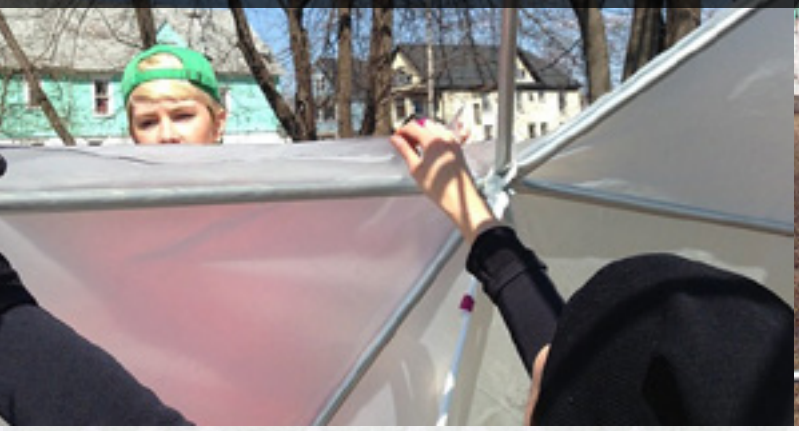
WILDER COMPOUND HANDBOOK



BUILD A GEODESIC DOME GREENHOUSE

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OVERVIEW

This workshop offers the opportunity to work together in fabricating and constructing a geodesic dome greenhouse. The project is divided up into phases to allow the group to spend more time and become more familiar with both the various tools and skills needed to cut, stamp and grind all the pieces and ultimately assemble the full dome from these parts. This time spent in the shop, making the pieces, connecting with the materials and each other, builds respect and a better understand of both. There is an opportunity in this workshop to be creative and really delve into the understanding of the tectonics of the dome structure. The ultimate use of the structure as a greenhouse can promote growth both in the plantings within as well as for the dynamic of the developing community.

Prep time: 2 weeks Cooking time: 2+ days Serves: 5-20 people

SECTIONS

+ METAL FABRICATION
+ PLASTIC FABRICATION
+ METAL ASSEMBLY
+ COUNTER/HANGER ASSEMBLY AND INSTALL
+ PLASTIC COVER INSTALL
+ PLANTER ASSEMBLY AND INSTALL

RESOURCES

+ DOME CALCULATOR
+ METAL FABRICATION SHOP (OR HAND TOOLS THAT CAN CUT, FLATTEN, GRIND AND DRILL)
+ LARGE SPACE TO CUT 4'X8' PLASTIC
+ SITE TO BUILD ON

HOW TO PLAN

1. Plan to start the metal fabrication a week before you assemble the dome. You will be cutting lengths of steel tubing, pinching the ends, bending those pinched sections to a specific angle, then rounding the edges and punching a hole in the resulting angled tabs at the ends of each of these lengths of tube. **See APPENDIX pgs. 9-17 for diagrams.**

2. Cutting the plastic panels will take 1-2 days depending on the number of helping hands. You'll create 3 different size triangles which will correspond to the triangles found on the dome. Holes will be drilled in 6 corresponding places on each triangle.

3. On the day of the build, one team can level the ground (if needed) by putting down weed-resistant fabric, then covering that in an even layer of mulch. Another team will organize the metal pieces and begin at the bottom, constructing the dome in layers.

4. Metal assembly involves loosely bolting the tabs of various metal tubes together as indicated by your map, then tightening when all pieces are in place. The last, higher-up pieces will require multiple people and ladders to finish.

5. Hang the countertops to the first horizonal level of bars going around the dome with zip ties and rope.

6. Plastic assembly starts at the bottom of the dome, lining up appropriate triangles and using zip ties to connect triangles to eachother around the bars of the dome. After triangles are zip tied, aluminum tape seals the seams.

METAL FABRICATION FOR THE DOME

OVERVIEW

This task involves fabricating the various lengths that will form the triangles, hexagons and pentagons of the dome. An assembly line of measuring, cutting, stamping, grinding and punching the tube steel will move quite quickly with a pretty small group of people. Prior to fabrication, some time is required calculating the sizes of each of the tubes and their quantity. This website is a necessary tool in figuring out the dimensions of the pieces to creat the 3V flat bottomed dome: http://www.domerama.com/calculators/3v-geodesic-dome-calculator/3v-flat-base-815-kruschke-calculator/

Prep time: 2 weeks Cooking time: 3 8-hour days (depending on number of fabricators) Serves: 3-8 people

