

Zip Tie Domes - 3V 3/8 Assembly Manual

Instructions for Assembling the 25 Foot 3V 3/8 Frequency Geodesic Dome



Tools Needed: 8 foot Step Ladder, Wire Cutters

SAFETY RULES: Do Not Climb On the Dome. It is not designed for climbing.

Step 1. Unpack the Dome for Construction.

Unpack the dome materials where the dome will be constructed. Use wire cutters or manually unwind the wire for releasing the struts from the package restraining wires.

The package will include:

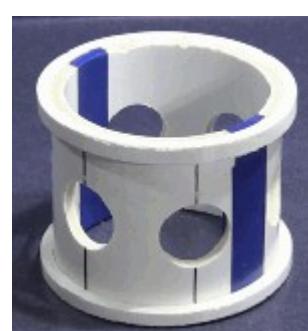
- 50 Blue "A" Struts 5' long – marked with blue tape.
- 40 Yellow "B" Struts 4' 10-3/4" long - marked with yellow tape.
- 30 Red "C" Struts 4' 2-3/4" long – marked with red tape.



6 Red 5-way Hubs, marked with red tape.



40 Blue 6-way Hubs, marked with blue tape.





46 Center Hubs

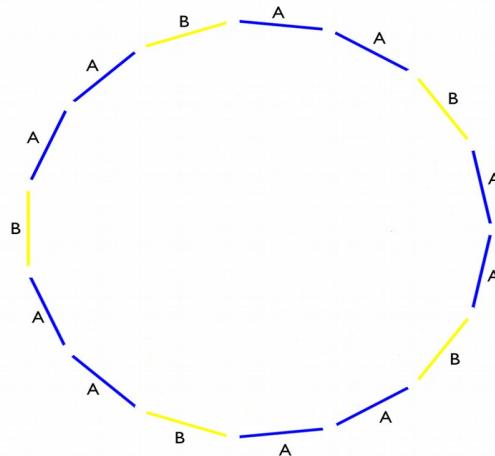


250 Stainless Steel Zip Ties (250 lbs)

NOTE: 240 Zip ties are required for building this dome. 250 Stainless Steel Zip ties are provided with the package, so you will have 10 zip ties left over.

Step 2. Build the Foundation Ring.

(2.1) Select 10 Blue "A" Struts, and 5 Yellow "B" Struts. Lay the struts in a circle, with 2 Blue "A" Struts followed by one Yellow "B" Strut.



(2.2) Attach the struts in the Foundation Ring together using 15 Blue Hubs and 15 Center Rings.



Slide the strut through the hole in the hub.



Use a Stainless Steel Zip Tie to attach the end of the strut to the center ring inside the hub.



Insert the second strut through the hole on the **opposite side** of the hub.

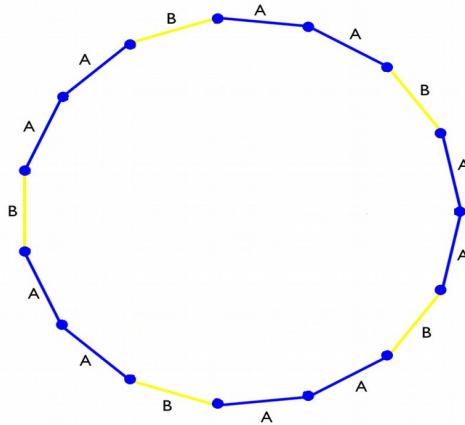


Zip Tie the second strut to the center ring. This completes the connection.



The connected struts and hubs should form a 25' circle.

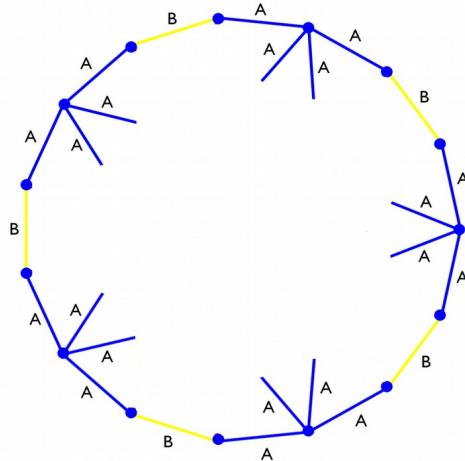
(2.3) Visually inspect the Foundation Ring to make sure it is roughly circular.



