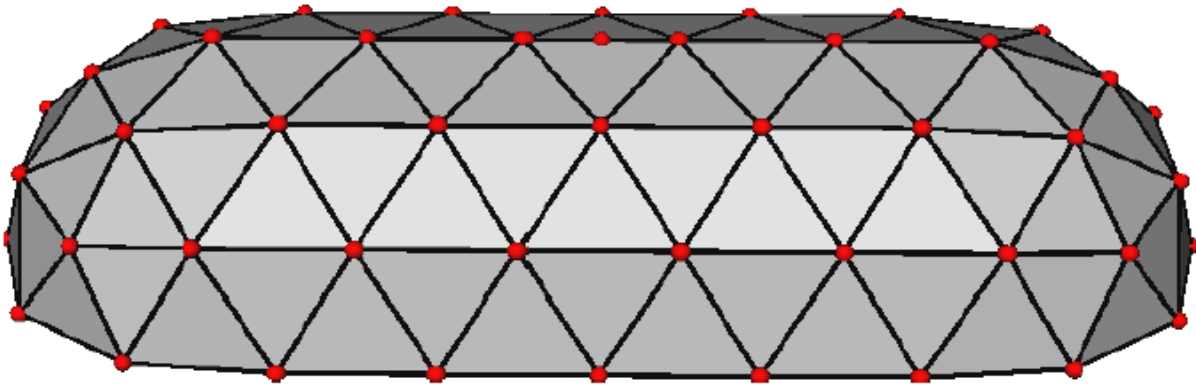


Zip Tie Domes

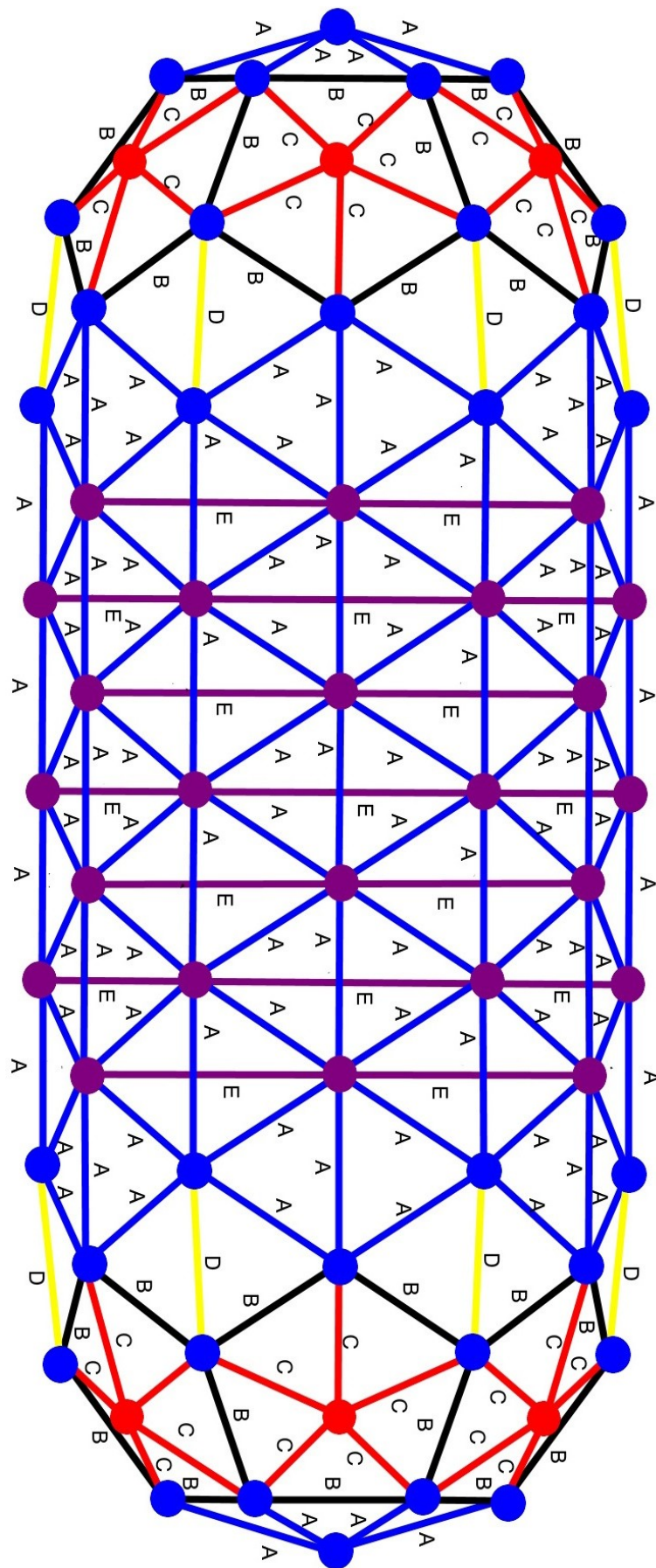
4 Extension Tunnel Dome



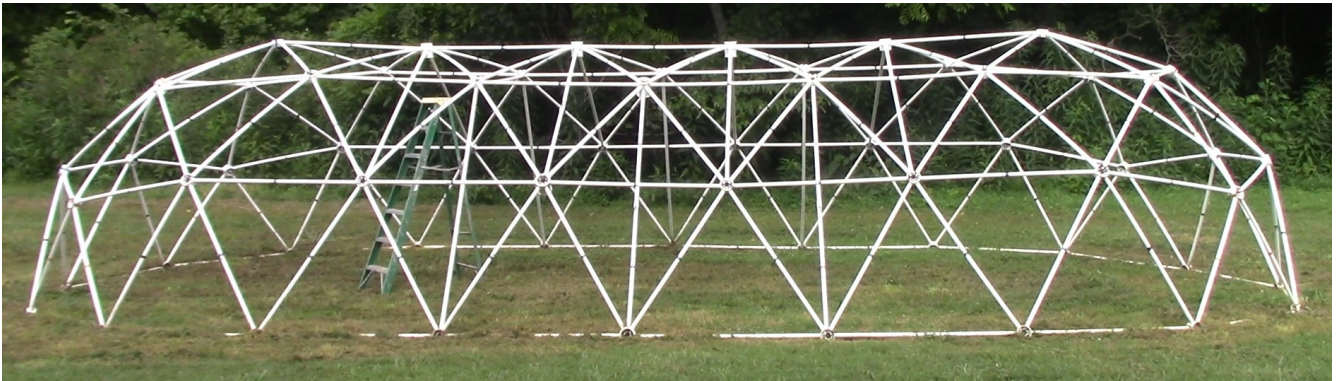
Assembly Manual

(c) 2023 Zip Tie Domes
1857 Brindley Hollow Rd
Buffalo Valley, TN 38548
(931) 858-6892

Zip Tie Domes – 4 Extension Tunnel Dome Assembly Manual



Zip Tie Domes – 4 Extension Tunnel Dome Assembly Manual



Tools Needed: 8' Stepladder, Wire Cutters.

SAFETY NOTICE: Do not climb on the dome. It is not designed for climbing.

The dimensions of this dome are:

Height: 8' 8-3/8"

Width: 17' 4-3/4"

Length: 41' 5-3/8"

Floor space: 648.39 square feet

Step 1. Find a level area wide enough to assemble the dome.

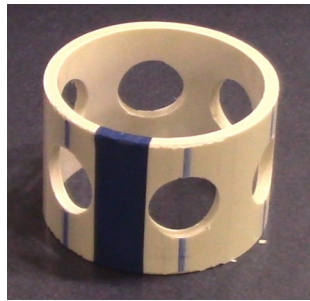
Step 2. Unpack the dome materials where the dome will be constructed. Use wire cutters or manually unwind the wire for releasing the struts from the restraining wires.

This package will include:

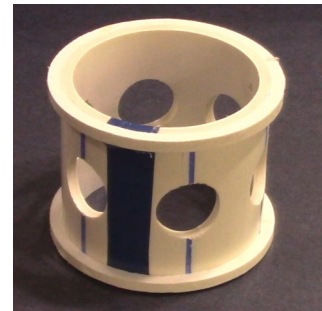


99 Blue "A" Struts	5' in length.
26 Black "B" Struts	4' 9-7/8" in length
30 Red "C" Struts	4' 2-5/8" in length
8 Yellow "D" Struts	4' 10-1/2" in length
17 Support Struts	8' 6" in length (when assembled).

32 Blue 6-way Hubs,

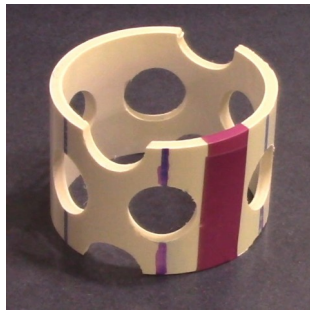


Standard Hub

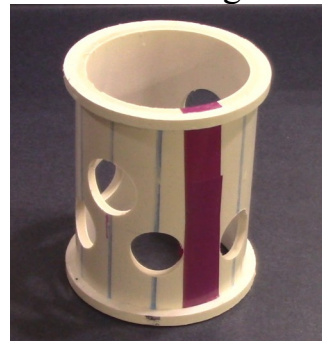


Dual Covering Hub

24 Purple Support Hubs



Standard Hub

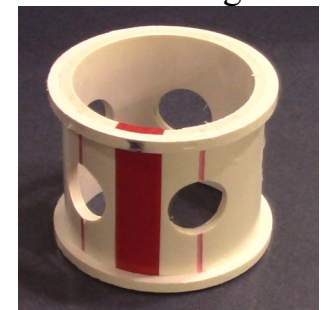


Dual Covering Hub

6 Red 5-way Hubs,



Standard Hub



Dual Covering Hub

62 Center Rings,



372 Nylon Zip Ties to attach
the greenhouse plastic to the
Dual Covering Hubs,



Nylon Zip Ties

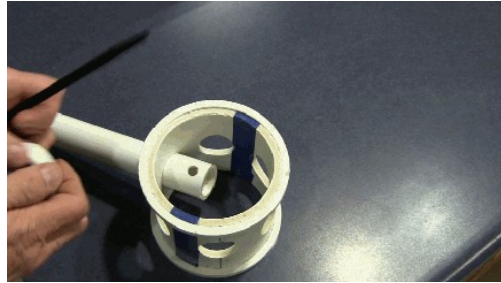
And 326 construction zip ties
for building the tunnel dome
plus 68 support strut zip ties,
both made from 350 lb
Stainless Steel Zip Ties.



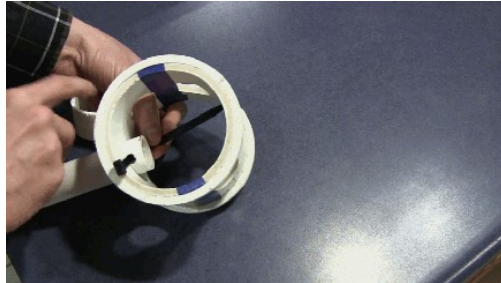
Stainless Steel Zip Ties

How to Attach the Hubs to the Struts

Put the end of the strut into the opening on the side of the hub.



Insert a zip tie into the end of the strut.



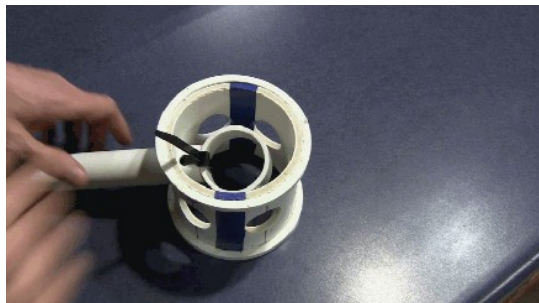
Place a center ring on the end of the strut.



Loop the zip tie through the center ring.

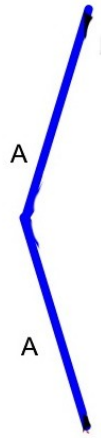


Tighten the zip tie to secure the center ring to the strut.



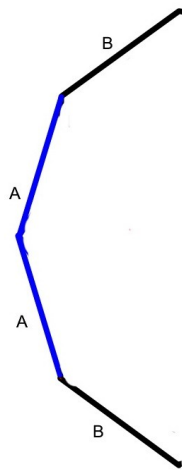
Step 3. Tunnel Dome Construction. Building the Foundation.