INGREDIENTS

+ MULTIPLE PEOPLE
+ GALVANIZED STEEL TUBING (3/4" DIAMETER)
+ PACKING PLASTIC

TOOLS

+ HORIZONTAL BAND SAW OR PIPE CUTTER
+ ANGLE GRINDER
+ IRON WORKER w/ JIG OR MALLET AND METAL BLOCK
+ DISC/BELT SANDER OR ANGLE GRINDER
+ IRON WORKER w/ PUNCH OR CORDED DRILL w/ BITS
+ 4 PERMANENT MARKERS
+ SAFETY GLASSES,GLOVES, EAR PLUGS, DUST MASKS

DIRECTIONS

1. Using the dome calculator, figure out the quantity and lengths of the steel tubing. See APPENDIX pg. 9 for our measurements and diagrams.

2. Calculate how many pieces you can get out of each full 10' length of tubing, trying to create as little scrap as possible. The longer scrap pieces should be saved and fabricated the same as the other tubes; they will be used as hanging planter bars.

3. Label what size pieces are cut from each length, and cut all of the 4 varying lengths. Label each piece as it is cut, so as to stay organized as the process continues.

4. Continue stamping each end flat and grinding the corners round.

5. Punch a hole in one end of each of the pieces. To ensure the correct location of the hole at the other end, consult the dome calculator. Each of the four lengths will have a hole-to-hole dimension, so measure from the center of first hole and make a mark at the flattened other end to locate where the second hole will be. Use this first one as a template moving forward.

6. When all tubes are complete, bundle them with packing plastic by kind so as to keep organized, as there are almost 200 pieces. Use permanent markers in 4 different colors to label the plastic wrap "A", "B", "C" and "D".

SEE APPENDIX pg. 9, 12 & 13 for diagrams.

PLASTIC FABRICATION FOR THE DOME

OVERVIEW

This phase is about cutting and preparing the plastic material that will be used as the sheathing or covering of the dome. There will be three sizes of about 75 triangles that will need to be cut.
Prep time: 1-2 weeks for material order lead time Cooking time: 3-6 hours Serves: 2-4 people

INGREDIENTS

+ MULTIPLE PEOPLE
+ CUTTING
+ LARGE FLAT SPACE
+ 4'X8' SHEETS OF CORRUGATED (TWINWALL) PLASTIC

TOOLS

+ MATTE KNIFE
+ STRAIGHT EDGE
+ DRILL AND BITS
+ 3 DIFFERENT SIZED TRIANGLE TEMPLATES

DIRECTIONS

1. Print or draw the three varying triangles on paper to use as templates to cut out the plastic. (see APPENDIX pg. 11 for templates)

2. Calculate how many of each triangle you can get on each 4'x8' sheet of plastic to create the least amount of waste.

3. There will be 1 type of triangle for the pentagons and 2 types of triangles for the hexagons.

4. Using the paper template, trace and cut out 1 of each of the triangle types. Use this plastic triangle as a template to trace out the rest. Be sure to label them as you go. The lengths of the sides will be most helpful for reference.

5. After all the pieces are cut out, drill two holes on each flat edge, for attaching the sheet to the structure. Set each hole 1" in from the edge and 8" from each corner. This will allow for each hole to align with the hole at the neighboring triangles.

METAL ASSEMBLY FOR THE DOME

OVERVIEW

This phase starts the assembly of the dome, and may invovle a larger group than those working on fabrication leading up to this workshop. It is important to communicate with the group as the pieces are assembled, as it is all too easy to place the wrong piece in the wrong location. This phase progresses quite quickly and it is exciting to see how fast the individual pieces come together to create the dome.
Prep time: 2 hours Cooking time: 2-3 hours Serves: 6-12 people

INGREDIENTS

+ MULTIPLE PEOPLE
+ FABRICATED TUBING
+ SITE FOR GREENHOUSE

TOOLS

+ APPROPRIATELY SIZED BOLTS w/ MATCHING WASHERS AND NUTS
+ PLIERS
+ WRENCHES
+ LADDER(S)
+ AUGERS

DIRECTIONS

1. Locate the dome on the site, noting where the entry will be located.

2. Referencing the assembly diagram (see example on APPENDIX pg. 12 & 13) lay out the base of the dome and connect the first row of tube lengths together.

3. Working in in teams of at least two people, build up the first row of triangles. Do not tighten the nuts and bolts completely, as more pieces will attach above. Each completed hub will have one bolt, two washers and one nut, with nuts located at the interior of the dome.