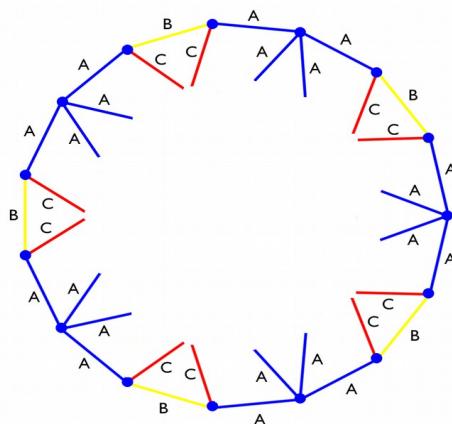
Completed Foundation Ring

Step 3. Assemble the First Tier

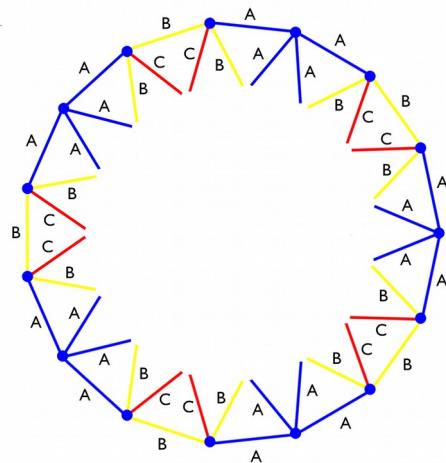
(3.1) Select 10 Blue "A" Struts, and attach them in the shape of a "V" where 2 Blue Struts meet in the Foundation Ring.



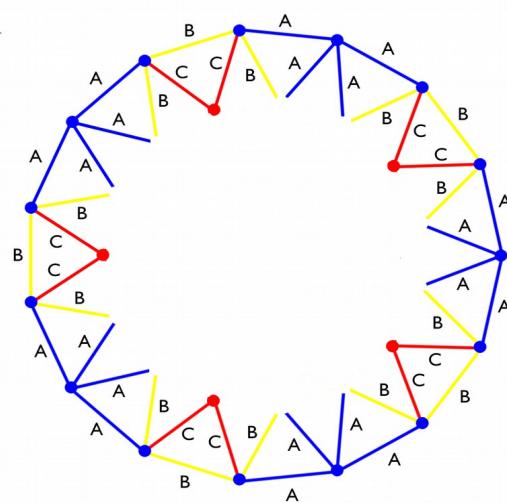
(3.2) Select 10 Red "C" Struts, and attach them in the shape of a pyramid over the yellow "B" strut in the Foundation Ring.



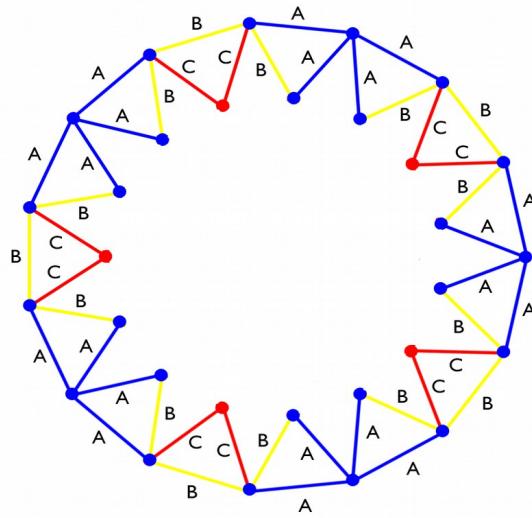
(3.3) Fill the rest of the triangles with 10 Yellow "B" Struts. Attach the struts to the Foundation Ring.



(3.4) Connect the top of the Red Struts with Red Hubs.

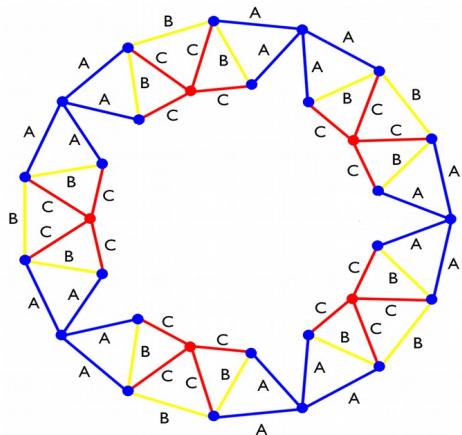


(3.5) Connect the top of the other struts with Blue Hubs.