A1.



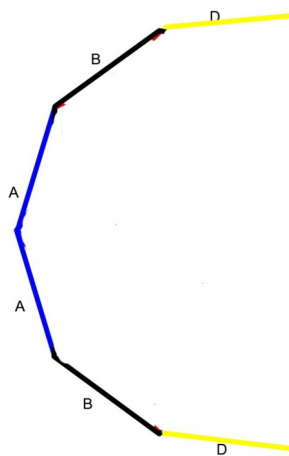
A1. Take 2 blue struts and lay them in a slight “V” at one end of the dome footprint.

A2.



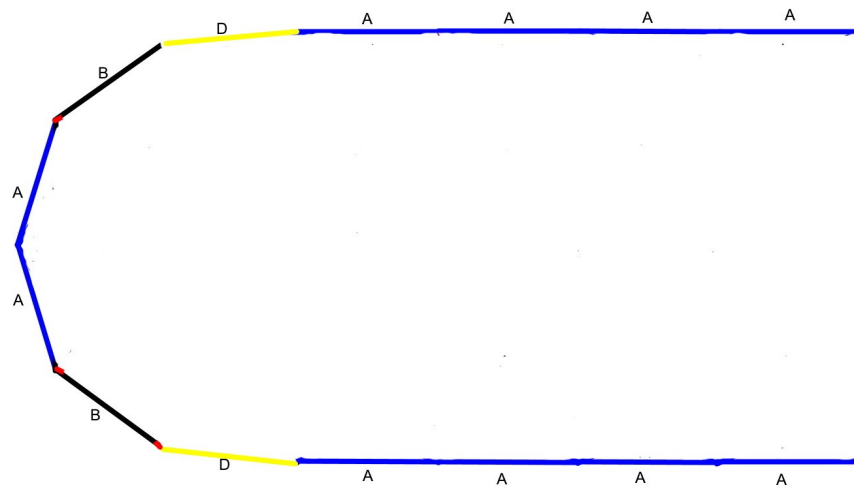
A2. Take two black struts and put a black strut on the ends of the blue struts in the shape of a circle.

A3.



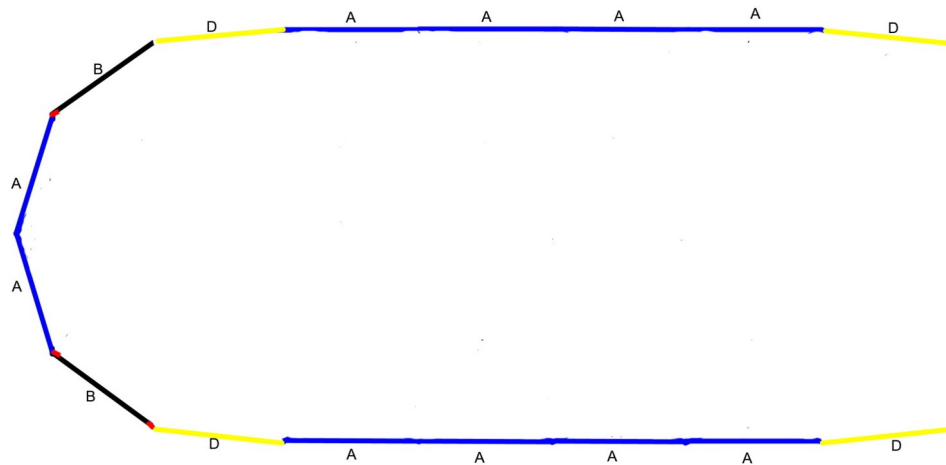
A3. Take two yellow struts and put a yellow strut on the ends of the black struts, in the shape of the tunnel dome.

A4.



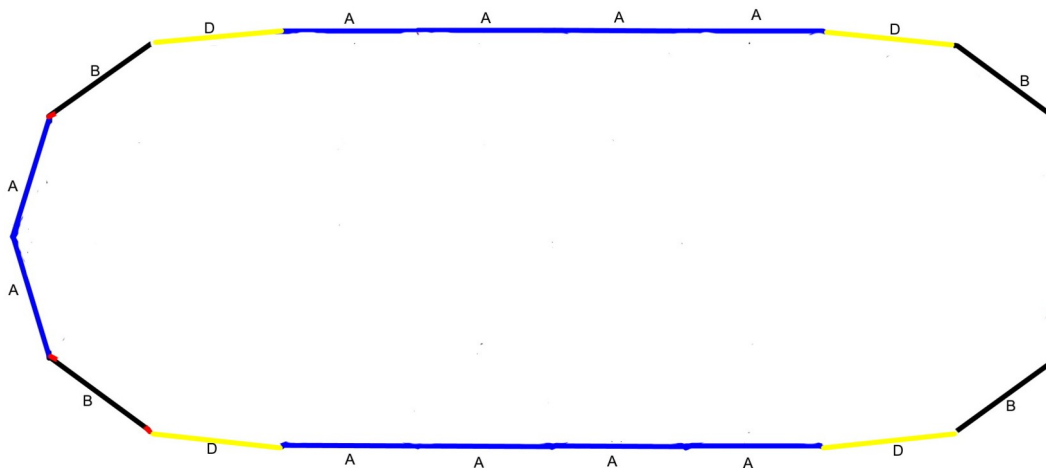
A4. Take 8 blue struts and put 4 blue struts on the ends of the yellow struts, along the length of the tunnel dome.

A5.

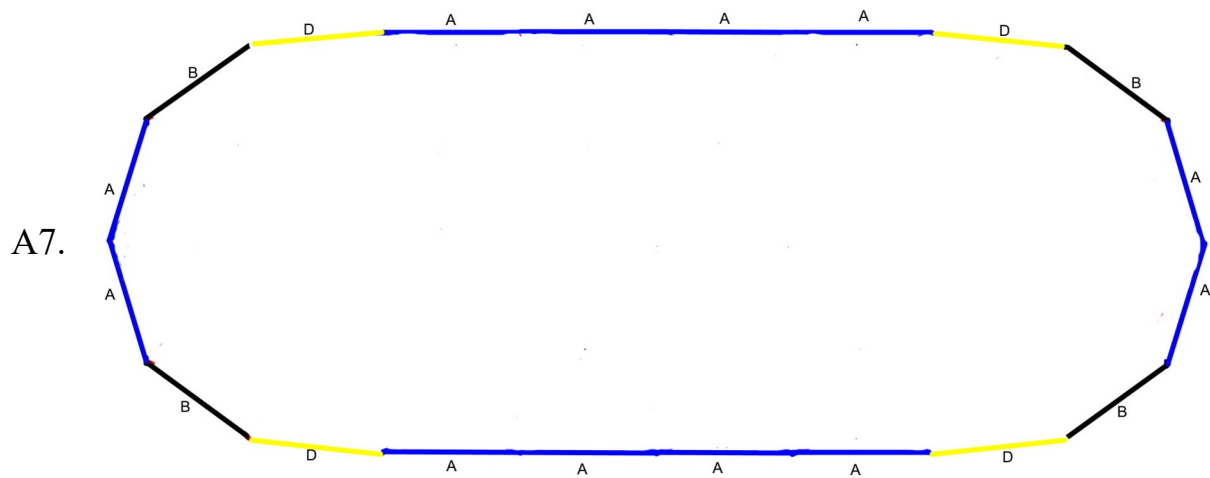


A5. Take two yellow struts and put a yellow strut on the end of each of the blue struts.

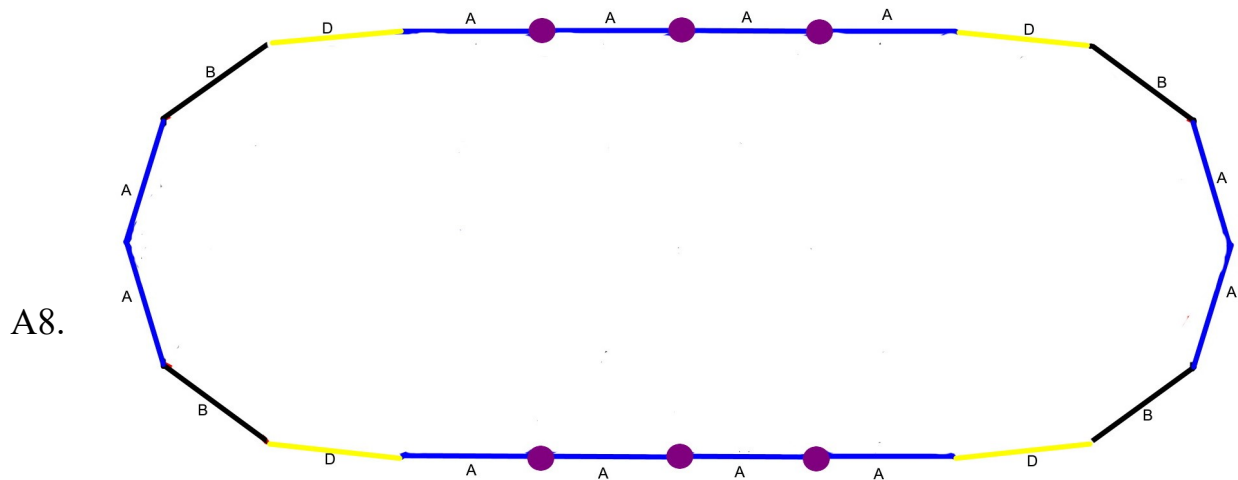
A6.



A6. Take two black struts, and place them at the ends of the yellow struts, in the form of a circle.



A7. Complete the end of the tunnel dome foundation with two blue struts.



A8. Take 6 purple support hubs and 6 center rings, and put a purple hub between the 4 blue struts on the side of the tunnel dome, 3 purple hubs on each side.

The Standard Purple Support Hub will have curved slots along the edge of the hub.



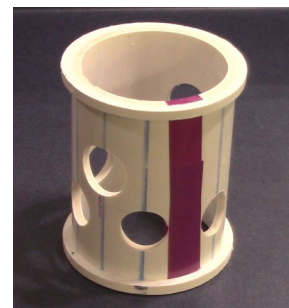
When you attach the struts to the hub, make certain the curved slots on the edge of the purple hubs are perpendicular to the length of the tunnel dome. The curved slots in the purple hub should point towards the center and the outside of the tunnel dome. The struts should be inserted on opposite sides of the hub, or 180 degrees apart, and attached to the center ring with zip ties.



When the first tier is raised, the hub will turn on its edge, and the curved slot will be on top of the hub. This will allow the Support Struts to be attached when the dome is complete.



If you are using Dual Covering Hubs, the Purple Support Hub will have 6 holes on one end for the struts, and 2 holes on the other end for the support struts.



When you attach the struts on opposite sides of the hub, make certain that the two openings for the support struts are on the top of the Dual Covering hub, and that they point to the inside and the outside of the dome.



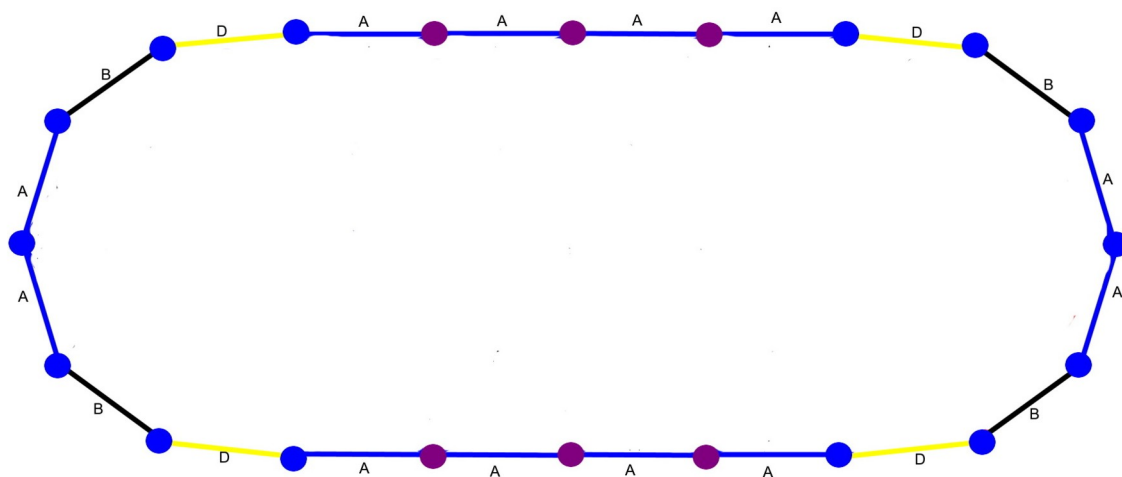
When the first tier is raised, the Dual Covering hub will turn on its side, and the support strut holes will be facing up on the inside of the dome.



