a warm and protected environment for growing plants. The design incorporates the use of an automatic greenhouse vent opener that eliminates manual ventilation requirements without the use of electricity. At night the temperature within the tunnel may only be 3 to 5 °F warmer than outside due to limited insulation. The use of an additional plant blanket[1] within the tunnel is advised during cold weather conditions. The protection of the tunnel allows for planting vegetables and flowers approximately one month earlier than average (See Planting Dates for the Wasatch Front), however, success will vary between plant species and local climate conditions. The tunnel base is designed to hold soil to create a raised bed, which allows for warmer soil temperatures and better drainage for plants. Fill with a quality garden soil mix and/or topsoil. Select a site that will not be shaded in the winter months, and that has a 4′ 3″ clearance on one side for opening the tunnel for planting.

To build a garden tunnel you will need a circular saw, electric drill, staple gun, a square, and a screwdriver bit to match the screws. The right size screwdriver bit is often included in the box of screws, or specified on the box. Table 1 provides the materials list. Most materials can be sources from local home improvement stores. Be sure to select straight timbers of the appropriate lengths. Building the tunnel on a flat surface like a cement driveway or garage floor makes the construction easier. The following descriptions and images will assist you in building the tunnel. Construction is easiest with at least two people. The tunnel will be 8′ long, 4.2′ wide, and will stand 52″ tall.

Step One: Constructing the Tunnel End Walls

To construct the two end walls you will need three 8′ long 2x3's

Note: If you desire a 3′ wide tunnel, replace letters with the following measurements (Figure 1):

B – 24″

D – 3′

H – 20″

[1] Plant blanket refers to spunbond polyester such as Reemay® and Harvest-Guard® row covers that protect plants from adverse weather conditions. Plant blankets are available where garden products are sold.

Table 1. Materials List

ITEM	UNIT	QTY.	PRICE	TOTAL	NOTES
Wood lumber	2"x 10"x 8'	3	$ 7.45	$ 22.35	
Wood	2"x 3"x 8'	5	$ 0.52	$ 9.60	2”x3” lumber was selected to minimize weight of tunnel
Wood	2"x 2"x 8'	5	$ 1.52	$ 7.60	
Wood lath	4 ft	18	$ 0.13	$ 9.36	
3/4" black poly pipe	100' roll	1	$ 7.98	$ 17.98	
Foam pipe insulation	6' section	4	$ 0.97	$ 3.88	fits ½” copper pipe
Staples	box	1	$ 3.22	$ 3.22	
2.5” hinges	ea	4	$ 1.40	$ 5.60	
4” door hinges	ea	2	$ 5.25	$ 10.50	
3/4" 2 hole conduit strap	ea	14	$ 0.30	$ 4.20	
Door handle	ea	2	$ 3.67	$ 7.34	
Screws (1 1/4")	box	1	$ 7.50	$ 7.50	
Screws (2 5/8")	box	1	$ 7.50	$ 7.50	
Foam Brush	ea	2	$ 0.78	$ 1.56	
Thompson's Water Seal	oz	25	$ 0.11	$ 2.75	
2.5” double wide corner brace	ea	4	$ 1.98	$ 7.94	
6”x 6” “L” brackets	ea	4	$ 3.77	$ 15.08	
6-mil Greenhouse plastic (24' x 12')*	ft	12	$ 3.51	$ 42.12	Available online or Steve Regan Company in Utah/Idaho
Greenhouse opener (UNIVENT)	ea	2	$ 44.95	$ 89.90	UNIVENT available online. Other models may be sold locally.
shipping		1	$ 9.35	$ 9.35	
TOTAL				$285.33	

*The Greenhouse plastic is large enough to cover two tunnels, or the remaining plastic can be stored and used to replace the old plastic after 4 years.

Vented End Wall Frame:

1. Cut two 2x3 boards into thirds to make six 32″ pieces.
2. Cut one 2x3 in half to make two 48″pieces labeled “D”.
3. Attach 32″ boards “A” and “C” to board “B” as shown in Diagram #1 using two 2 5/8″screws. *Tip: Pre-drill small holes to avoid wood cracking.* Repeat to build the other end wall frame.
4. Attach assembled sections ABC to board “D” as shown in Diagram #1 using two 2 5/8″ screws. If wood is not straight, try attaching one screw in A, and one screw in C first, then use a square to hold the frame in place while the final screws are added.