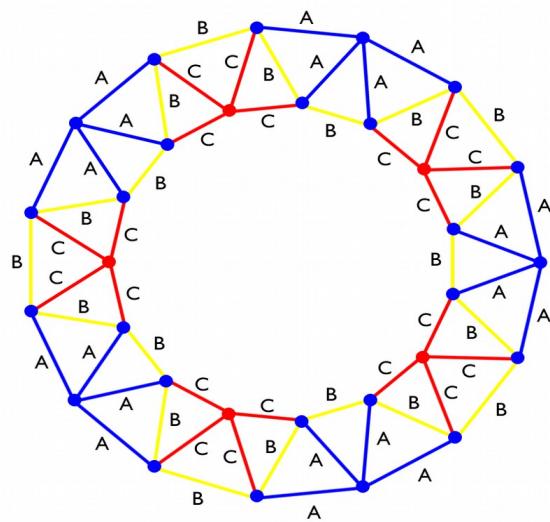


(3.6) Select 10 Red "C" Struts, and 5 Yellow "B" Struts for building the top of the first tier.

(3.7) Lay the 10 Red "C" Struts on the ground, with a Red Strut on either side of the Red Hub.



(3.8) Complete the circle on the ground with 5 Yellow "B" Struts.



(3.9) Raise the top of the first tier by attaching the struts to the hubs.



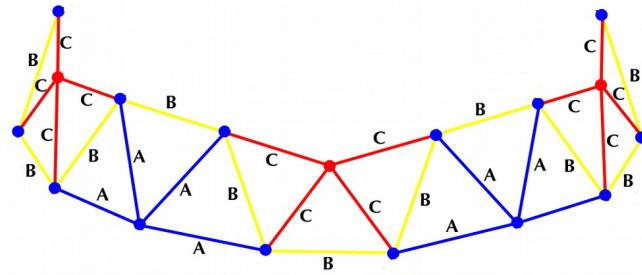
You may need a ladder to hold up the first set of struts.



Continue until the First Tier is complete.

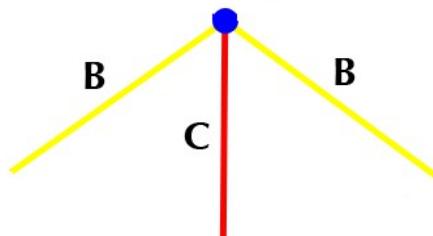


The First Tier is now Complete!

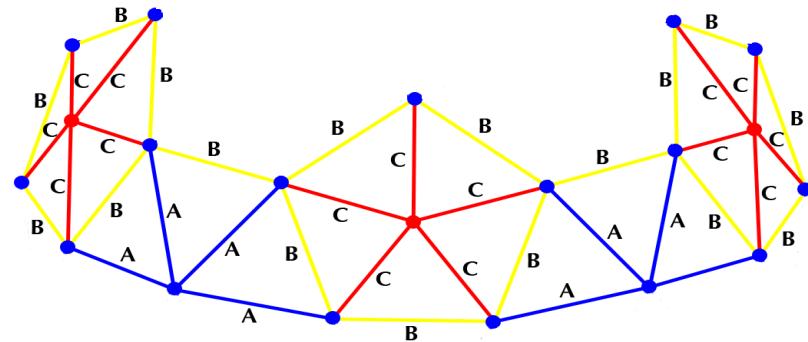


Step 4. Assemble the Second Tier

(4.1) Attach a Red "C" Strut to a Blue Hub. Then attach a Yellow "B" Strut to the hub on either side of the Red "C" Strut.



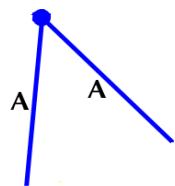
(4.2) Place the Red "C" Strut on top of the Red Hub on the top of the First Tier. Connect the Red "C" Strut and 2 Yellow "B" struts to the top of the first tier.



(4.3) Repeat by placing the same design over the other 4 Red Hubs on the top of the First Tier.



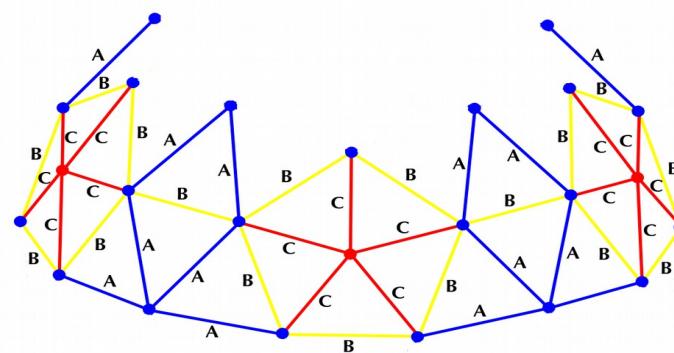
(4.4) Take 2 Blue "A" Struts and connect them to a Blue Hub.