This will allow the Support Struts to be attached to the Dual Covering hub when the dome is complete.



A9.



A9. Take 14 blue hubs and 14 center rings. Put a blue hub and center ring between every strut, and connect them together to complete the tunnel dome foundation.

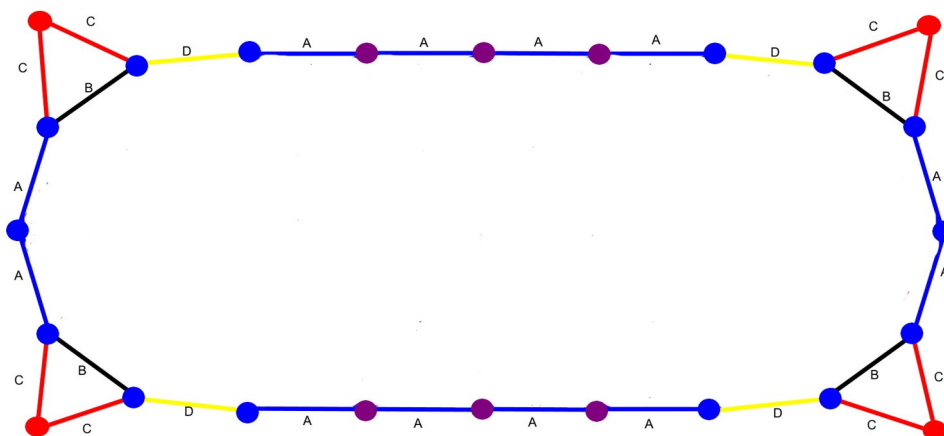
The struts should be inserted on opposite sides of the hub, or 180 degrees apart, and attached to the center ring with zip ties.



Building the First Tier:

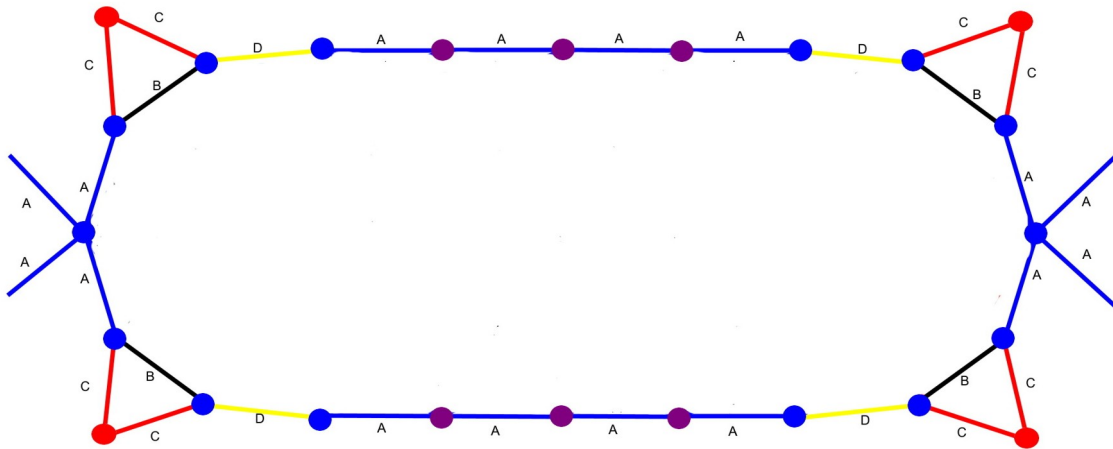
All struts and hubs will be placed on the outside of the foundation ring.

B1.



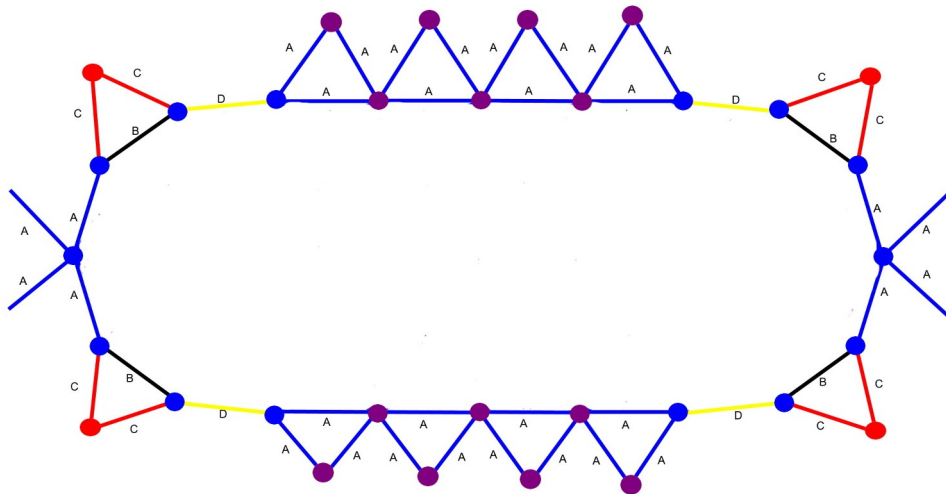
B1. Take 8 Red Struts and 4 Red Hubs. Lay the struts and hubs in the shape of 4 red triangles over the 4 black struts near the ends of the tunnel dome foundation.

B2.



B2. Take 4 blue struts, and put a blue “V” where two blue struts meet at the very ends of the tunnel dome.

B3.



B3. Take 16 blue struts and 8 purple hubs. Put 8 blue triangles with a purple hub over the 8 blue struts on the sides of the tunnel dome.

When you assemble the triangles with the purple hubs, make certain the curved slots on the edge of the purple hub point up to the top and down to the bottom of the triangle, so that the support struts can be installed later.

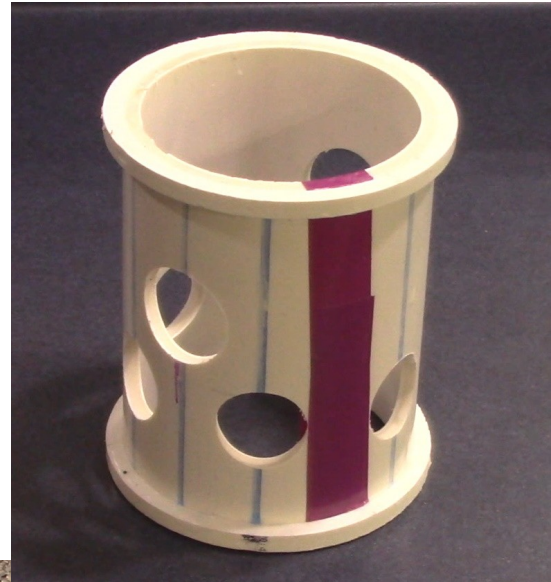




The curved slots will allow the Support Strut to be attached when the dome is complete.



If you are using Dual Covering Hubs, the Purple Support Hub will have 6 holes on one end for the struts, and 2 holes on the other end for the support struts.

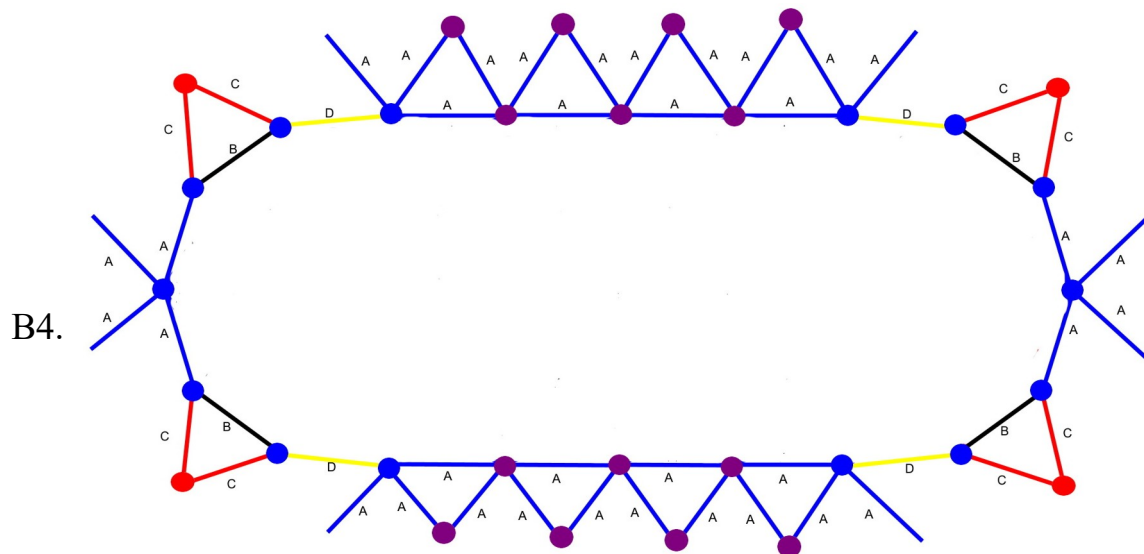
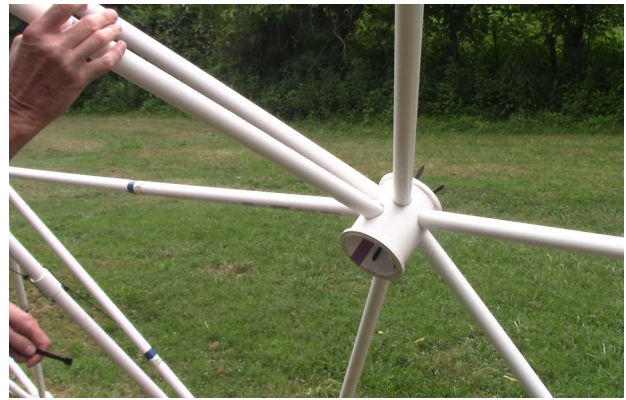


You want the two openings for the support struts on the top of the hub, and to point up and down on the triangle.

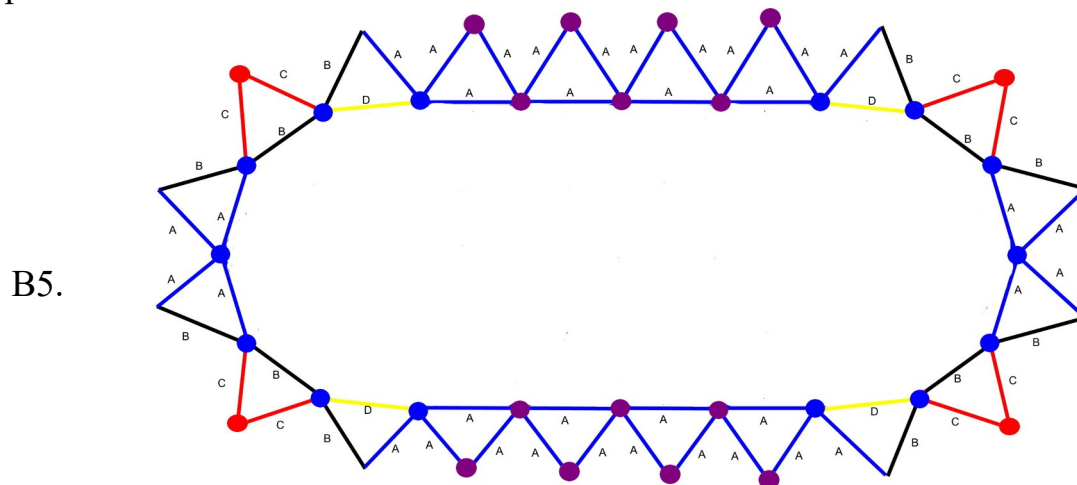


This will allow the Support Strut to be attached when the dome is complete.