Vent:

1. Cut four 28″ sections (F, H) and four 28 ½″ sections (E, G) from three 2x2″ boards.
2. Attach boards E, F, G, and H as shown in Diagram #1 to build the two vent frames using 2 5/8″ screws.
3. Place assembled vents inside the vent frames, and connect board F to board D using the small 2″ hinges as shown in Diagram #1.

Step Two: Prepare Tunnel Frame for Hoops

1. Attach the two assembled end wall frames to the 2″ x 2″ x 8′ frame base boards “I” and “J” as shown in Figure 1 using 2 5/8″ screws.

2. Attach a large “L” bracket to the four inside corners of the tunnel frame
3. Attach a small “L bracket to outside corners of the tunnel vent frame (Figure 2)
4. Attach two-hole hoop straps to inside corners of boards I and J using 1 1/4″ screws. The strap should be centered over board “D.” Leave one side loosely screwed in to ensure the hoop will slip through the strap (Figure 3).
5. Center the remaining two-hole hoop straps at 2′, 4′, and 6′ along boards I and J. Straps should also be centered vertically. Attach hoop straps with 1 1/4″ screws. (Step Four and Figure 5).
6. Attach two 2″ x 2″ purlins to the top of the vent frames as shown in Figure 1 and 5.

Step Three: Install automatic vent opener

1. Attach automatic vent opener according to the instructions included with the product.

Step Four: Insert and Secure Hoops

1. Insert one end of the roll of 3/4″ tubing and place it into a corner hoop strap. Tighten the screw on the second side of the hoop strap with 1 ¼″ screw to secure the tubing (Figure 3).
2. Bend the tubing over the top of the vent frame and cut the length of the first hoop (approximately 9′ long), leaving additional length for error. Cut the tubing to fit into the second corner hoop strap and secure the tubing with a 2 5/8″ screw for additional strength (Figure 3). *Note: Approximate lengths are given because the tubing is curved and stiff, making it hard to measure precisely.*
3. Secure the tubing to the purlins using two-hole straps at hoop strap location 1 (Figure 1). The tubing should be located at the outer edge of the vent frames to make a smooth corner for the plastic to rest on.

Step Five: Construct the Base

1. Cut one 2″ x 10″x 8′ in half to make two 4′ ends for the base (M).
2. Assemble a rectangular base from boards K, L, and M as shown in Figure 1 using three 2 5/8″ screws in each corner. Board M (4′) should be sandwiched between boards K and L (8′)
3. Use your fingers to break the pipe insulation and place the pieces over top edges of tunnel base. The insulation helps create a seal between the base and the top frame.
4. Use the staple gun to attach the pipe insulation to the base.

Step Six: Applying Water Seal to Wood Frame

1. Brush off any dust and dirt from the frame before applying water seal
2. Pour water seal in a small container, and use a paint sponge or brush to apply the seal to all areas of the frame. Placing the tunnel frame on top of sawhorses can make it easier to apply the water seal to the bottom of the frame (Figure 5).

Step Seven: Attaching the Plastic to the Frame

1. Cut the 24′ x 12′ plastic to make two 10′ x 12′ pieces of plastic. One of these pieces will be used to cover the tunnel and the other should be stored to re-cover the tunnel several years later.
2. Cut the remaining 4′ x 12′ piece of plastic into four 3′ x 3′ pieces. Two of these pieces are needed to cover the vent openings and the other should be stored for later use.
3. Cut six 32″ pieces of lath to match boards A, B, and C (Figure 1)
4. Center the large piece of plastic over top of tunnel so the 12′ length spans the length of the tunnel. The extra 2′ on each tunnel end is needed to secure the plastic to the tunnel end wall.
5. Attach the plastic to board B (Figure 1) by rolling the plastic several times around the lath and attaching it to board B with 1 ¼″ screws. The plastic may need to be cut on the diagonal in the corners to allow for smooth rolling around the lath.
6. Continue this process on the opposite end wall frame. Start by attaching the plastic to board B making sure to stretch the plastic tight, but not so tight that it bends the end hoops.
7. Use same method of rolling the plastic around the remaining 32″ lath and attach the lath to boards A and C (roll, then screw) on

both end walls as shown in Figure 6. Make sure the plastic is tight on the tunnel.