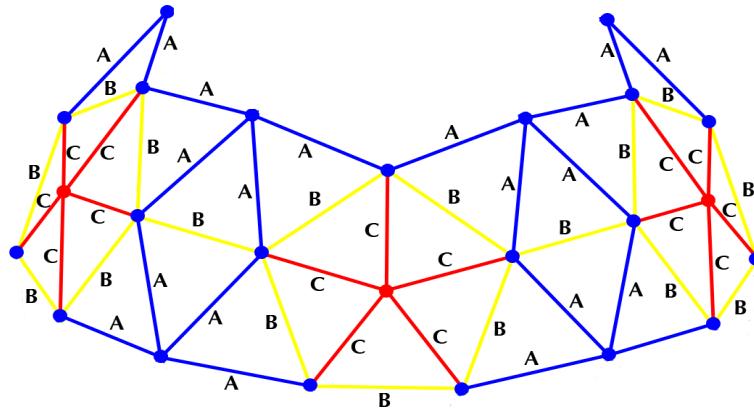
(4.5) Place the 2 Blue "A" Struts over the Yellow "B" Strut on the top of the First Tier.



(4.6) Repeat by placing the same design over the 4 other Yellow "B" Struts on the top of the First Tier.



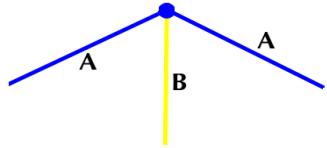
(4.7) Complete the Top of the Second Tier with 10 Blue "A" Struts.



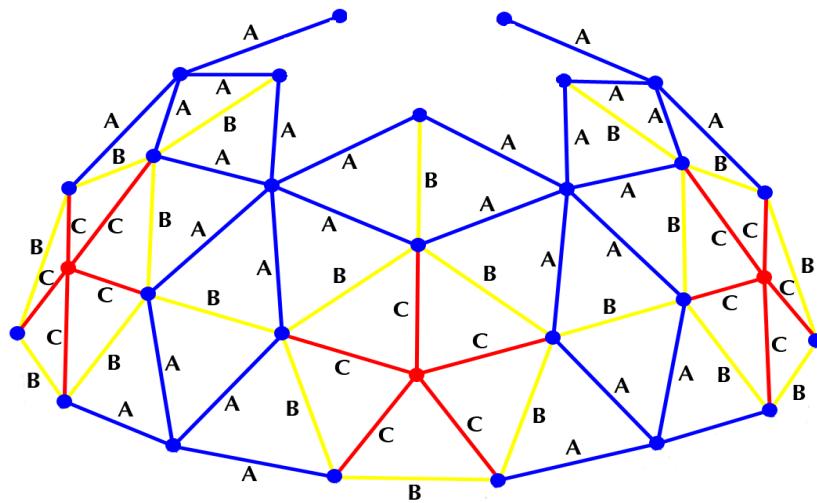
The Second Tier is now complete!

Step 5. Assemble the Third Tier

(5.1) Attach a Yellow "B" Strut to a Blue Hub. Attach a Blue "A" Strut to either side of the Yellow "B" Strut.



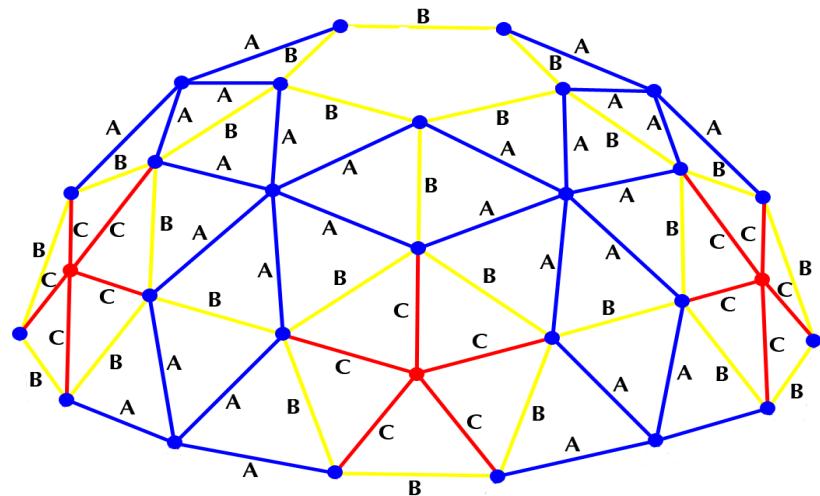
(5.2) Place the Yellow "B" Strut above the hub that has a Red "C" Strut directly beneath it.