4. Continue assembling the second and then the third rows this way.

5. While the main structure is being assembled, someone else can bolt together the top pentagon of five interior and five perimeter pieces.

6. Continue assembling the dome until the last pentagon is ready to be lifted up on top. Connect it to the awaiting pieces and then tighten all the nut and bolt connections throughout the dome.

7. Create the six doorframe pieces by using the dome as a template, measuring final heights, widths and lengths and locating top, middle and bottom holes. (see APPENDIX pg. 17)

8. Attach the doorframe pieces G to the dome frame using zip-ties at the top and bottom of pieces F.

9. Pick up and move the dome into its final location; it can be moved by 5-6 people quite easily. Anchor the base of the doorframe into the ground to prevent it from moving left and right.

10. Evenly distribute and screw four augers into the ground around the outside of the dome, tying them to the bottom tubes of the structure, so as to secure the whole dome to the earth.

COUNTER ASSEMBLY FOR THE DOME

OVERVIEW

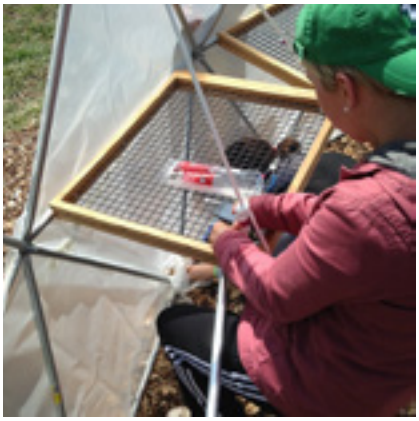
This phase starts to make the dome a more usable space. Surfaces that hang from above will start to support the tools used to install them. The hanging tubes will create a lower ceiling height, awaiting the plantings within arms reach overhead. In the week leading up to the counter install, source the materials that you will be using for the counter surface. Reuse former building materials, build your own counters or buy new materials, be creative while also remembering what you will be supporting on these counters. *Prep time: 1 week Cooking time: 1 hour Serves: 5*

INGREDIENTS

+ MULTIPLE PEOPLE
+ TIEING / ZIP-TIEING
+ COUNTERTOP MATERIAL
+ STEEL TUBES FOR HANGING
+ NYLON ROPE

TOOLS

+ ELECTRICAL TAPE
+ SCISSORS
+ APPROPRIATELY SIZED ZIP-TIES
+ ASSEMBLY DIAGRAMS



DIRECTIONS

1. Hang the counters to align with the row of tubes that are around 36" above the ground.

2. Zip-tie the rear of the counter to the horizontal tube of the dome structure; keep the zip-tie loose until the front is tied to the structure above.

3. Using the rope, tie a bowline knot to the left and right front corners of the counter, leaving ample length to connect it above. Tie the loose end to the structure above using 2 to 3 square knots, ensuring that the counter is level both front to back and left to right.

4. Tighten the knots and the zip-ties, trimming the ends of each to leave about a 1" tail.

5. At all the knots, take the loose end of the rope and together with the taught length, wrap in electrical tape to prevent fraying.

6. Similarly, hang the extra tubing from the structure overhead for hanging planters. Tie a square knot at one end of the rope, threading the loose end through the holes in each ends of the tube. Tie the loose end to the structure above, adjust the height and leveling.

7. Finish the ends of the rope with the electrical tape as done before.

PLASTIC COVER INSTALL FOR THE DOME

OVERVIEW

This phase completes the dome assembly portion of the workshop. The installation of the covering encloses the structure, allowing the sun to heat it while keeping the wind, rain and cold out. This is the final step in preparation for the seeds and plants that will inhabit the space. This newly constructed dome offers warmth to the both the plants and the people nurturing them.

Prep time: 2 hours Cooking time: 3-4 hours Serves: 6-12

INGREDIENTS

+ MULTIPLE PEOPLE
+ TIEING AND TAPING
+ PREVIOUSLY PREPARED TRIANGLES
+ ZIP-TIES
+ ALUMINUM FOIL TAPE 2" WIDE
+ 2 SOLAR VENTS
+ DOOR FRAME AND DOOR

TOOLS

+ SCISSORS
+ LADDER(S)

DIRECTIONS

1. Working in teams of two, starting at the base, attach the triangles to the outside of the frame, aligning the sides of the triangles with the tubes of the same length. See APPENDIX pg. 16 for a diagram. Zip-tie through the holes in two adjacent triangle panels, connecting the panels to the structure behind. Working with in teams of two people to install the zip-ties, start with one person on the inside of the dome, threading the leading end out through one hole in the triangle, have the second person on the outside of the dome, thread it back into the dome into the hole in the adjacent triangle. Connect the two triangles to the dome tubing and close zip-tie on the interior.

