

# **The EarthTainer III™ “Convertible” Edition**

## **Construction, Planting, and Maintenance Guide**

**Rev. 3.9 FINAL Version**

May 15, 2014

**INTRODUCTION:** This Construction Guide supersedes the EarthTainer II Guide. New features include easier assembly, lower cost, and new 12-point clip-on cage systems that are less costly and more flexible than the fixed cage system used in the previous design. The new double-walled “container-within-a-container” design keeps the plant’s root system cooler in the Summer and makes the EarthTainer III “Convertible” stronger and longer lasting.

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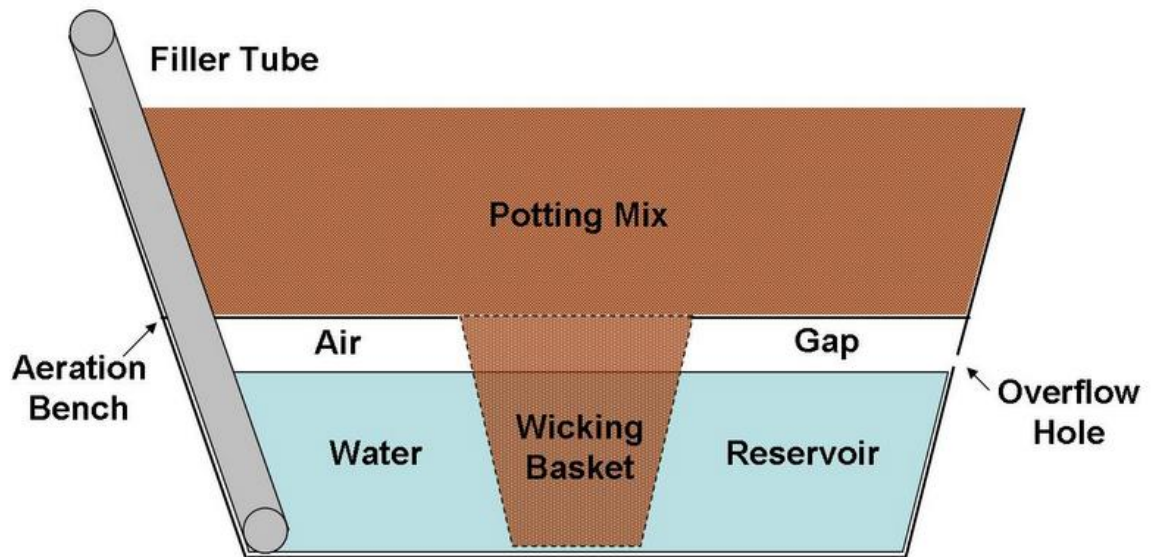
Please visit [www.earthtainer.org](http://www.earthtainer.org) from time to time, and follow the progress of EarthTainer growing and news events throughout the Season. **NOTE: earthtainer.org is no longer active.**

## Overview

The basic principle of the EarthTainer™ dates back thousands of years when the Egyptians and others of that era employed “wicking” properties to craft oil lamps, and other moisture absorbing materials. This Law of Nature (capillary action) enables moisture to “defy the Laws of Gravity” and actually flow upward in a porous medium.

In the EarthTainer, a centralized wicking basket provides the “charge pump” to disperse water evenly throughout the Grow Media chamber. A 7 gallon water reservoir coupled with a 3.2 cubic-foot Grow Media capacity provides ample room to grow the largest varieties of tomatoes and other vegetables.

The innovative removable / folding cage system eliminates the hassles of building external trellis and stringing systems.



There are numerous advantages to EarthTainer gardening. Most important today is the water conservation properties of a 100% self-contained eco-system. Virtually no water is wasted growing weeds, or loss from water run-off. In a time of Statewide drought in many areas of the U.S., savings of up to 75% in water use reduction is significant, as compared with traditional in-ground gardening. The EarthTainer also provides urban gardeners the opportunity to now use patio and sunlit deck space to grow their own, quality organic vegetables.

As the soil in the EarthTainer typically warms up to planting temperature earlier than in-ground beds, the “early-bird” gardener can get ripe tomatoes much sooner in the season.

EarthTainer construction requires simple power and hand tools. It also requires a moderate degree of hand/arm strength. Only attempt to build an EarthTainer if you have experienced skills with power and hand tools. If you are not totally comfortable handling power tools and cutting devices, please instead buy a pre-manufactured Self-Watering Container (SWC) as offered by several Manufacturers.

Cost of components for the Base Unit is approximately \$38.00 (when building multiple units at a time). The self-supporting double height tomato cage systems are approximately \$21.00 to \$28.00. (Estimate as of January 20, 2014 – costs may vary over time).

## Chapter One - Building the Base Unit

With the goal of using commonly available components to fabricate the EarthTainer™, as well as having a stable finished unit that will remain upright even under windy conditions, the Lowes RuggedTote 31 gallon container was selected as the base unit. Fully loaded with water and Grow Media, the EarthTainer weighs approximately 130 pounds. While the EarthTainer design principles can be applied to smaller containers, stability could be negatively impacted. Light colored tan is recommended as it will be more resistant to absorbing the Sun's energy avoiding "cooking" the plant's root system. It is also recommended to install a sun block panel to prolong the life of the container.

The EarthTainer is constructed from two 31 gallon RuggedTote containers, one of which will be cut down to become the bench support, and "Aeration Bench" - both of which are inserted into the outer container.