Now let's finish the dome.

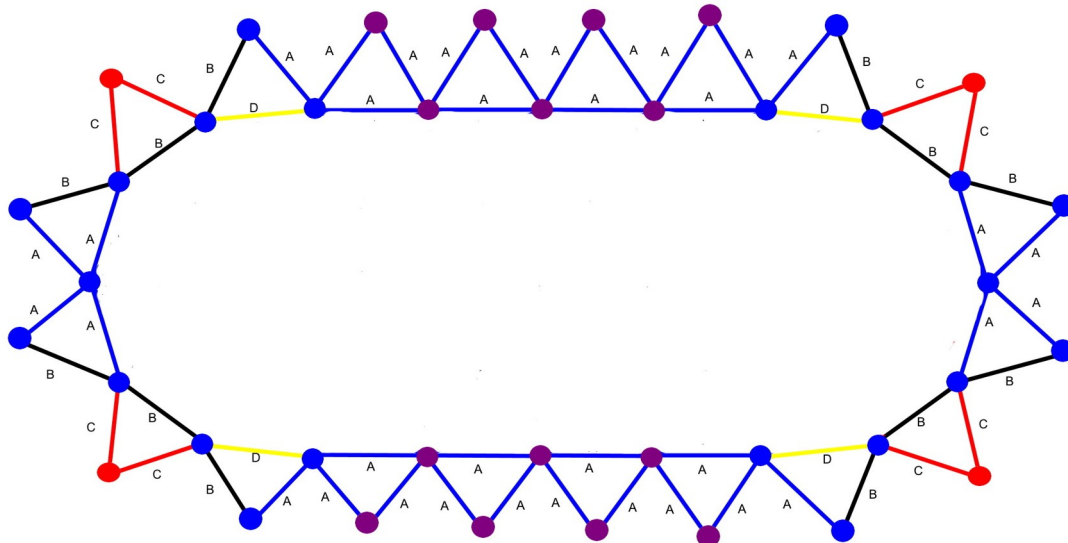


B4. Take 4 blue struts and lay a blue strut on either side of the blue triangles with a purple hub.



B5. Take 8 black struts and place them in the remaining gaps, so that a triangle is over every strut in the foundation ring.

B6.

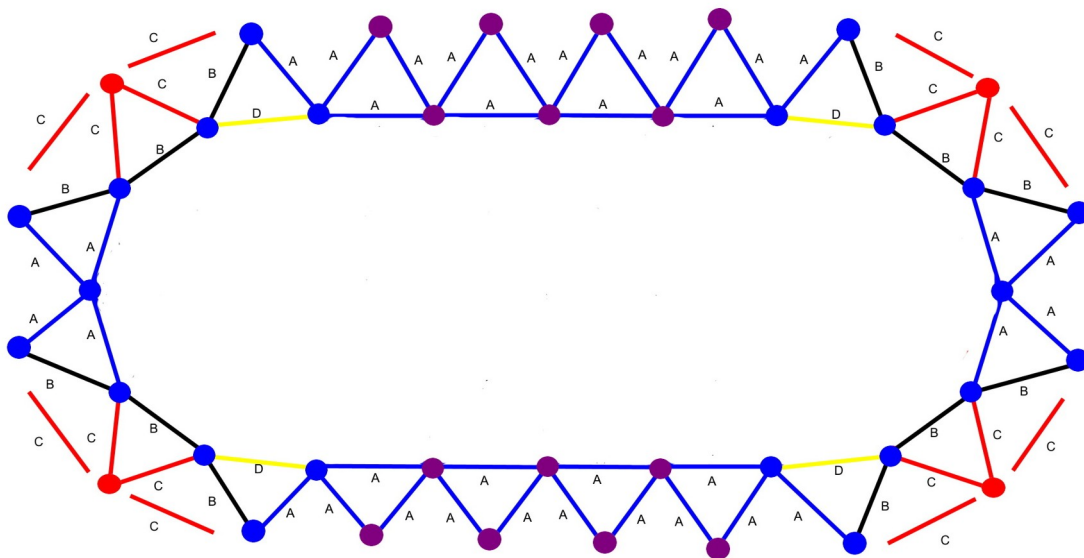


B6. Put blue hubs at the top of the remaining triangles.

B7. Connect the hubs and struts to the foundation ring. It will be easier to connect the struts to the foundation ring first, and then connect the hubs at the top of each triangle.

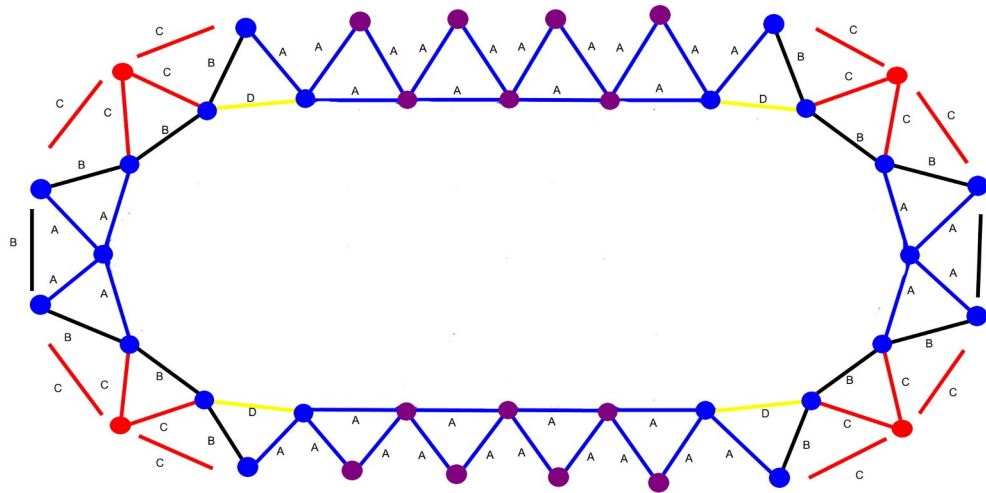


B8.



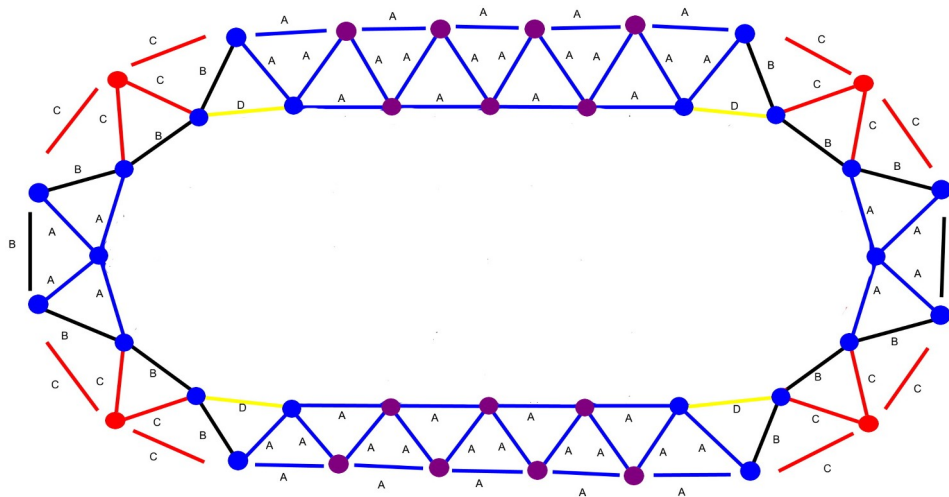
B8. Take 8 red struts and place two red struts on either side of the 4 red hubs.

B9.



B9. Take 2 black struts and place a black strut over the blue V at each end of the tunnel dome.

B10.

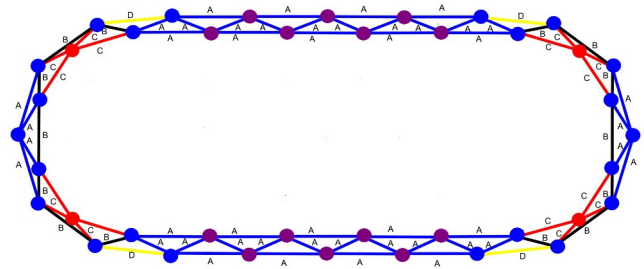
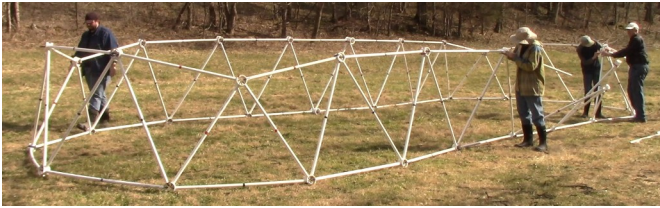


B10. Take 10 blue struts and put a blue strut between and on each side of the purple hubs on the sides of the tunnel dome.

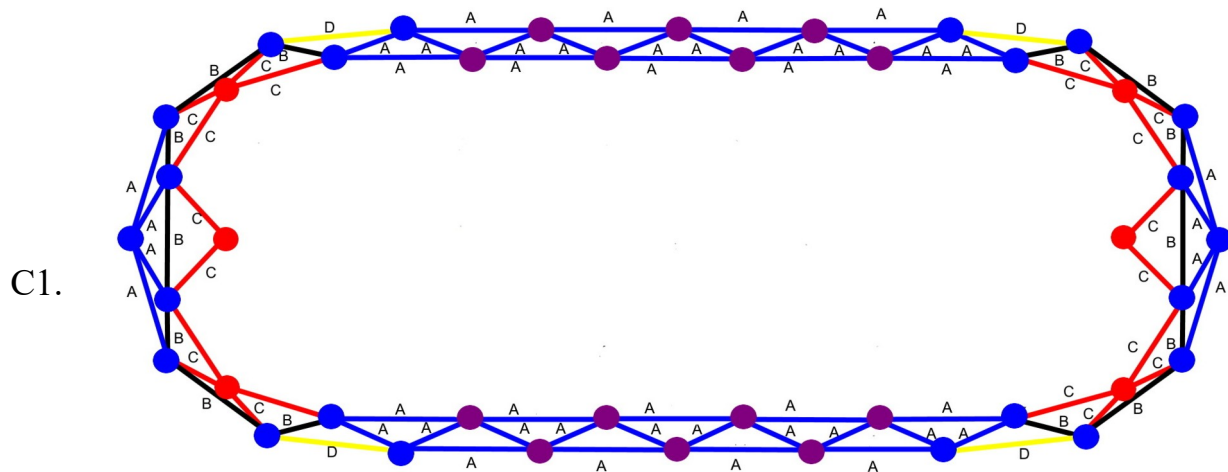
B11. Raise the 1st tier.

Lift the triangles up from the ground, and connect the tops of the triangles with the struts.