(5.3) Repeat by placing the same design over the other 4 hubs that have a Red "C" strut beneath them on the top of the Second Tier.

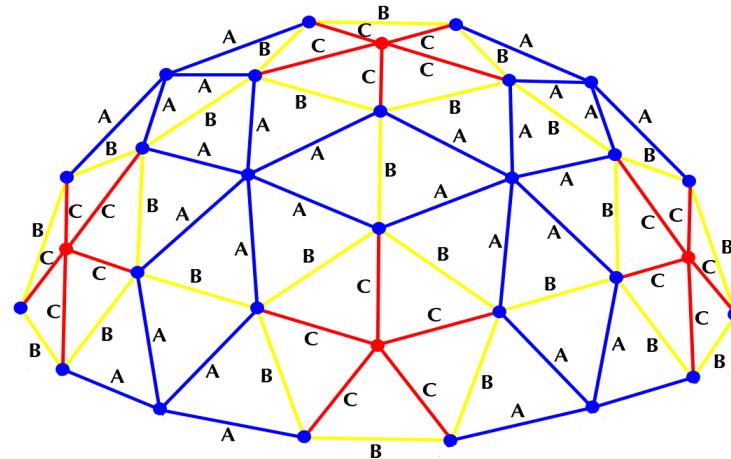


(5.4) Finish the top of the Third Tier with 5 Yellow "B" Struts.



Step 6. Complete the Dome.

(6.1) Complete the dome with a Red Hub and 5 Red "C" struts. The last connection in a geodesic dome is very tight. You may have to insert two struts into the top hub at the same time to complete the dome.



Construction Time is about 4 hours for one person.



How to Cut Your Own Struts

Use the Dome Calculator at www.ZipTieDomes.com to determine your strut lengths. The Blue struts on the calculator are always the longest struts, and this is the place to enter your data. For maximum strength, the longest struts should not be greater than 5 feet in length.

The hubs are designed for 1" PVC pipe with 1.315" OD. If you want to use 3/4" or 1" EMT conduit, upon request we will drill the hubs with the correct apertures for these ODs as a special order.

The Dome Calculator Material Utilization Chart will indicate the number of pipes that you will need to purchase.

Common sizes for 10' pipe material are:

16' 2V Dome:

35 Blue Struts – 5' length
30 Red Struts – 4' 5" length

Total pieces of 10' Pipe needed:

33

10' 2V Dome:

35 Blue Struts – 3' 4" length
30 Red Struts – 2' 11 3/8" length

Total pieces of 10' Pipe needed:

22

25' 3V 3/8 Dome:

50 Blue Struts – 5' length
40 Yellow Struts – 4' 10 3/4" length
30 Red Struts – 4' 2 3/4" length

Total pieces of 10' Pipe needed:

60

25' 3V 5/8 Dome:

80 Blue Struts – 5' length
55 Yellow Struts – 4' 10 3/4" length
30 Red Struts – 4' 2 3/4" length

Total pieces of 10' Pipe needed:

83

16' 3V 3/8 Dome:

50 Blue Struts – 3' 4" length
40 Yellow Struts – 3' 3-1/8" length
30 Red Struts – 2' 9-7/8" length

Total pieces of 10' Pipe needed:

56

16' 3V 5/8 Dome:	80 Blue Struts – 3' 4" length
	55 Yellow Struts – 3' 3-1/8" length
	30 Red Struts – 2' 9-7/8" length
Total pieces of 10' Pipe needed:	41

Common sizes for 20' pipe material are:

13' 2V Dome:	35 Blue Struts – 4' length
	30 Red Struts – 3' 6-1/2" length
Total pieces of 20' Pipe needed:	13

19' 3V 3/8 Dome:	50 Blue Struts – 4' length
	40 Yellow Struts – 3' 11" length
	30 Red Struts – 3' 4-5/8" length
Total pieces of 20' Pipe needed:	24

19' 3V 5/8 Dome:	80 Blue Struts – 4' length
	55 Yellow Struts – 3' 11" length
	30 Red Struts – 3' 4-5/8" length
Total pieces of 20' Pipe needed:	33

How to Cut and Drill the Struts:

Mark the pipe with a marker, using a tape measure or a jig for the length.