The second key component used is an Aquatic Plant Basket to serve as the "wicking basket". The one selected is available from aquarium stores and Hydroponics Shops (where it is called a 5 inch "Net Pot"). The EarthTainer III uses a 5" diameter by 4" high basket. As they are thin-walled, be careful when handling and do not crush them down, as the thin plastic will break. (The support assembly will be described later). Do not use anything larger as the EarthTainer would run too moist, and over-water the plants. Note: If necessary, you can substitute an equivalent size Deli container, but drill numerous small holes in it to permit water to enter.



**Step 1:** Secure the inverted lid on a flat surface and using a jig-saw, cut along the outer ridge of the inverted lid. This center cutout section will be used as a "double floor" inside the EarthTainer. Insert cutout into bottom of container #1. Repeat cut out for second lid. NOTE: The lid rim will be the first component to weather from the Sun's UV. Store the second lid rim in the garage to replace when the first lid rim has cracked and is no longer usable.



The second lid cutout piece should be placed under the assembled EarthTainer to protect the bottom from stones or other protrusions which could puncture the water reservoir.

**Step 2:** On the outer container (#1) make a mark at the center of the short (handle) sides 3-7/8 inches up from the bottom. Rotate the container and repeat on the other center of the short side.

Using a 3/8" drill-bit, drill both holes as indicated. These function as the Overflow Holes for any excess water to drain out. Set Container #1 aside for now.

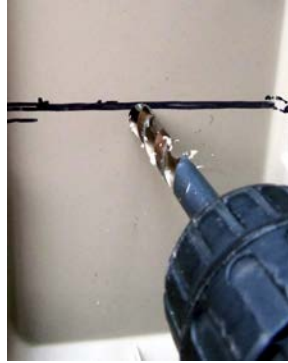




**Step 3:** Invert Container #2, on a flat surface and with a marker draw a horizontal scribe line around the outside perimeter of the container. Hint: Tape the marker on the inverted wicking basket as this will create a mark approximately 4-1/2" up from the bottom of the container. It is much easier to rotate the container around the pen to do this.



**Step 4:** Drill a 3/8" pilot hole anywhere on the line.

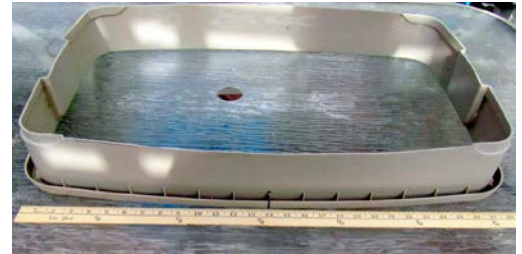


**Step 5:** Using a power jig-saw, begin cutting along the scribe line, completely around the circumference of the container. (Be EXTREMELY cautious with this step, always alert as to where your hands and legs are. Also, always wear glasses or safety goggles to protect your eyes).



If you do not have a power jig-saw, you can use a sturdy pair of kitchen scissors or tin snips to manually cut the container along the scribe mark (this will require good hand strength).

**Step 6:** Take the cut off 4-1/2 inch piece and invert on a level surface. Notice the "ribs" spaced every two inches on the underside of the lip rim. Locate the rib at the center of the long side (rib #7) at approximately 14 inches in from the ends of the rim. Draw a vertical line at this center rib. Next, move 3 inches to the right and draw a second vertical line.

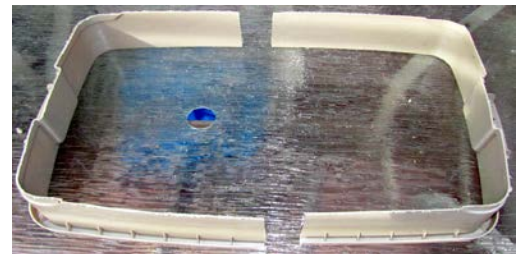


**Step 7:** Rotate the piece 180 degrees on the work surface, then find the center rib at the 14 inch mark, and repeat the 2 vertical lines at the center rib, and again 3 inches to the right (at the 17 inch mark).



Using kitchen shears, cut out both 3 inch pieces and discard them.

Note that you will now have two identical pieces, each with one leg 3 inches shorter than the other.



**Step 8:** Invert, then arrange the two sections interleaved with each other placing the shorter sections to the inside, and the longer sections wrapping around the outside. The objective is to get a rectangular, symmetrical assembly.



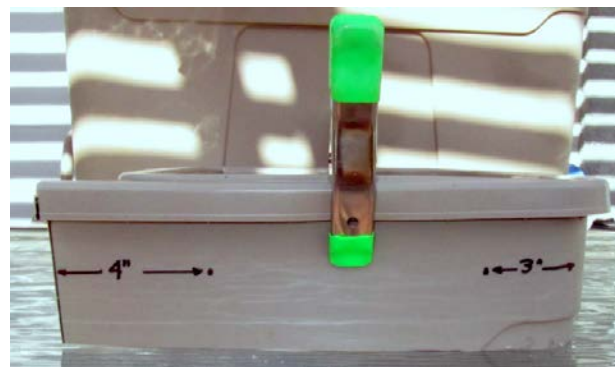
**Step 9:** Place the two sections into the outer container and arrange so that the two sections align to fit squarely against both sidewalls. Use two spring clamps to hold the sections in place.

Make an alignment mark across both pieces in case they move after taking the assembly out of the container. Repeat alignment scribe mark on the other leg pair.



**Step 10:** Carefully remove this bench support assembly and set on a flat surface. Make two marks; one 4 inches from the left edge, and a second at 3 inches from the right edge, 2-1/4 inches up from the bottom surface.

Using a 1/4 inch drill-bit, drill two holes through both panels. Rotate assembly, mark again as above, then drill the other two holes in this side of the assembly.