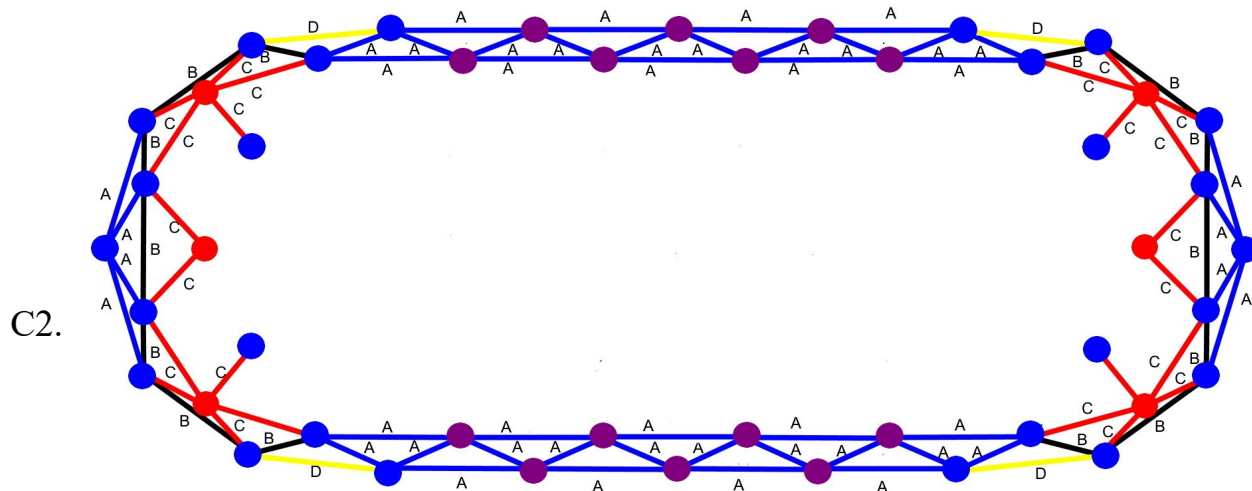




Building the 2nd Tier:

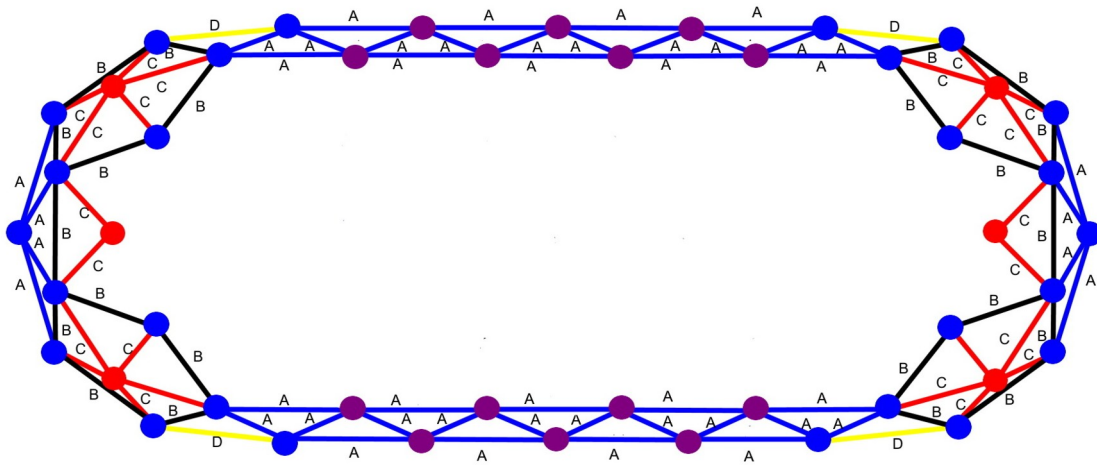


C1. Take 4 red struts and 2 red hubs. Make 2 red triangles with a red hub and place them over the black strut at each end of the tunnel dome.



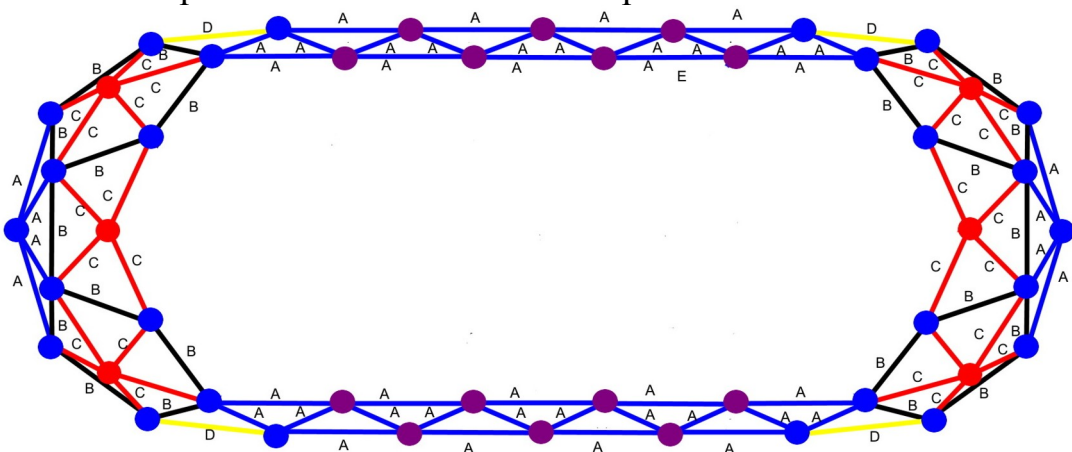
C2. Take 4 red struts and attach them to 4 blue hubs. Insert these into the 4 red hubs at the top of the 1st tier.

C3.



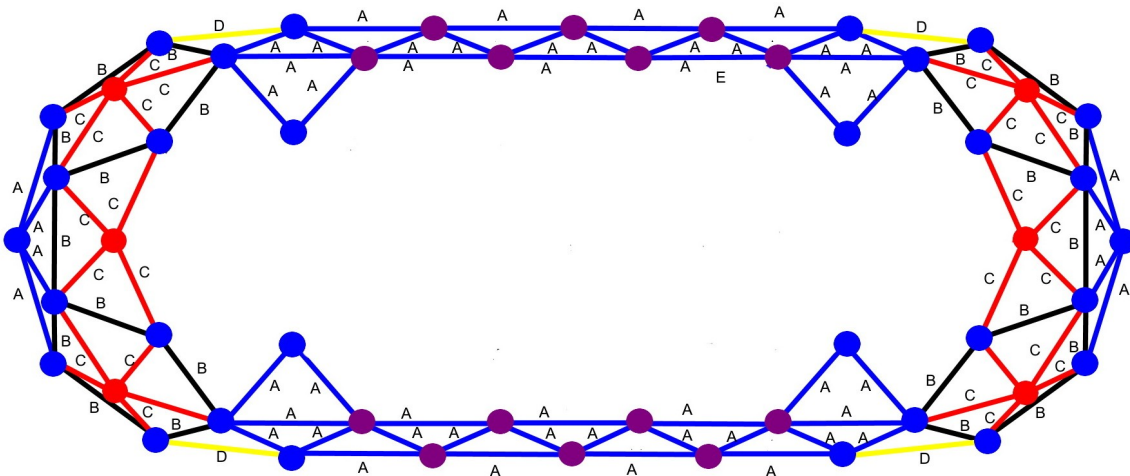
C3. Take 8 black struts, and put a black strut on either side of the 4 red struts with blue hubs. Attach with zip ties at the bottom and the top.

C4.



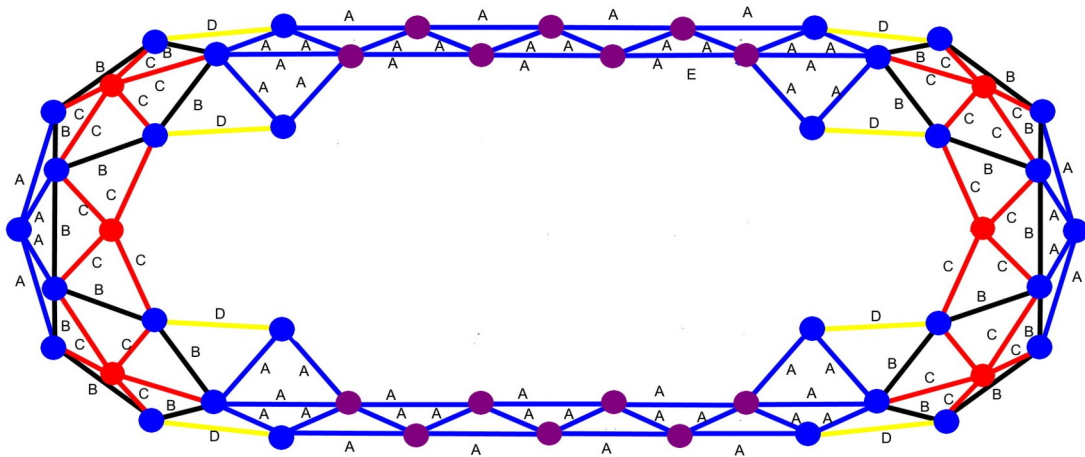
C4. Take 4 red struts and connect a red strut on either side of the red hubs at the ends of the tunnel dome. Connect the other end of the red strut to the blue hub.

C5.



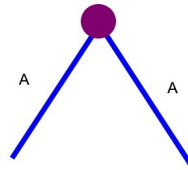
C5. Take 8 blue struts and 4 blue hubs. Make 4 blue triangles and place them over the 4 empty blue struts in the corners of the tunnel dome.

C6.



C6. Take 4 yellow struts and put a yellow strut above the black and blue “V” and connect to the blue hubs.

C7. Take 12 blue struts and 6 purple hubs. Make 6 blue triangles with the openings in the purple hubs aligned up and down.

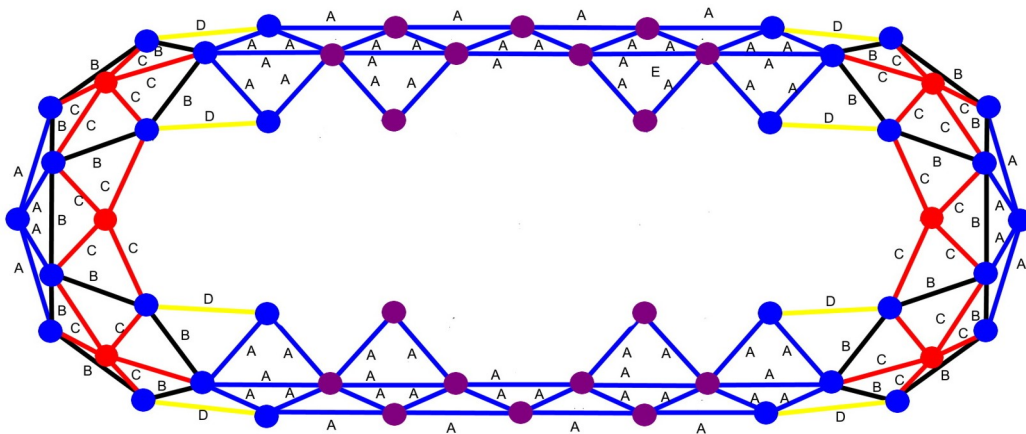


Standard Hub

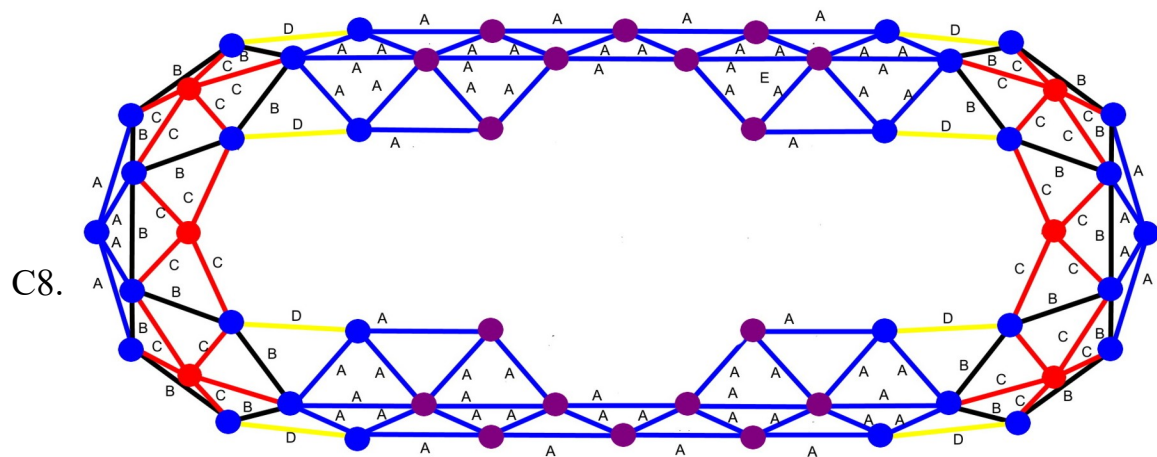


Dual Covering Hub

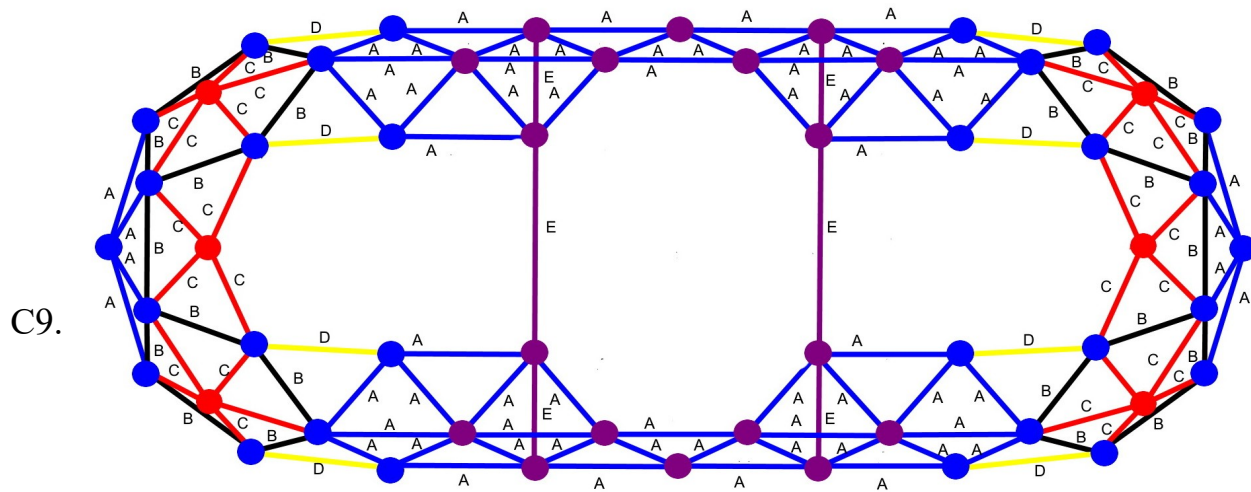
C7.