2. While some people are working around the base and going up, a couple people should start at the top and work their way down, this will ensure you can close the dome at a workable height.

3. Cut two of the triangle panels to accept the solar vents, and locate them appropriately, based on direction of sun, wind and shade. Attach these panels at their designated locations the same as the other panels. These solar vent panels should be on ½" thick material.

4. Using the aluminum tape, cover the seams between each of the two abutting triangle panels; ensuring the tape covers the holes for the zip-ties.

5. As the door opening is wider and shorter than a typical door, we have to make a door. Hang plastic sheet door(s) from the tube frame using larger heavy-duty zip-ties, allowing the door leaves to overlap so you can tie them together to close them. Alternately, you can zip-tie a wooden doorframe to the tube frame, having nailed the wood pieces together at each of the corners. Attach the door(s) to the wood frame with hinges and ensure it closes by either overlapping or latching into the frame.

APPENDIX

GEODESIC DOME DIAGRAMS

STEEL TUBE LENGTHS AND NUMBERS

	TOTAL LENGTHS	TO CENTERS OF HOLES
30 x A	2′-9 3/16″	2′-7 5/8″
35 x B	3′-2 1/4″	3′-0 5/8″
74 x C	3′-6″	3′-4 1/2″
20 x D	3′-7 7/8″	3′-6 3/8″
2 x E	2′-1 1/2″	DRILL 1 HOLE ONLY
159		