**Step 11:** Use four 1/4-20x1/2 inch machine screws, washers and nuts and tightly fasten the two sections together. Make sure the panels are flush with each other. Sand if necessary, as these surfaces will sit on the bottom of the container. If the assembly is fitting inside the container too tightly, trim the ends of the longer pieces to follow the contour of the outer container's sidewalls.



Invert the Support assembly and place into the Container #1 (handles facing up), making sure that you have the lid cut-out properly in place inside the container first.



Set Container #1 aside for now.

**Step 12:** In order for the top lid to fit securely, we need to next remove a 1-3/8 inch section from the top of the Aeration Bench (Container #2). Invert the Aeration bench and scribe a 1-3/8 inch line around all sides of the unit. Hint: as with the wicking basket scribe, it is easier to use a "spacer" to rest the Sharpie pen on. Then rotate the Aeration Bench against the stationary pen. Drill a pilot hole anywhere on this line.



**Step 13:** Secure the Aeration Bench in a Work-Mate or firmly grasp the edge, then cut off this 1-3/8 inch section. NOTE: Use manual tin snips or kitchen shears for this Step.



Hand sand the burrs off and level any protrusions with a sanding disk.



**Step 14:** Draw a circle 3-5/8 inch diameter in the center of the inverted Aeration Bench (Container #2). NOTE: Either a 3-1/2 inch or a 3-5/8 inch Hole Saw can be used for this Step.

Next, using a yardstick or folding ruler, place marks with a Sharpie pen every 1 inch apart as shown.

TIP: You can use a piece of Pegboard as a template to either mark, or drill the holes directly through the Pegboard's holes. Cut the Pegboard slightly larger than the Aeration Bench surface, then use short pieces of duct tape on 2 ends to hold it temporarily in place.



**Step 15:** Using a hole saw, drill out the 3-5/8 inch section. Alternatively, a jig-saw or kitchen shears can be used. Use a 2 inch hole saw to drill out an opening for the Filler Tube in the lower corner in the Aeration Bench. Remember, the Aeration Bench is inverted so when installed, the Filler Hole will be on the lower right side of the EarthTainer in this example. You can elect in which corner you want to drill the hole. Next, using a 1/4 inch drill-bit, drill the aeration holes as shown. Note: To speed the process, you can “pancake” 2 or 3 units together, reducing marking and drilling time.



**Step 16:** Using a 5/32 inch drill-bit, drill a hole approximately 1/2 inch down from the lip of the pond basket. Rotate the basket and repeat on the opposite side.

Center basket over the opening with the 2 holes in the 9:00 o'clock and 3:00 o'clock position. Place a mark 1/2 inch outside these two holes.



Drill 5/32 inch holes in the Aeration Bench for the basket attachment.

Insert a zip tie in each of the 2 holes as shown, with the flat surface of the zip ties facing upward.



Next, feed the ends of the 2 zip ties through the center opening.

Then feed the zip ties up through the 2 attachment holes in the Aeration Bench and ratchet them loosely.



Pull the zip ties tight so the wicking basket is secured over the center of the opening. Cut off excess.



**Step 17:** Invert Aeration Bench (Container #2) and place in Container #1, sitting on the Aeration Bench assembly. Temporarily place a 20 to 30 pound patio or concrete block over the wicking basket to hold down the Aeration Bench firmly in place.



**Step 18:** Using the spring clamps pinch together the outer wall of the EarthTainer with the inner wall of the Aeration Bench. Secure clamps slightly offset from the center location.



Locate the center rib (#7) and make a mark down 5-1/2 inches from the top of the container. Using a 1/4 inch drill-bit, drill through both the outer container as well as the Aeration Bench. Be mindful of where your hands are at all times!!

Rotate the EarthTainer and repeat on the other side. Be sure to remove label on container - SLOWLY removing the label works best. If it does not fully come off, use some Windex on the remaining fragments to loosen them and remove with a brillo-type pad.



Insert a 1/4-20x1/2 inch machine screw through a 1-1/4 inch fender washer, and secure inside with another fender washer and nut. Be sure that the fender washer clears the container's ridge above it. Rotate EarthTainer and repeat on the other side. The gaps between the sidewalls allow for better air circulation in the Aeration Bench, as well as act somewhat like a Thermos Bottle, keeping the root system cooler in the Summer from the Sun's rays on the outside walls.





**Step 19:** Cut a section of 1½” Inside Diameter Schedule 40 PVC pipe to a length of 20”.



Approximately 1” up from the bottom, drill two 3/8” diameter holes through both sides of the pipe. Move up another inch and repeat drilling another 2 holes.



**Step 20:** Insert Filler Tube into Aeration Bench.

NOTE: you can use an old aerosol can cap to place over the filler tube to keep insects out and minimize water evaporation.



***Congratulations, you have now completed all the steps in building your EarthTainer!***

NOTE: I have not made the cage system. I have made cages of concrete reinforcing wire which surround the containers and rest on the ground outside them.