C7. Attach two each of the triangles to the 4 purple hubs on each side in the corners of of the tunnel dome.



C8. Take 4 blue struts and connect the blue hubs to the purple hubs in the 4 corners of the tunnel dome.



C9. Take 6 support struts. Add 4 support struts and attach 2 support struts on each side of the tunnel dome. Then add 2 support struts across the width of the tunnel dome.

Each Support strut comes in 2 pieces for shipping.



Slip a 1" PVC pipe Coupler over the end of a support strut.



Put the other end of a strut into the curved slot on the edge of a purple support hub, and attach the strut to the center ring with a zip tie.



For Dual Covering Hubs, put the end of the strut into the hole on the side of the hub, and attach the strut to the center ring with a zip tie.



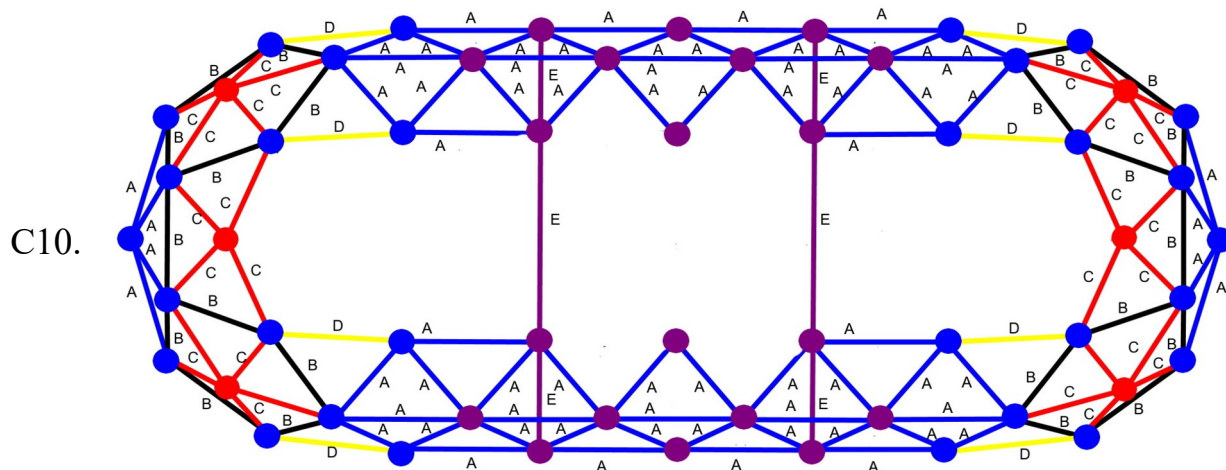
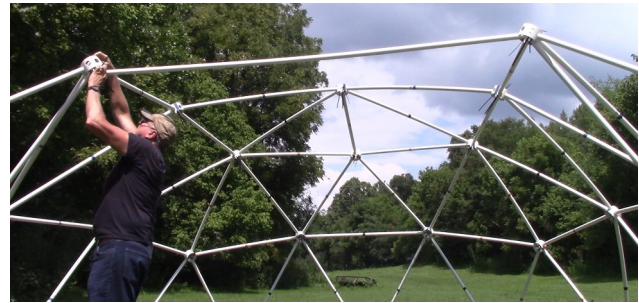
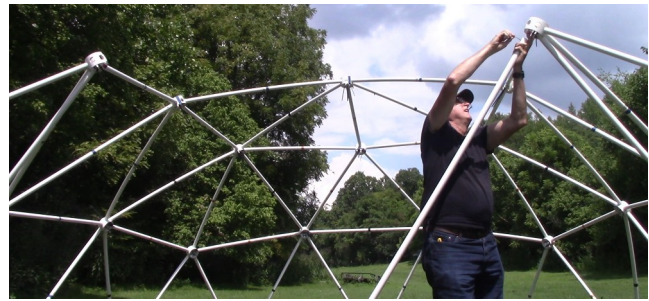
Take another support strut without a coupler, and attach it to the support hub directly above.



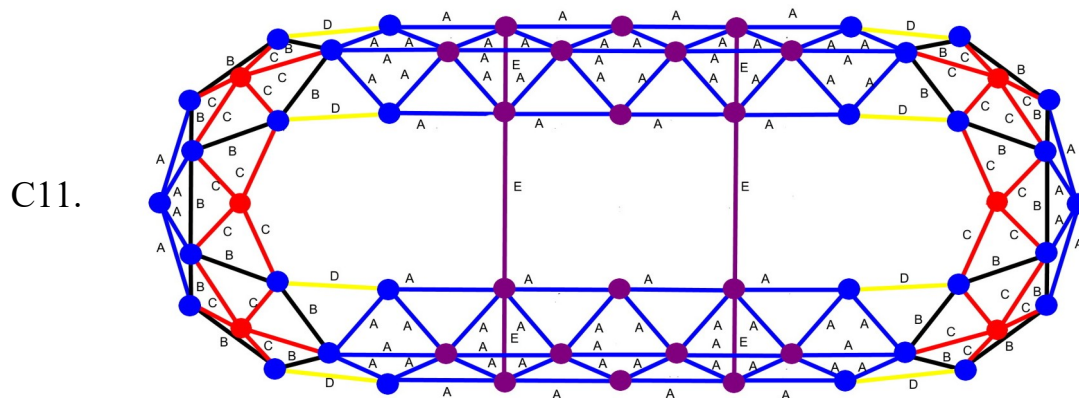
Connect the two struts together with the coupler, and secure the connection with two zip ties looped through the holes on the sides of the struts.



Then, add a support strut across the width of the tunnel dome.

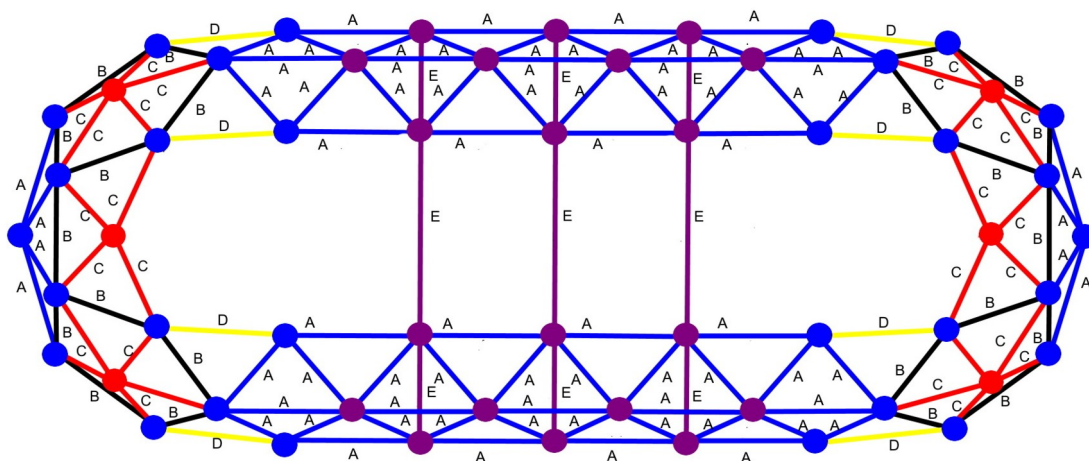


C10. Take 4 blue struts and 2 purple hubs. Make two blue triangles with the openings in the purple hubs aligned up and down as shown in C7. Place the triangles on each side of the tunnel dome.



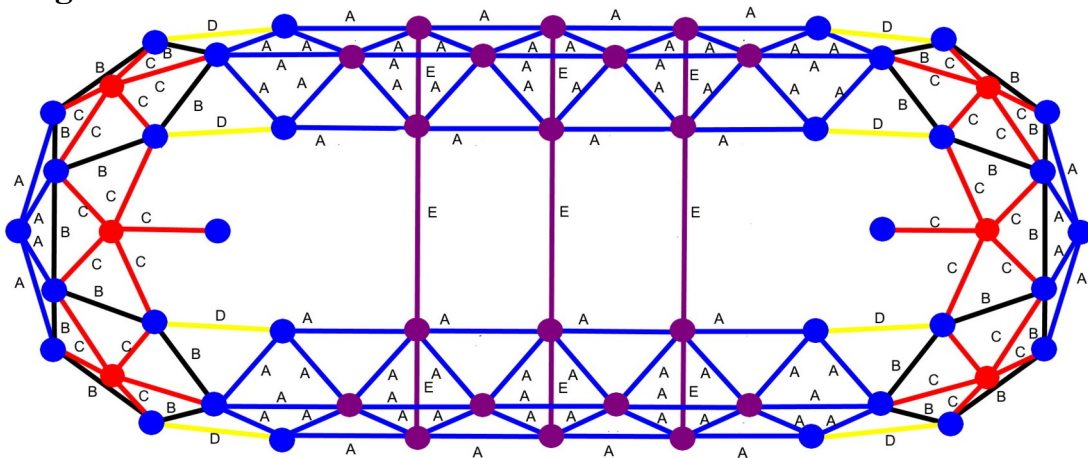
C11. Take 4 blue struts and connect them to the purple hubs at the top of the tunnel dome.

C12.



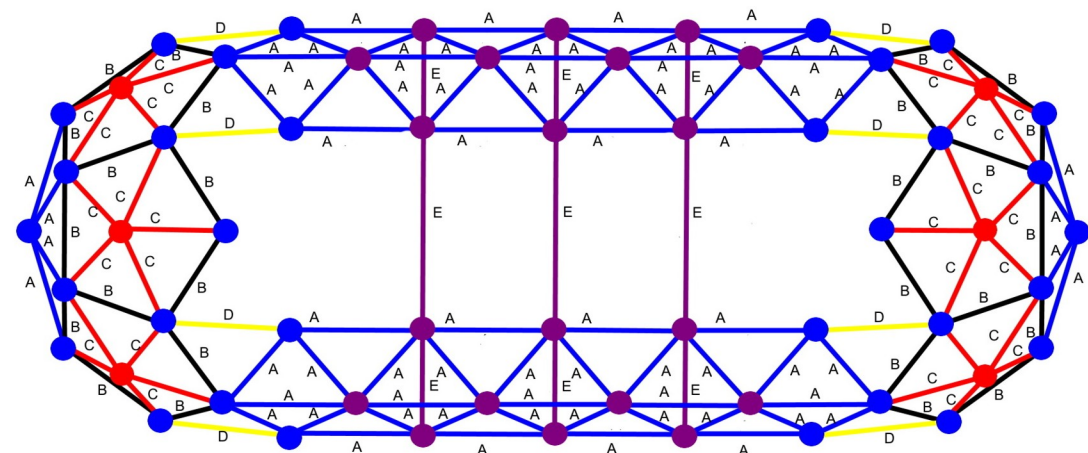
C12. Take 3 support struts and attach them to the 2 purple hubs as shown in C9.
Completing the Dome:

D1.