Cut the pipe to length using a pipe cutter or chop saw.

Drill a 5/16" or 3/8" hole across each of the ends of the pipe, about 3/8" to 1/2" from the pipe ends. Use a drill press if possible. Drill slowly so you won't crack the pipe.

The holes on each end of the pipe have to be drilled parallel to each other. If they are 90 degrees off, you won't be able to attach the end of the strut to the center ring. Try to drill through the lettering on the outside of the pipe, that will help you line up the holes on each end of the strut so they are parallel to each other.

Mark the pipe with Blue, Red, or Yellow colored tape to help you distinguish them during setup.

How to Attach a Greenhouse Cover

Greenhouse Plastic can be purchased from your Farmer's Co-Op, a Greenhouse supply store, or from Farmtek at www.farmtek.com

Recommended Greenhouse Covering Sizes:

Dome Size:	Covering Size:
10' Dome (5' tall)	20' x 20'
13' Dome (6' 6" tall)	24' x 24'
16' Dome (8' tall)	30' x 30'
25' 3/8 Dome (10' tall)	40' x 40'
25' 5/8 Dome (14' tall)	48' x 48'

Preparing the Dome for the Covering:

Before attaching a greenhouse covering, the zip ties must be trimmed so that they do not extend past the edges of the hub and into the covering. Use a pair of wire cutters or snips to cut the ends off the zip ties inside the hubs.



Painting or Taping the Dome to Separate the PVC from the Greenhouse Plastic

PVC pipe will slowly produce chlorine gas, which may destroy the UV light stabilizers in polyethylene greenhouse film. This chlorine gas from PVC pipe will cause certain types of 4 year greenhouse plastic to have holes and tears after the first year.

For this reason, your greenhouse plastic warranty may be voided if your greenhouse plastic comes in direct contact with PVC. Contact the greenhouse plastic manufacturer for details.

Greenhouse plastic can also be damaged by oil based paints, wood preservatives, chlorine based disinfectants, and certain pesticides, especially those containing sulfur or copper. This problem is not specific to our geodesic domes, but is evident in any type of PVC greenhouse structure.

Solution: Acrylic Latex Paint

To extend the life of your greenhouse plastic, before you attach your greenhouse plastic, use a white acrylic latex paint and paint any PVC struts and hubs that will come in direct contact with your plastic.

Alternate Solution: Clear Packing Tape

Another technique is to cover the hubs and struts with a non-PVC tape, such as clear packing tape. Applying tape over the hubs helps to smooth any rough edges that might rub against the plastic sheet.



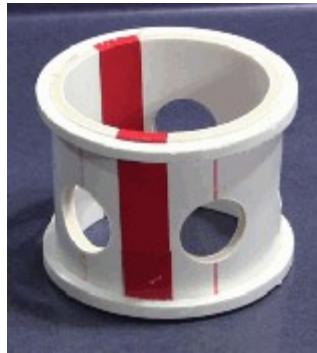
Raising the Cover over the Dome:

For the larger domes, you may want to tie a rope on the center of the leading edge of the

covering to hoist the center of the cover over the dome.



Method 1: Using the Dual Covering Hubs:

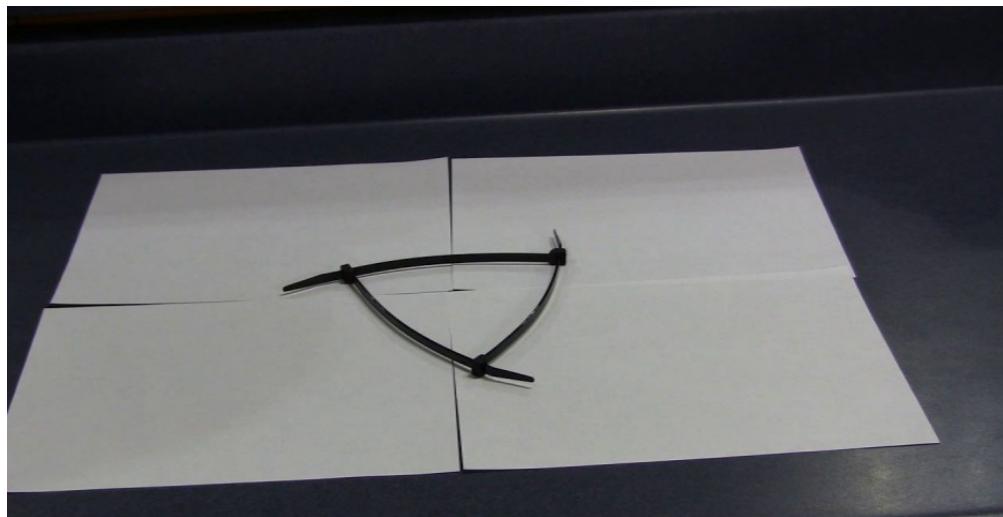
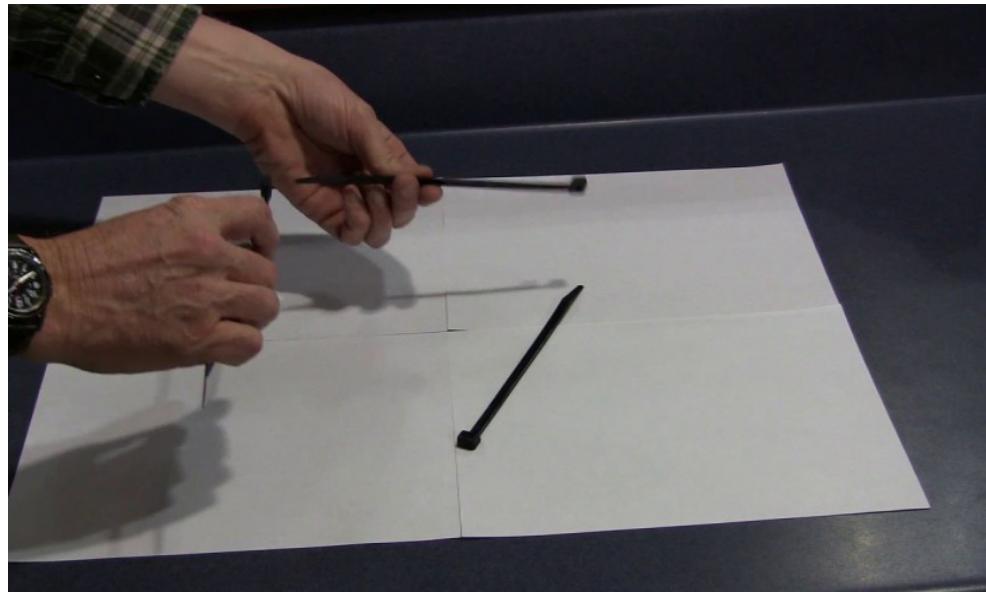


The Dual Covering Hubs have an extra ridge at the edge of the hub that allows you to attach the greenhouse plastic to the hub by cinching the zip ties over the plastic above the ridge, which secures the plastic to the hub.

The design of the Dual Covering Hubs allow you to attach two layers of greenhouse covering to the dome, one on the inside, and one on the outside. This creates a “dead air space” insulation pocket, and increases the greenhouse's ability to hold heat during the nighttime hours.

To attach the greenhouse covering to a Dual Covering Hub:

Connect 3 Heavy Duty 8” Zip Ties together in a “daisy chain” circle, with each of the Zip Tie Ratchet Knobs on the outside of the circle.



Attach the plastic to the dome by wrapping the plastic over the hub, and secure the plastic by cinching the 3 Zip Ties down over the plastic on the hub between the edge of the struts and the ridge on the outside of the hub.





It is easier to attach two layers to the dome if you start with the covering on the inside of the dome. To do this, you will need to find the exact center of your covering material, so that it can be attached to the center, or top, of the inside of the dome.

Take the covering and fold it twice, once in each direction.





Find where the double fold is, and make a large, visible mark with an ink marker to mark the center of the covering.



Put a step ladder inside the dome. Take the covering and put the marked center over the top of the step ladder.



Get under the covering and place the marked center of the covering over the hub at the top of the dome. Have 3 zip ties in a daisy chain ready to cinch down the covering over the hub. You may need one or more people to help you do this.

Lift the covering up over the hub, and secure it to the center top hub with zip ties.



Pull the covering to the next hub, and take up any slack in the covering between the hubs. Secure the covering to all of the hubs in the interior of the dome.