## **Chapter Two - Assembling the Self-supporting Cage System**

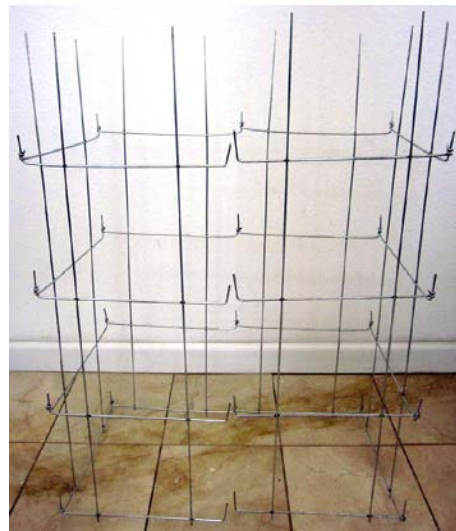
In this Chapter, we will fabricate the self-supporting cage system. The goal is to construct a structurally rigid system, eliminating the need to fashion an external trellis or other such out-board support assembly. Due to the aspect ratio of the 31 gallon EarthTainer, very few commercially available cages are available. A solution has been found by fabricating available Gurney’s Pea Fence cages into the proper size for easy attachment and removal. The removable and folding cage system is comprised of a base cage, plus an optional upper cage extension. For certain crops such as Peppers, only one 32 inch (or 40 inch) tall cage may be required. For other crops such as tomatoes, cucumbers, Snow Peas the base cage plus the extension cage are needed together to provide a 60 inch cage system. Alternatively, a dual 40 inch Pea Fence is available from Burpee which when two sections are attached together, combines into a 76 inch tall dual cage system. If you are growing heirloom tomato varieties, the 76 inch Burpee system is highly recommended. I have found the Burpee five rung 40” cage to be made of slightly thicker galvanized steel, versus the four rung model supplied by Gurney’s.

You might also possibly find Pea Fences at your local Nursery. The key metric is a cage system made of multiple 14 inch wide length panels. This dimension is needed to conform to the total 14 inch by 28 inch aspect ratio needed to straddle the rim of the EarthTainer. Alternatively, cages can be fashioned using a 7 foot length of Concrete Reinforcing Wire (at Lowes) bent with a Mechanical Brake.

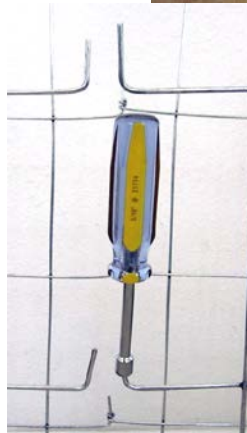


**Step 1:** Each carton contains two sections of 32 inch (Gurney's) or 40 inch high Pea Fence (Burpee). Unfold the first section being mindful to unfold with the vertical legs on the outside, and the horizontal rungs toward the inside. This places the sharp ends of the end spirals facing inward. The reason for this is to protect you from snagging your clothing (or you) on the sharp spirals.

Join the open end sections in the middle of one long side. These adjoining sections will be locked in place with the Wire Rope Clips in a later Step. Alternatively, you can attach the Clips at the corner, but folding the cage at the end of the Season will be more difficult.



**Step 2:** Using a Nut Driver, straighten the 8 endpoints so they are in vertical alignment.



**Step 3:** Place **one** 1/8 inch Wire Rope Clip as shown over the top endpoint pair (only) and secure tightly. Note: you will attach the wire rope clips to all endpoint pairs after the cage has been mounted on the EarthTainer. This provides additional flexibility when wrapping the cage legs around the rim of the container.

Repeat the same process for the extension cage, but attach all four wire rope clips at this time. Set the extension cage section aside for the moment.

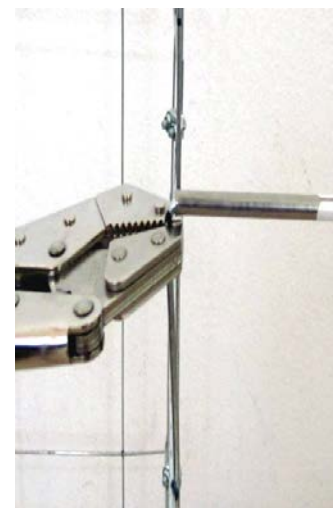
**Step 4:** Next, the clamping legs will be fashioned. The idea is for the 12 legs of the base cage to serve as anchor hooks underneath the circumference of the EarthTainer rim.

On the side of each of the 12 legs, place a mark at one inch, 2-1/2 inch, and again at 4 inches from the tip of each leg. After making your first cage, you will determine whether making the marks on the left side, or the right side of each leg is more convenient when making the 3 bends.

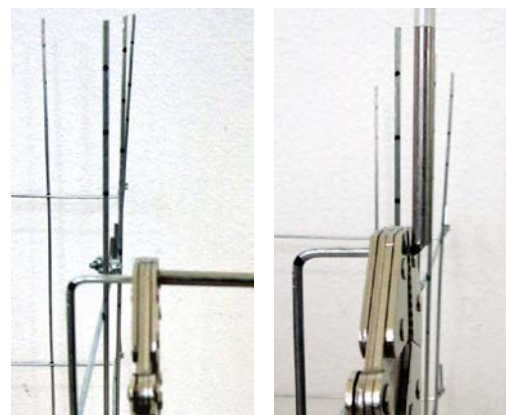


**Step 5:** Use a 1/4" O.D. diameter Stainless Steel Tube (see recommended Tools in the Appendix) along with heavy-duty vise-grip locking pliers to make each of the three 90 degree bends. Always lock the pliers on the opposite side of the bend. This will give you maximum leverage and will permit a crisp sharp bend at the marker points.

Start with making the first bend outward at the 4 inch marking. Set the locking pliers approximately 1/16 inch below each mark. Hold the vise-grip pliers in your left hand, and make the 90 degree bend with the Tube held in your right hand.



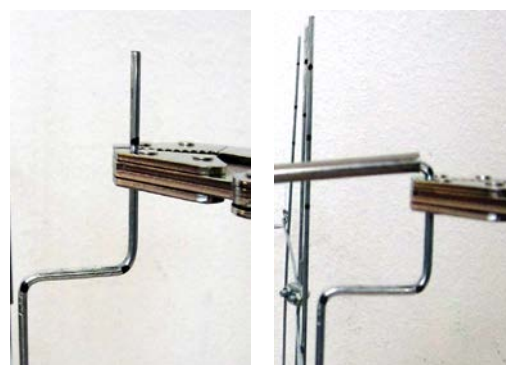
Consistency is most important in making the 3 bends. The goal is to get each 90 degree bend such that the mark falls on the inner or outer radius. The tighter the “fit” of the Tube to the cage, the sharper the bend that can be made at each mark.