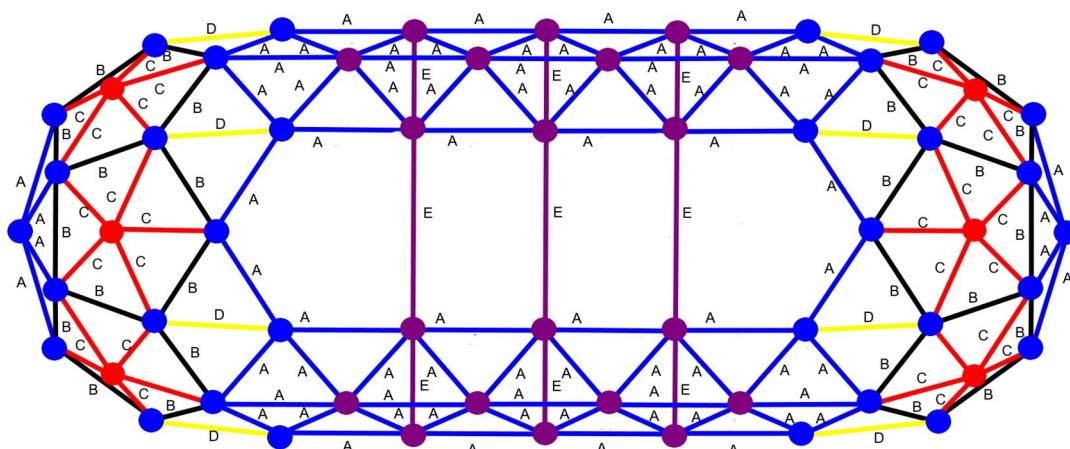
D1. Take 2 red struts and 2 blue hubs, and attach each red strut to a blue hub. Attach the other end of the red struts to the red hubs at each end of the tunnel dome.

D2.



D2. Take 4 black struts and put 2 black struts on either side of the red strut, and connect to the blue hubs at the top of the dome.

D3.

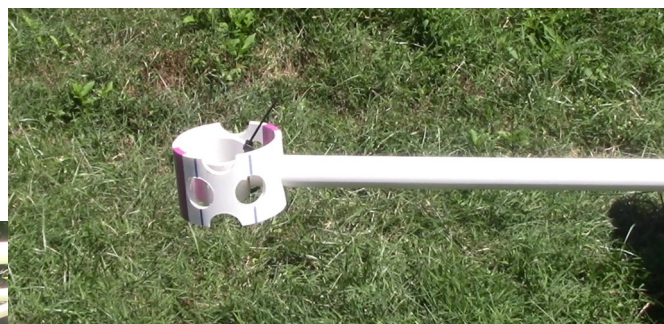
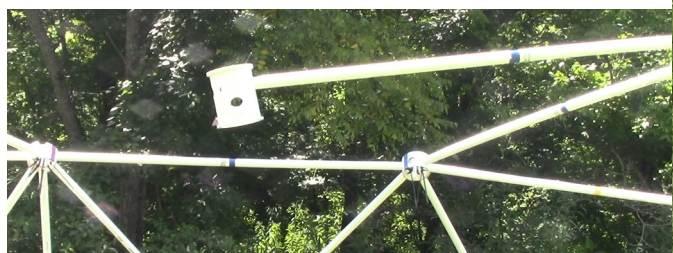


D3. Take 4 blue struts and connect to the same two blue hubs at the top of the dome.

D4. Take two blue struts and attach two purple hubs.



Make certain the openings in the purple hub are 90 degrees from the strut so that they will point to the sides of the tunnel dome.

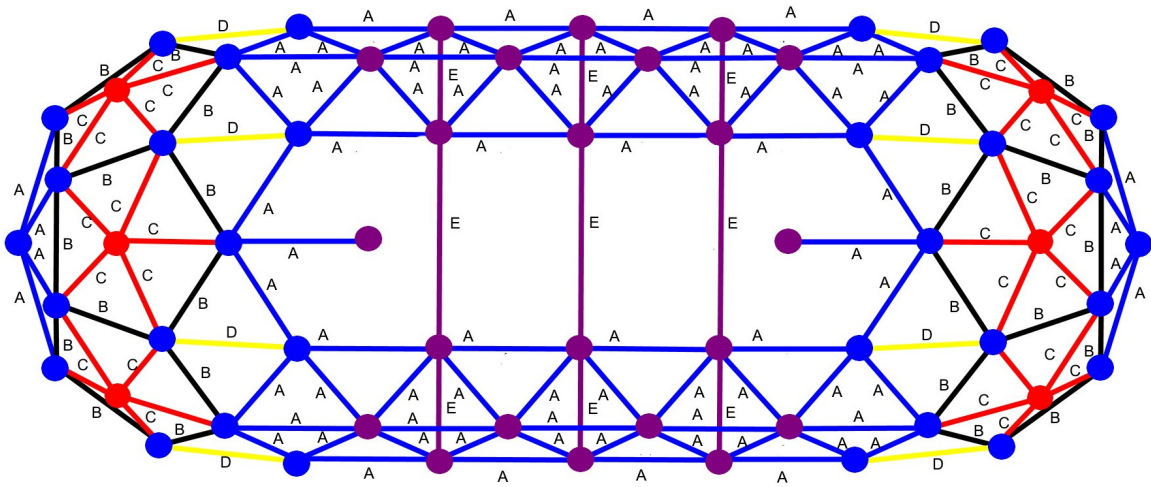


Standard Hubs



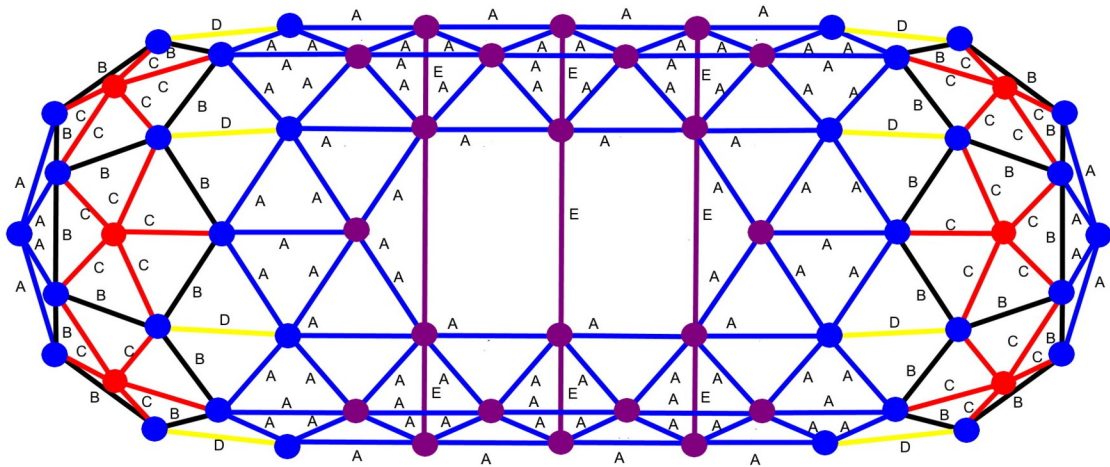
Dual Covering Hubs

D4.



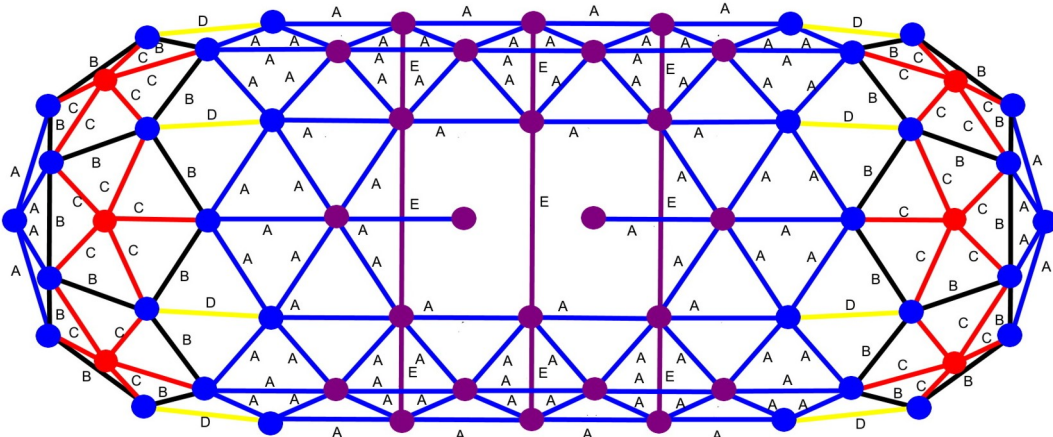
D4. Attach the other ends of the struts to the blue hubs at the top of the dome so that the purple hubs are towards the center of the dome.

D5.



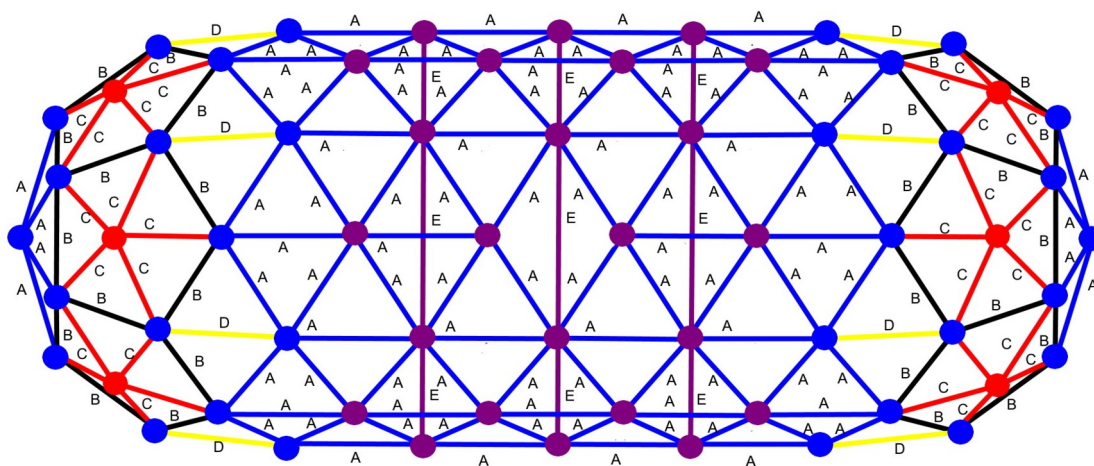
D5. Take 8 blue struts and connect the purple hubs to the top of the 2nd tier.

D6.



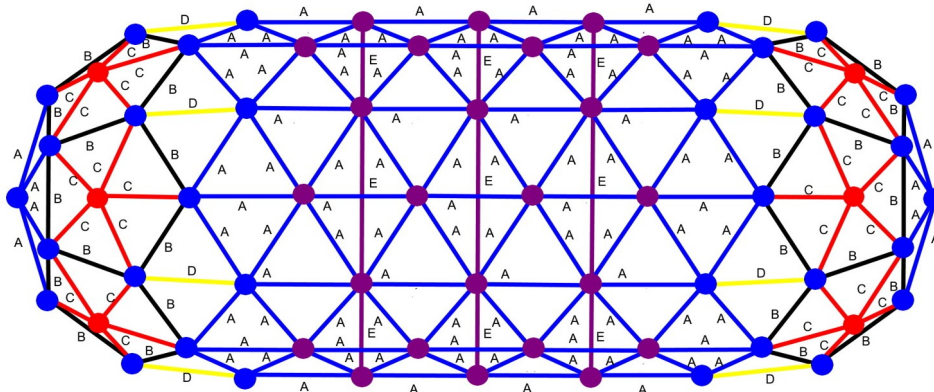
D6. Take 2 blue struts and attach to 2 purple hubs. Make certain the openings in the purple hub point to the sides of the tunnel dome. Attach the blue strut along the center line of the dome.

D7.