8. Use two 4′ pieces of lath to attach plastic to board I using the roll and fasten technique. Then install the door handles at a comfortable reaching distance.
9. Do not attach the plastic to board J until the 4″ door hinges have been attached (this can be postponed until last).
10. Cut two 26″ and four 32″ lengths of lath to fasten the plastic to the vent openings.
11. Center a 3′ x 3′ plastic vent cover over the vent opening. Sandwich plastic between vent top (H) and a 26″ lath piece of lath centered on the vent top. Screw through the lath and plastic without rolling the plastic around the lath (Figure 8). Use another 26″ lath piece to secure plastic to the bottom (F).
12. Now attach 32″ lath pieces to vent sides so that the extra length extends at the top (Figure 8). The extra plastic around the outside covers the gap between the vent and the vent frame to increase insulation.
13. Cover the vent opening on the opposite end wall.

Step 7: Finishing Touches

1. After soil is prepped, lay tunnel base in place.
2. Make sure the tunnel base is level by using a level, or by visually inspecting the base. If one side is higher than the other, remove the soil beneath the wood where it is higher until the base rests level. Add soil within the tunnel base.
3. Place the tunnel top onto the tunnel base and attach the 4″ door hinges to both sections.
4. Finish attaching the plastic to board J using two 4′ lath strips.
5. Make sure the tunnel opens freely by lifting it with the door handles.
6. IMPORTANT: to open the tunnel for planting, lift the tunnel with the handles and open until it can be gently rested on the ground (Figure 9).
7. You are now ready to use the tunnel to grow a variety of plants.

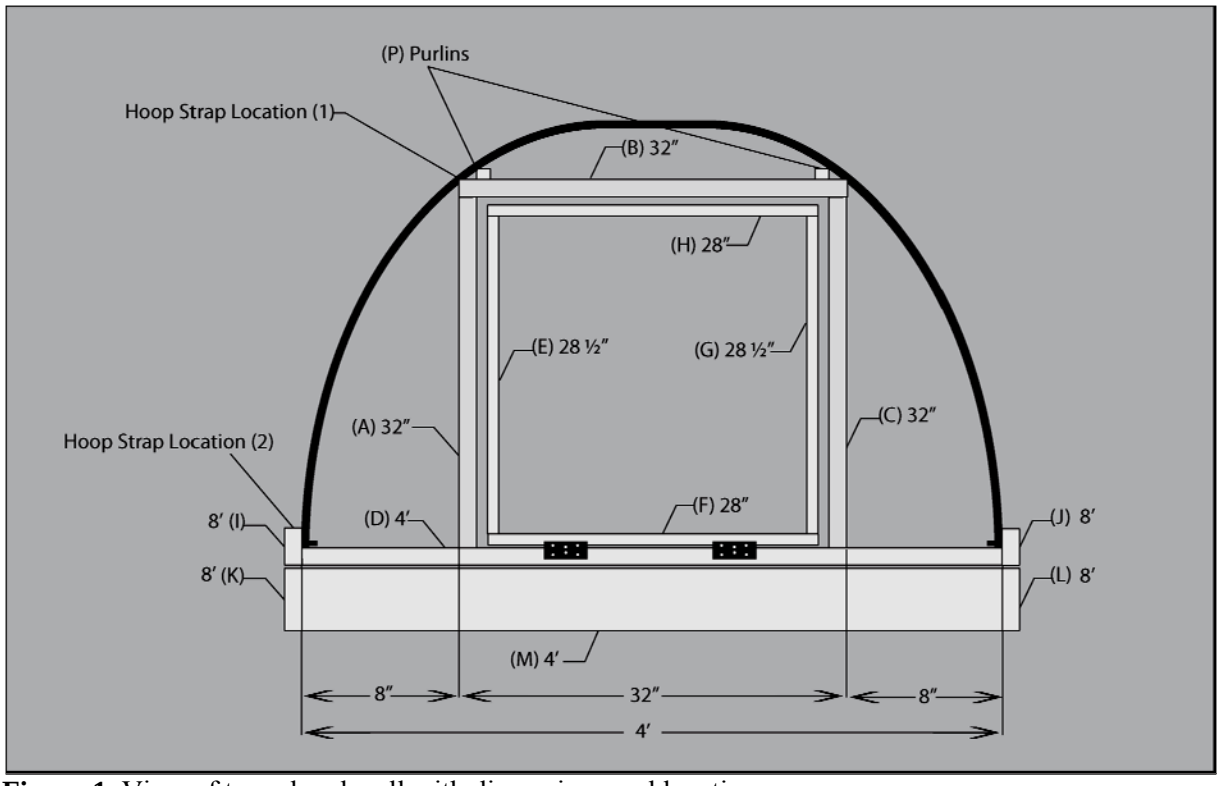

Figure 1. View of tunnel end wall with dimensions and locations.