**Step 6:** Unclamp the pliers from the first bend, and now locking them at the next bend at the 2-1/2 inch marking, 1/16 inch to the inside of the mark, facing upward. Make this second 90 degree bend up in the vertical direction.

**Step 7:** Move the pliers to the final mark at the one inch mark, and lock them 1/16 inches below the mark. Point the nose of the pliers facing inward toward the center of the cage.

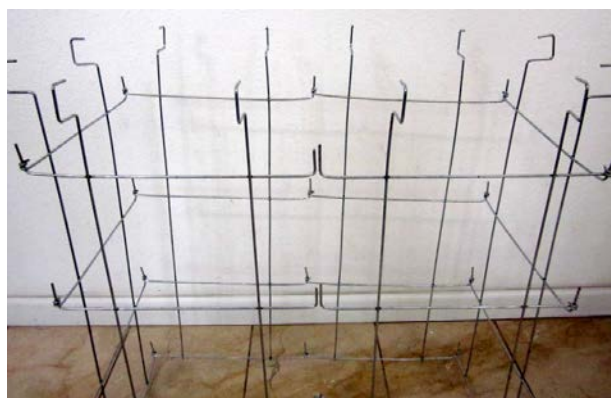
With the Tube sleeve, bend the final section 90 degrees inward.



This is the final shape you want after the three bends have been made. Note that the radius of each bend aligns with the marks.



Repeat the process on the other 11 legs, making sure all face inward toward the center of the cage.



Check the alignment to make sure they are all somewhat similar. The goal is consistency - - not Perfection!



**Step 8:** The extension cage can be attached to the base cage either before the cage system is attached to the EarthTainer, or can be mated to the base cage as needed later in the Season (recommended). For immediate attachment to the base cage, invert the cage and bend all of the legs at a very slight inward angle.

NOTE: Installing the extension cage section **after** the base cage is attached to the EarthTainer is a much easier process.





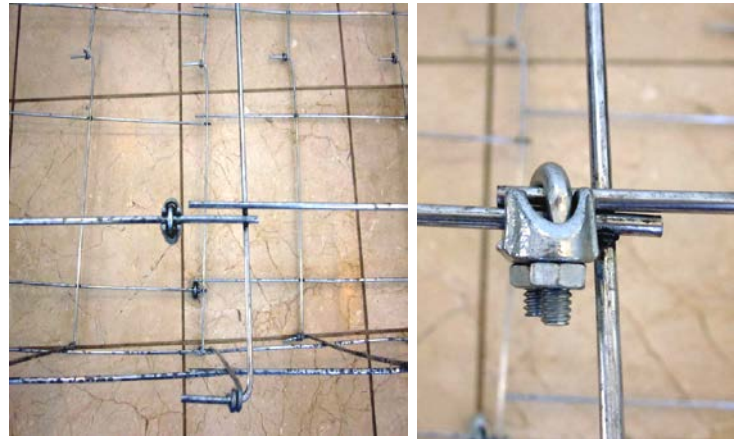
**Step 9:** Place Wire Rope Clips on the 4 vertical rails on the outer top sides of the base cage. (These will loosely sit on the 4 vertical legs at the top rung for the moment. They will be slid to the top of the rails for anchoring the extension cage.)



**Step 10:** Lay the base cage on a flat surface. Next, feed the extension cage legs over (outside) the top rim of the base cage. Slide the Wire Rope Clips to clamp the two cages together on the 4 rails. It is not necessary to attach wire rope clips to all 12 legs, but if you have extra clips, attach additional ones as you desire.



Be sure to feed the all of the legs of the extension cage **outside** the base cage. When clamping the Clips down, keep the overlap to a minimum as this directly affects the final cage height.



The cage system is now complete!

(Eight rung 60 inch Gurney's cage option shown)





## Chapter Three - Filling the EarthTainer, Fertilizer, and Planting

Container growing varies significantly from traditional in-ground in several areas. First, unlike conventional soil where worms and other insects provide “channels” for natural aeration, the growing media in container gardening requires a loose, porous mix to replicate the aeration process. Therefore, the choice of growing medium is extremely important. More experienced container gardeners blend their own homemade mix. However, there are several choices of ready-made available at your local Nursery and Hydroponics Shop that will provide excellent results. The key is to select Grow Media, and not potting SOIL for container gardening.

I recommend Premier Pro-Mix BX for optimum wicking and plant vigor. If economy is of prime importance, Miracle-Gro Potting Mix (WITHOUT Moisture Control) can be substituted. Never use Potting “Soil” as this will compress too much, negatively affecting root aeration.



In addition, a phenomenon known as Blossom End Rot which is believed to be caused by a calcium deficiency, or uneven watering can afflict tomato plants grown in containers. The addition of Dolomite Lime (or Agricultural Lime) tends to inhibit BER from developing. (Note: Do not use Hydrated Lime - - it is too fast acting and can harm the plants).



Locate the EarthTainer in an area of either full or moderate sun. Make sure the surface area is level. The overflow hole operation and wicking actions depend on a level surface. Place the unused lid cut-out on the surface on which the EarthTainer will be placed. This both protects the EarthTainer bottom from sharp sticks or rocks as well as facilitates easier rotation of the EarthTainer during the Season for more symmetrical plant growth and fruit production.