Pull the outside covering over the outside of the dome. Use Zip Ties to secure the outside covering to the hubs on the sides and on the bottom of the dome.

Method 2: Using the Standard Economy Hubs



The Standard Economy Hubs do not have a ridge on the edge of the hubs for attaching two layers of greenhouse covering.

With the Standard Economy Hubs, only one layer of greenhouse covering can be attached to the outside of the dome using Test Cap Covers and Greenhouse Clips.

For an overview, please see our video at www.ZipTieDomes.com “How to Attach A Cover with Test Caps and Pleats.”

The Greenhouse Clips are for attaching the greenhouse covering to the 1.315" OD PVC pipe, and can be purchased from FarmTek or a Greenhouse Supply store.



After the greenhouse covering has been placed on the outside of the dome, secure the covering to bottom struts of the dome using the 1.315" greenhouse clips.



Using the Test Caps and Carriage Bolts.

The 4" Test Caps can be purchased from Lowes or Home Depot in the plumbing section of the store.



For the 3v 24' dome, you will need:

30 Test Caps
15 carriage bolts that are 5" long,
and 15 nuts and washers for the bolts.

For the 2v 16' dome, you will need:

20 Test Caps
10 carriage bolts 5" long
10 nuts and washers for the bolts.

A hole needs to be drilled in the center of each Test Cap slightly larger than the diameter of the carriage bolt, so that the carriage bolt can be inserted. Assemble the Test Caps with the carriage bolts inserted.



The Test Caps and carriage bolts will be used on the hubs at the top of the first tier of the dome. Fold any excess greenhouse covering over the hubs on the top of the first tier to make a pleat. Insert the carriage bolt through the pleat, and through the center ring of the hub.



Push the Test Cap into the hub opening, securing the greenhouse covering to the hub.

On the inside of the dome, thread a Test Cap over the carriage bolt, and secure with a washer and nut.



How to Build a Greenhouse Door

We have included 2 extra struts and extra heavy duty zip ties to help you build a door for your greenhouse. You can use this same technique to build vents for your greenhouse.

After you cover the dome with greenhouse plastic, cut the plastic along two sides of one of the triangles.

Tape the loose plastic along the two cut sides to the struts, leaving the flaps to be used for the door.



Tie a Heavy Duty Zip tie through the end of one of the Blue Struts, leaving a large loop in the Zip Tie.



Daisy chain 3 zip ties together as shown in “How to Attach a Greenhouse Cover”, and loop them through the zip tie on the end of the strut.

If you have Dual Covering Hubs, place the daisy chain zip ties over the ridge on the hub on the outside of the dome and cinch it down to secure the end of the strut to the hub.

If you have Standard Hubs, put the daisy chain zip ties under the plastic and through the outer or inner ring of the hub to secure the end of the strut to the hub.



Take the second strut, and attach it in the same way to the hub at the bottom of the opening.



To make the door, connect the loose ends of the two struts together using two zip ties.

To connect the struts, loop a zip tie through the end of each of the struts, making sure the two zip ties are also looped together. Tighten the zip ties to connect the ends.



Pull the loose plastic flaps up to the door, and attach the plastic to the door with clear tape or greenhouse clips.

Patch any holes with clear tape. You can attach a clear plastic flap on the outside over the top of the opening to hold the door closed and to help insulate the dome.



After You Build Your Dome...

High Winds Advisory for the 24' Geodesic Dome

If you will be covering your dome, and expect winds in excess of 40-50 mph, you will need to do the following:

Put an immovable stake / ground anchor next to each hub on the Foundation Ring. Secure each hub in the Foundation Ring to the stake / ground anchor with heavy duty wire, rope, or cable.

Attach guy wires from the hubs on the First or Second Tiers to immovable stakes / ground anchors outside the dome.

Reinforce the Zip Ties on the Foundation Ring, the top of the First Tier, and the top of the Second Tier with heavy duty wire. Cut an 8 inch length of wire and pass it over the Zip Tie, through the strut opening, and around the Center Ring – then twist the wire together. The Stainless Steel Zip Ties are rated at 250 lbs, but can loosen in a high wind, as more than 250 lbs of force can be exerted. By reinforcing with wire, especially on the windward side of the dome, you are much more protected from having your struts break free from the hubs.

Questions or Comments?

Call us at (931) 858-6892, or email us at www.ziptiedomes.com

(c) 2014 Zip Tie Domes.