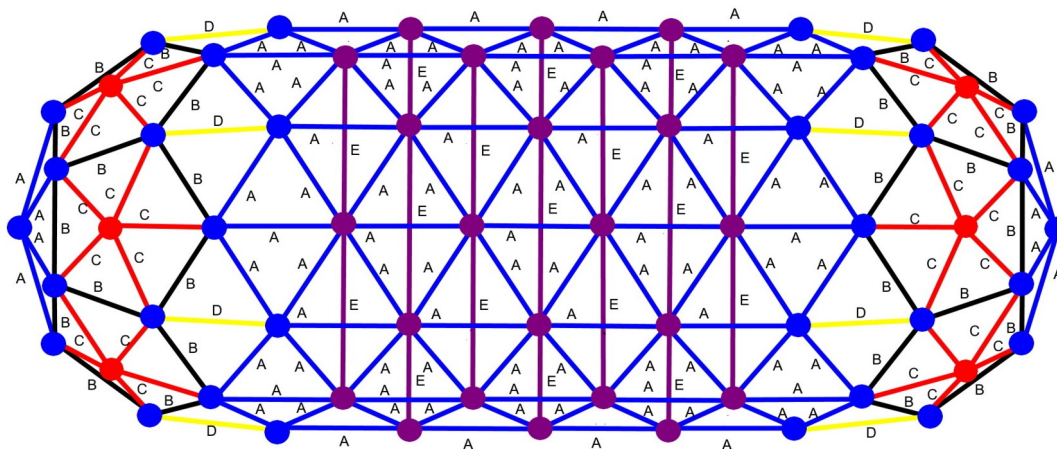


D7. Take 8 blue struts and attach the 2 purple hubs to the top of the 2nd tier.

D8.



D8. Connect the two purple hubs with a blue strut.



D9. Attach 8 purple support struts – 4 on each side, between the sides and the top of the tunnel dome.

Slip a 1" PVC pipe Coupler over the end of a support strut.



Put the other end of the strut into the curved slot on the edge of a purple support hub, and attach the strut to the center ring with a zip tie.



For Dual Covering Hubs, put the strut into the strut support hole, and attach the strut to the center ring with a zip tie.



Take another support strut without a coupler, and attach it to the support hub directly above.



Connect the two struts together with the coupler, and secure the connection with two zip ties.

If the struts are not close enough to meet together, pull the bottom part of sides of the tunnel dome towards the center to the correct width.



After the dome is complete, check the width of the dome to make sure it is correct, and that it matches the width stated in the Assembly Manual or on the Tunnel Dome Calculator.

Tunnel Domes have a tendency to spread out in the middle, and pulling the sides together will make the Tunnel Dome much, much stronger.



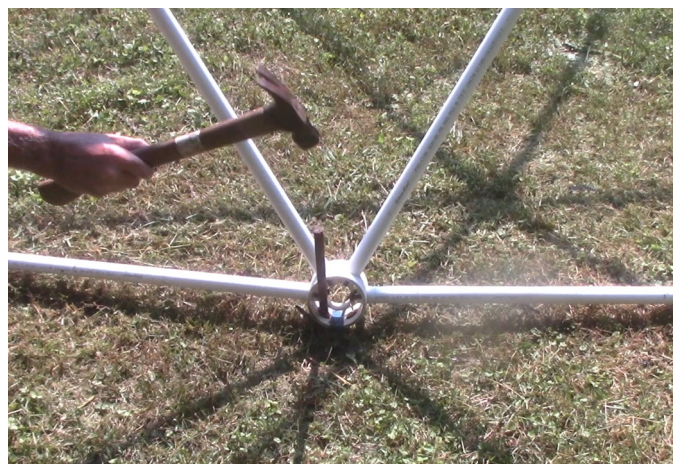
You can stake down one side of the Tunnel Dome and pull it together manually, or you can use electric fencing wire to pull the two sides together.



Each hub on the ground will have two holes facing the ground.

Once the Tunnel Dome is the correct width, take a short piece of rebar or other metal stake, place it inside one of these holes, and pound the stake into the ground.

Staking the sides of the Tunnel Dome will bring the design to full strength.



How To Cut Your Own Struts

Use the Dome Calculator at www.ZipTieDomes.com to determine your strut lengths. Here are some of the common strut sizes for the 4 Extension Tunnel dome:

1. 4 Extension Tunnel Dome: 8' high, 17' wide, 36' long.

Length of 99 Blue "A" Struts:	5'
Length of 26 Black "B" Struts:	4' 9-7/8"
Length of 30 Red "C" Struts:	4' 2-5/8"
Length of 8 Yellow "D" Struts:	4' 10-1/2"
Length of 17 Support Struts	8' 6" (when assembled).
Tunnel Dome Height:	8' 8-3/8"
Tunnel Dome Width:	17' 4-3/4"
Tunnel Dome Length:	41' 5-3/8"
Floor Area:	648.39 square feet.
Volume:	4,008.92 cubic feet.
10' pieces of pipe needed for struts:	99
or, 20' pieces of pipe needed for struts:	51

2. 4 Extension Tunnel Dome: 7' high, 14' wide, 29' long.

Length of 99 Blue "A" Struts:	4'
Length of 26 Black "B" Struts:	3' 10-1/4"
Length of 30 Red "C" Struts:	3' 4-3/8"
Length of 8 Yellow "D" Struts:	3' 10-3/4"
Length of 17 Support Struts	6' 9-7/8" (when assembled).
Tunnel Dome Height:	7' 1/4"
Tunnel Dome Width:	14' 1/2"
Tunnel Dome Length:	33' 5-3/4"
Floor Area:	422.91 square feet.
Volume:	2,111.74 cubic feet.
10' pieces of pipe needed for struts:	99
or, 20' pieces of pipe needed for struts:	43

3. 4 Extension Tunnel Dome: 6' high, 11' wide, 24' long.

Length of 99 Blue "A" Struts:	3' 4"
Length of 26 Black "B" Struts:	3' 2-1/2"
Length of 30 Red "C" Struts:	2' 9-5/8"
Length of 8 Yellow "D" Struts:	3' 3"
Length of 17 Support Struts	5' 8-1/2" (when assembled).
Tunnel Dome Height:	5' 10-7/8"
Tunnel Dome Width:	11' 9-3/4"
Tunnel Dome Length:	28' 1-7/8"

Floor Area:	299.25 square feet.
Volume:	1,256.97 cubic feet.
10' pieces of pipe needed for struts:	72
or, 20' pieces of pipe needed for struts:	35

4. 4 Extension Tunnel Dome: 10' high, 20' wide, 43' long.

Length of 99 Blue "A" Struts:	6'
Length of 26 Black "B" Struts:	5' 9-1/2"
Length of 30 Red "C" Struts:	5' 3/4"
Length of 8 Yellow "D" Struts:	5' 10-1/8"
Length of 17 Support Struts	10' 2" (when assembled).
Tunnel Dome Height:	10' 4-3/8"
Tunnel Dome Width:	20' 8-7/8"
Tunnel Dome Length:	49' 5-1/8"
Floor Area:	921.87 square feet.
Volume:	6,796.37 cubic feet.
10' pieces of pipe needed for struts:	165
or, 20' pieces of pipe needed for struts:	62

The 4" 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.

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, Black, Red, or Yellow colored tape to help you distinguish them during setup.

How to Attach a Greenhouse Covering:

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 for the 3 Extension Tunnel Dome

Dome Size:

1. 17' wide, 36' long.
2. 14' wide, 29' long.
3. 11' wide, 24' long.
4. 20' wide, 43' long.

Covering Size:

- 61' long, 32' wide
- 48' long, 25' wide
- 40' long 22' wide
- 68' long, 36' wide.

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.

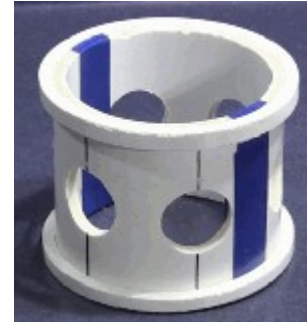
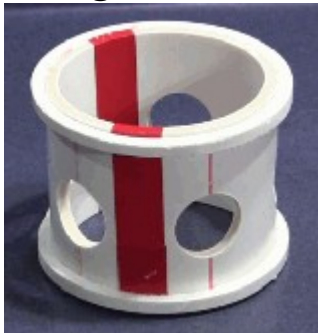
Alternate Solution: Clear Packing Tape

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.



Attaching the Covering to the Dome:

Method 1: Using the Dual Covering Hubs:

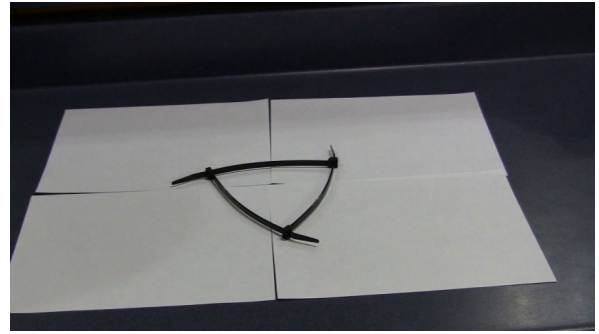
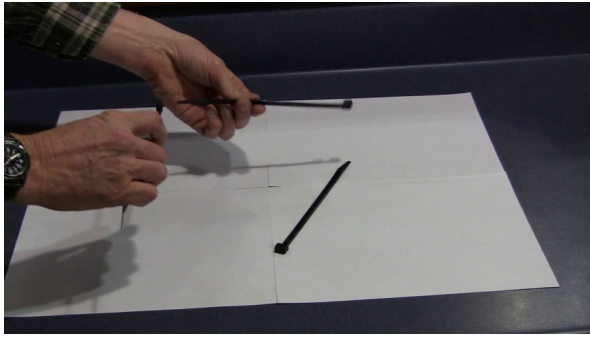


The Dual Covering Hubs have an extra ridge at the edge of the hub that allows you to attach the greenhouse plastic to the hub by cinching the zip ties over the plastic above the ridge, which secures the plastic to the hub.

The design of the Dual Covering Hubs allows you to attach two layers of greenhouse covering to the dome, one on the inside, and one on the outside. This creates a “dead airspace” 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.

Make certain the longer part of the covering is aligned down the length of the tunnel dome.



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.





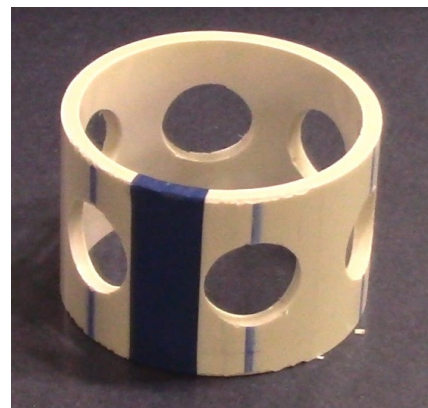
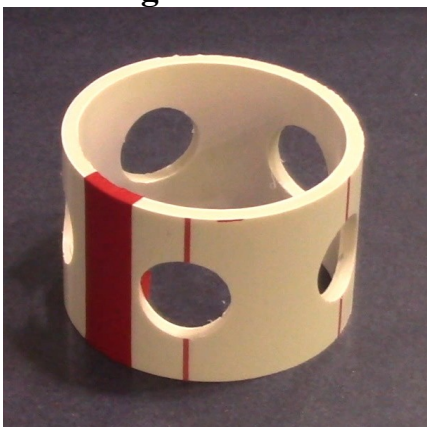
Pull the covering to the next hub, and take up any slack in the covering between the hubs.

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 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.”

1" Schedule 40 PVC pipe has an Outside Diameter (OD) of 1.315".

Greenhouse Clips for attaching the greenhouse covering to the 1.315" OD PVC pipe 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.



You will need 16 Greenhouse Clips for the 2 Extension Tunnel Dome.

Using the Test Caps and Carriage Bolts.

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



For the 3 Extension Tunnel Dome, you will need:

36 Test Caps, and

18 Carriage Bolts 5" long, with 18 washers and 18 nuts.

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.

There are several large, rectangular doorway examples on our Customer Review pages at www.ZipTieDomes.com

If you have questions, call us at (931) 858-6892.