Preparing your Growing Media. Using a wheelbarrow, or plastic tote bucket, add in 5 scoops of Grow Media, then add in 1 scoop of Perlite. (If using Miracle-Gro Potting Mix, use a ratio of 2 scoops Perlite.) Use breathing protection when working with Perlite as it is quite dusty and it should not be inhaled. Blend the mix together by stirring with your scoop. Thoroughly wet the mix. Repeat the process when filling successive layers in the EarthTainer.



**Step 1:** Fill the water reservoir half way to the overflow holes.

**Step 2:** Fill **only** the wicking basket with Grow Media at this time. Pack firmly into the basket until water seeps up into the top of the mix. Make a 1” to 1-1/2” high “cupcake” mound of the Grow Media **above** the wicking basket opening and thoroughly wet. This is VERY important to maintain wicking as the Grow Media settles in the wicking basket over time. Make sure you have firmly compacted the Grow Media into all of the corners of the wicking basket.



**Step 3:** Installation of Landscape Fabric. To inhibit the roots from growing down into the water reservoir cut 2 pieces of 26 inch by 18 inch water permeable Landscape Fabric as a “bed liner” to go on top of the Aeration Bench and filled wicking basket. This will also make removal of the root ball much easier at the end of the season. Only use a premium quality product such as DuPont’s 15 year landscape fabric. Other inexpensive, cloth-type Landscape Fabrics will not prevent root penetration. **NOTE: Cutting enough fabric to extend up the sides a few inches works better.**



As an example, this was my experience without using the Landscape Fabric. Roots penetrated through the aeration holes and into the water reservoir. Cleanout was terrible, and the tomatoes had a bland, hydroponically grown taste.



**Step 4:** After placing the two pieces of the Landscape Fabric on the Aeration Bench, add a 2” layer of Grow Media / Perlite combo into the EarthTainer, then saturate the layer with water. This is EXTREMELY important, as dry Grow Media won’t wick water, and will not deliver moisture to the plant’s root system. Continue adding 2” layers of Grow Media as above, saturating it with water. Do not cut an opening over the wicking basket as moisture will wick through it naturally.



**Step 5:** When you have filled the EarthTainer to within 4” from the top, for tomatoes sprinkle 3 cups of Dolomite Lime on the surface area (use 2 cups for other vegetables). Trowel in thoroughly. Continue to fill with the Grow Media combo. Water-in at each stage. Add in 1/4 cup of E.B. Stone Sure Start fertilizer, or equivalent such as Espoma BioTone when filling the final top layer, and trowel in thoroughly.

**Step 6:** Carve a 3” deep trench across the short width of the EarthTainer using the 2 fender washers as alignment points. Spread three cups of Tomato fertilizer evenly in the trench. Cover the fertilizer strip with Grow Media and pat down firmly. Use tomato fertilizers that have specially added micro-nutrients optimized for tomatoes. Avoid using fertilizers that have an N-P-K higher than 10-10-10, as they could “burn” the plants.



Liquid water soluble fertilizers such as FoxFarm GrowBig / Big Bloom combination can be added into the Filler Tube instead of using fertilizer strips; or can be added periodically to supplement the granular fertilizer strips, if desired.



Mid-Season application of Botanicare’s Clearex (or similar product if needed) will help prevent buildup of nutrient salt deposits in soilless grow media. Clearex is a drench solution, which binds with the excess nutrient salts and leaches it from the grow media. Treat when you see excessive white scale buildup at the overflow hole.



**Step 7:** Cut a 33 gallon trash bag down the seams to form 2 individual pieces. Install this black plastic moisture barrier, and clamp the lid down securely to the container, locking the moisture barrier in place. Cut an “X” where you want to place the 2 tomato, or 4 Pepper plants. Pull the edges of the 4 wedges back to expose the Grow Media, then scoop out an amount slightly larger than the root ball of the plant. **NOTE: Heavy contractor trash bags work best.**



**Step 8:** Place the plant into the hole. Cover back with the removed Grow Media, and fold the moisture barrier flaps back over, to minimize evaporation.

Later in the season as the Sun warms the black moisture barrier, cover it with bark Micro-bark, or other mulch to prevent over-heating. Alternatively, a silverized plastic mulch can be used in warmer climates that also inhibits habitation of insects on the underside of the leaves. Top water the plants sparingly each week during the first 4 weeks. This will help establish the root system in encouraging growth down into the more moist area.

Add more water down the Filler Tube until water comes out the overflow holes. Note: I find it best to let the wetted EarthTainer “stabilize” for at least 1 day before putting in the plants. This will reduce the moisture “shock” to the plants in letting the ‘Tainer drain off excess moisture accumulated from the filling process.



**Step 9:** Perform this step after plants have been put in, but before you install the cage system. With scissors, cut away the excess “skirt” of the moisture barrier around the circumference of the EarthTainer (you *know* your Mother would make you do this Step!).

**Step 10:** Install the cage system. Note: this step is best done with 2 people doing the installation. Remove the one wire rope clip securing the top of the base cage. Starting at the Filler Tube end of the EarthTainer, begin to “wrap” the cage around the rim of the EarthTainer.

With a person on the back-side and another one on the front-side, continue working the cage legs from right to left around and under the rim.

**Step 11:** When the legs have been fully seated under the rim, attach the wire rope clips to the base cage endpoint pairs and tighten. Reverse the process when removing the cage system in the Fall.

Use vise-grip pliers to gently bend any legs inward as necessary. A tight fit of all legs against the rim is not necessary. Just make sure all 12 legs are hooked under the rim for maximum retentive strength.





Additional Locking Option. If you are in a high wind zone, you can attach Tarp Tie-downs (not stretchy bungee cords) to better secure the cage to the EarthTainer. Attach at 2 diagonal corners as this is where the EarthTainer rim is the most rigid. Do not over-stretch as this could deform the EarthTainer rim over time.