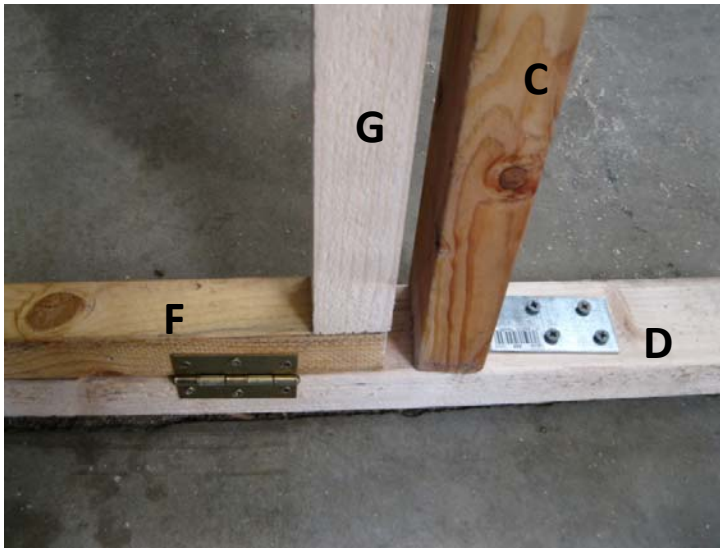

Figure 2. View of hinge attachment to vent frame and small "L" bracket.

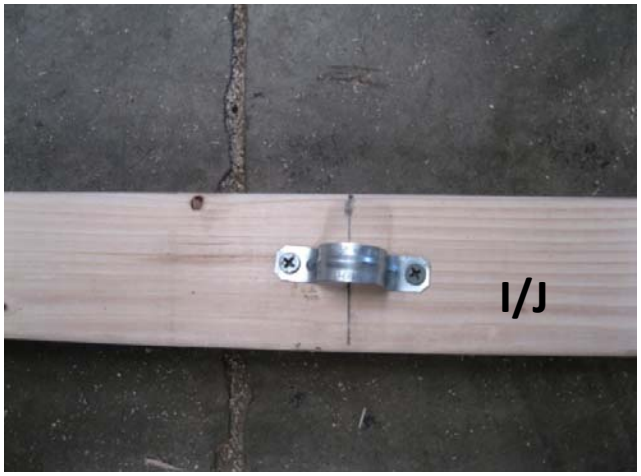

Figure 4. Two-hole strap centered vertically and attached to board I/J.

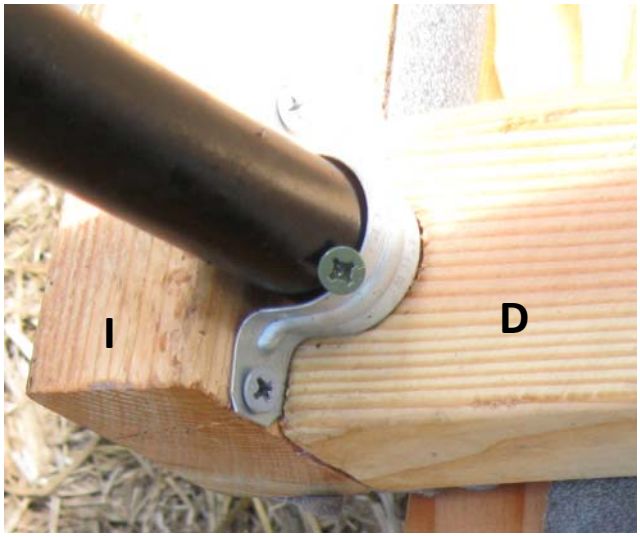

Figure 3. Secured corner hoop strap to tunnel frame.

Figure 5. Tunnel frame assembled before installation of vents and plastic.

Figure 6. Plastic rolled over lath and screwed onto board I/J.

Figure 8. Closed vent. Note how the lath and plastic are situated to cover the gap between the vent frame and vent.

Figure 7. Vent opener doing its job on a sunny day.

Figure 9. Fully opened tunnel ready for planting.