### Floating Flag Level Indicator

NEVER let the EarthTainer run dry, as it would take several days to re-moisturize the entire wicking system. As an assist to determine water level in the reservoir, make a "floating flag" out of a 21" length of thin wire, attach a cork at one end. Take an aerosol can cap, drill a 1/8" hole through the middle and insert the float rod through the cap (this will reduce water evaporation and protect against entry of mosquitoes).



NOTE: The automatic watering system available at [EarthBox.com](http://EarthBox.com) works well with a minor modification. See "Automated Watering System (AWS)" near the end of this pdf for details.



So that's all there is to it. After you build the initial one, it will take an average of 60 minutes per EarthTainer using the methods described above, from start to finish when constructing three at a time.

*Enjoy the fruits of your labor!*

*Ray Newstead*



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## Appendix: Parts List and Tools

**NOTE:** Centrex Rugged Tote Large 31-Gallons (124-Quart) with Standard Snap Lid still available at Lowes.

2 ea RuggedTote storage totes, 31 gallon light tan color – Available at Lowes. Part number: 314141

**Note:** You can use other light color 30+ gallon containers, but be sure they are thick walled or you may experience premature container failure.

1 “PondLife” 5” diameter Aquatic plant basket from an Aquarium store or any Hydroponics store.

See photo at this link for reference description. (Typical pricing at a Hydroponics store is \$1.25):

<http://www.thatpetplace.com/pet/prod/209728/product.web> **NOTE:** This link is not active. Search for "5 inch diameter aquatic plant basket" on Amazon.com or elsewhere.

2 cable zip ties to hold wicking basket

1-1/2" ID Schedule 40 PVC pipe cut to a 20" length

14 ea 1/8" “Malleable” Wire Rope Clips. Don’t buy the expensive “Drop-forged” ones at H.D.

Lowes sells them for \$0.85 each.

If building more than 2 EarthTainers, go to this Link for \$0.11 each, plus flat \$5.50 Shipping for Qty 100. Note: order the box of 100 even if you will not use all of them:

<http://www.pambinainpex.com/servlet/Detail?no=49> **NOTE:** Link not active.

6 ea 1/4 x 20 by 1/2 inch machine screws and nuts.

8 ea 1/4” small washers

4 ea 1/4" hole by 1 1/4" Fender Washers

1 33 gallon trash bag

20" length of thin coat hanger wire plus large cork. Aerosol can cap

2 pieces cut 26” by 15” fifteen year warranty DuPont Landscape Fabric material (or equivalent) (sold in 3’ by 50’ rolls) \$14.00 at Lowes

1 carton of two 40 inch panels from Burpee (Recommended),

Part Number: 93047:

<http://www.burpee.com/gardening-supplies/garden-growers/supports-ties-and-fences/pea-and-cucumber-fence-2-pack-prod001250.html?catId=2320&trail>

(Alternate) Gurney’s 32 inch Pea Fence, Part Number: 12826. <http://gurneys.com/pea-fence/p/12826/>

Note that Gurney’s frequently runs a promotion of order \$50.00 in products and get \$25.00 off.

Do a Yahoo or Google search for other Gurney’s, or Burpee coupons as they often run “Free Shipping” and other discount offers.

**NOTE:** The Burpee.com link will redirect you automatically. The Gurneys.com link is working.

### Tools:

1/4” O.D. x .028 stainless steel tube, 12 inches long recommended (lower one). Larger diameter pipe will work, but will not make as sharp a bend. Find at full service Hardware Store – not Lowes or H.D.

Also available on Ebay:

<http://www.ebay.com/itm/316L-Stainless-Steel-Tubes-1-4-OD-/140548249762?hash=item20b95418a2&item=140548249762&pt=Motors+Car+Truck+Parts+Accessories&vxp=mt> **NOTE:** Link is not active. Search for "Round Tube 1/4" D X 12" L Stainless Steel"

Power drill, 3/8" bit, 1/4" bit, 5/32” bit

Power jigsaw, or pistol-grip hand saw

2" hole saw, 3-5/8” hole saw

5/16” Socket driver for nuts on 1/8" Wire

Rope Clips

Sanding disk, Kitchen shears or Tin Snips

Sharpie Marker, Folding ruler / yardstick



### Planting Medium:

2.5 cu ft Potting Mix (not SOIL), avoid brands with “Moisture Control” additives. **NOTE:** I use inexpensive Garden Valley potting mix, available at A-Boy, where they will load it for you.

.6 cubic foot of Perlite

3 cups Dolomite Lime or Agricultural Lime

1/4 Cup Starter fertilizer, plus 3 cups tomato fertilizer.



## End of Season Maintenance

Stop filling the water reservoir when the plant starts to die off. A few weeks later, remove the dead plant vines, then remove the cage system and fold. Secure with 2 zip ties. Store inside garage or shed.

Lift off the lid and remove moisture barrier. With a shovel or scoop dig in all around the plant about 5" out from the stem. Grab the stem and lift out the root ball. With both tomato plants, you should be removing approximately 1 cubic foot of old Grow Media. Before it freezes, tilt the Tainer up at a steep angle to drain as much of the water out of the reservoir overflow hole as possible. Then put the moisture barrier back on and secure it in place with the lid. Cover with a large trash bag or tarp for Winter storage.



## Springtime Start-up

At the start of each new Season, I recommend spraying the EarthTainer rim and exposed sides with **303 Aerospace Protectant**. “SPF 40 for your stuff”, as the ad goes.

As the EarthTainer holds approximately 3 cubic ft. of mix, add 1 cubic ft. of new combo mix (5 parts Grow Media with 1 part Perlite) and thoroughly mix that in with the old mix. Also add 2 new cups of Dolomite Lime as well as 1/4 cup of Starter Fertilizer such as E. B. Stone Sure Start or Espoma Bio-tone well mixed throughout.

Next, add 3 cups of new Tomato fertilizer into the center fertilizer strip.

Reinstall cage system.



## “Tweaks” For The Experts

While the 5:1 ratio of Grow Media and Perlite works well as a general purpose EarthTainer combo mix, you may want to experiment with additional combo mix ingredients for the particular vegetable you are growing. For example, for Heirloom Tomatoes I have added a third ingredient known as “Micro-bark” (called “Groundcover Bark” at Home Depot) to minimize compaction and provide additional aeration for the root system. Here is an excerpt from an article written by Premier (the folks who make Pro-Mix) regarding aeration:

*“““The process of aeration is one of the most important factors of productivity. Plants absorb oxygen (O<sub>2</sub>) and release carbon dioxide (CO<sub>2</sub>) during the respiration process. “Respiring” roots use the sugars made during photosynthesis to provide the energy necessary to drive mineral salt absorption. For most plants, internal transfer of oxygen from the leaves and stems to the roots is too slow to supply enough oxygen to the roots. In order to have good plant growth, the*





*growing media needs to be "aerated", meaning that air exchange between the growing medium and atmosphere has to provide the plant roots with sufficient oxygen and to remove excess carbon dioxide from the root zone.""*

My Combo Mix Trials have shown improved Tomato plant health and production using a 3:2:1 ratio of Pro-Mix BX, Micro-bark (also called "Decorative Groundcover Bark, or Bark Fines), and Perlite. If using Miracle-Gro, use a 3:2:2 ratio.

For the second and subsequent years in re-using the previous Combo Mix (5 year maximum is recommended), modify the one cubic ft. re-charge amount's ratio to 3 parts Pro-Mix BX, **3 parts** Micro-bark, and 1 part Perlite. Micro-bark (unlike Perlite) will decay over the course of the prior growing Season, so modifying the re-charge amounts will equalize out the total second Season ratio back to approximately 3:2:1. Be sure to thoroughly stir in the newly added Combo Mix into the old Mix.



To get maximum productivity and assure good plant health, use 14 inch by 28 inch mesh panels installed horizontally between the cage connectors. For Snow Peas, etc. install 8 panels using 2 inch square mesh netting. Stretch the netting over, and notch it into the groove of the spiral metal loops.



For tomatoes, start at the second rung up, and install a total of 7 panels using a finished 14 inch by 28 inch panel made of 7 inch mesh trellis netting material. This provides 8 vertical "channels" within the cage for the tomato vines to be guided through as they grow upward.

I have found with Snow Peas, that yields can be almost doubled when using the mesh netting as the entire "volume" of the cage is now utilized by the vines. Well worth the minimal cost and labor!

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## **Automated Watering System (AWS) - optional**

As tomato plants, corn, and other vegetables consume varying amounts of water during the growing season, anticipating a routine watering schedule is impractical. Also, for those who travel, go on vacation for an extended time period, etc. find an automated watering system (AWS) is highly desirable.

There are several commercially available devices such as mini-float valves that can be adapted for use with the EarthTainer. The advantage of a float valve is that it can be set up to feed from a gravity source such as a rain barrel, or elevated cistern.

A simpler to use alternative is to adapt the EarthBox Company's AWS to your EarthTainer. This is an ingenious product that employs a passive pneumatic diaphragm to close and open the valve to permit or restrict the flow of water. It attaches to a water source such as a standard home spigot. It operates based upon Bernoulli's Principle whereby the rising water in the reservoir creates increasing pressure within an "air bell", and water will continue to flow through the AWS valve until

pressure within the bell increases just enough to trip the pneumatic diaphragm to close, shutting off water flow.

Two simple modifications need to be made to the filler tube plus the tube connecting the bell to the AWS valve. First, take the 1.5” PVC filler tube previously installed in the EarthTainer (see Step 21) and cut its length down to 16”. This filler tube will be used instead of the shorter filler tube that comes with the AWS.



Next, remove the 1/4” I.D. (3/8” O.D.) clear plastic tube that connects the air bell to the AWS valve. Hint: Cut the tube 1” from each end, then dip in a heated cup of water. After a few seconds of immersion, the old tube sections will easily slide off.



Reconnect a 13” section of new hose. This is common Ice Maker hose found at Home Depot or Lowes in 10 or 20 ft. sections. Reinstall the filler tube and insert the lengthened AWS unit into the EarthTainer. Connect the Pressure Regulator and tubing as per the supplied instructions.

You can purchase the AWS for single or multiple container installations directly from the EarthBox Company at their website:

<http://store.earthbox.com/AWS-Kits/products/57/>

## Suggested Additives, Fungal and Pest Control Products for use in the EarthTainer

Commercial growers have long been aware of the benefits growing vegetables inoculated with Mycorrhizae. I have found both of these products effective in root development leading to increased yields. At about \$6.00 per packet, it is very cost effective.



I am also very impressed with the results I’ve had in adding an Organic Fungicide as a soil drench called **Actinovate**. It increased my plant vigor and yield on Snow Peas this Season (‘Tainer on the left treated with Actinovate, ‘Tainer on the far right without Actinovate).



**Daconil** is a very effective Fungicide which works well to treat diseases and issues such as Septoria, Fusarium, Powdery Leaf Mildew and other blight affecting vegetables. Keep in mind that Daconil is not an Organic approved Fungicide.

Also, **Take Down Garden Spray** does a good job of controlling pests such as Psyllids, Mites, Aphids, etc.