PIECES CUT FROM 10′ LENGTHS

10 x C + C + A

20 x C + D + A

11 x B + B + B

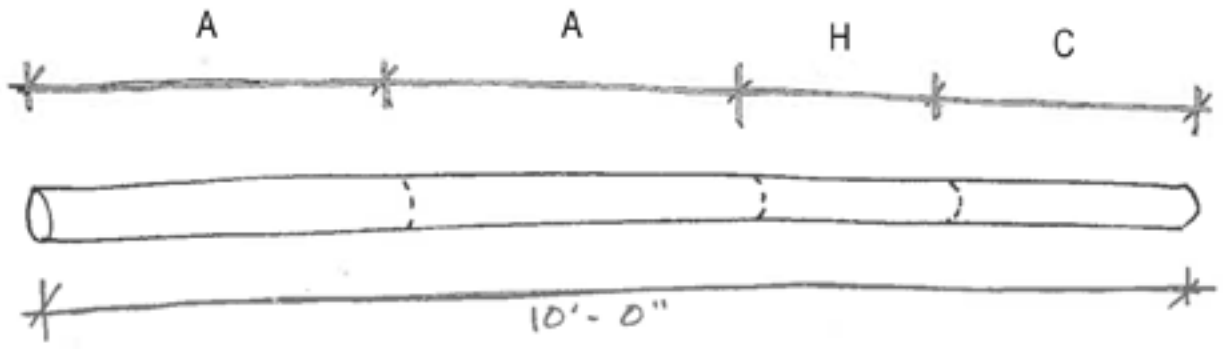
16 x C + C

1 x C + C + E

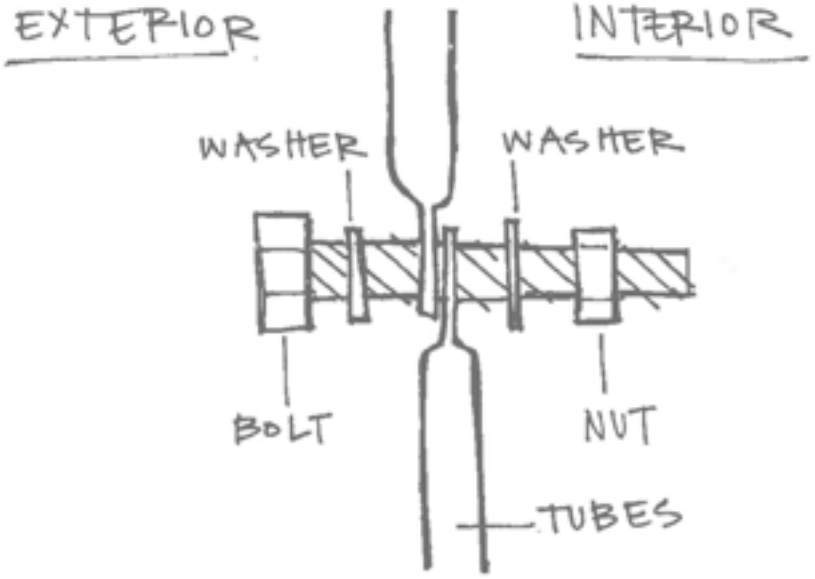
1 x B + B + E

GEODESIC DOME DIAGRAMS

STEEL TUBE LENGTHS

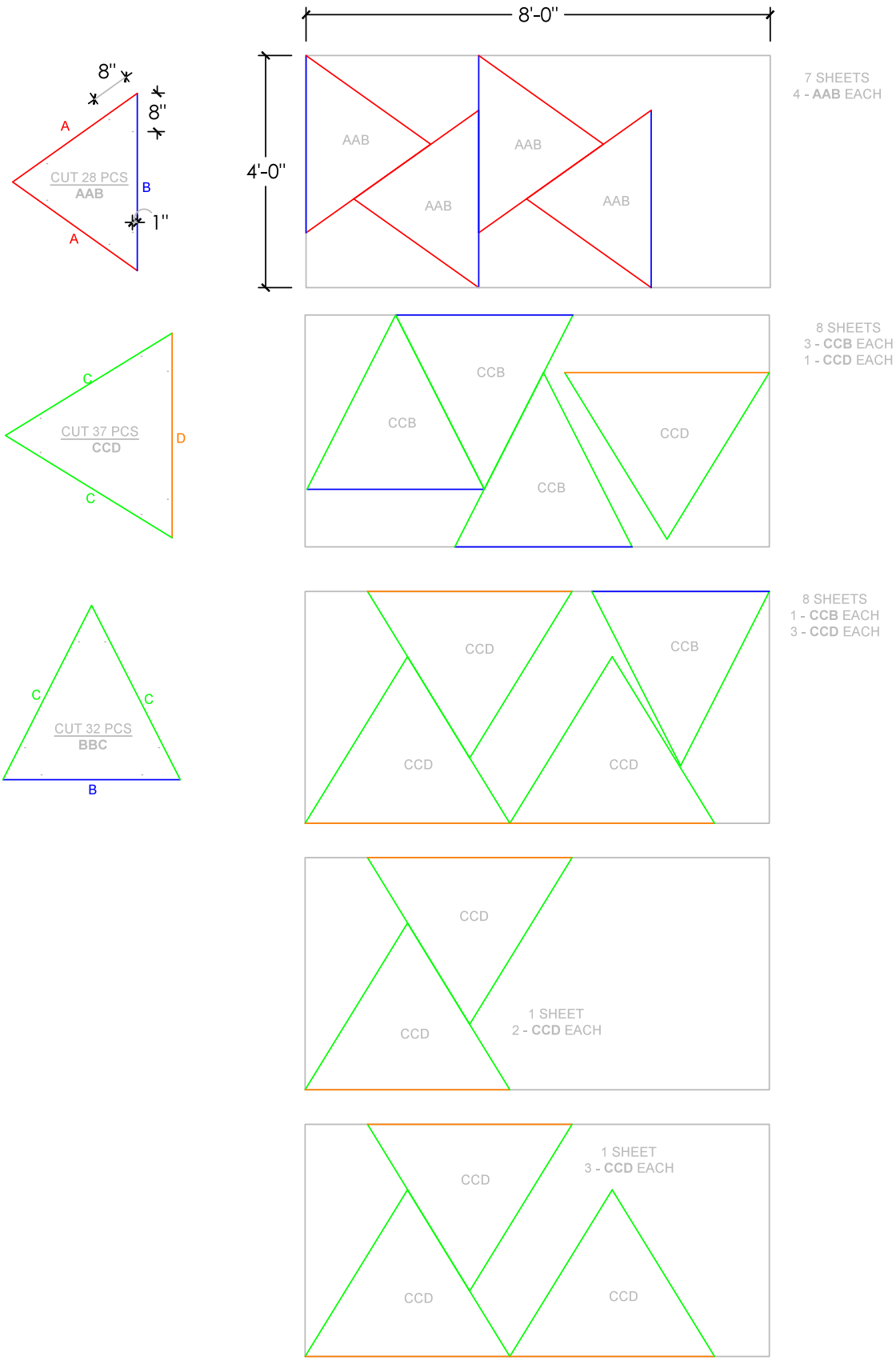


FABRICATED TUBE ASSEMBLY AT HUBS



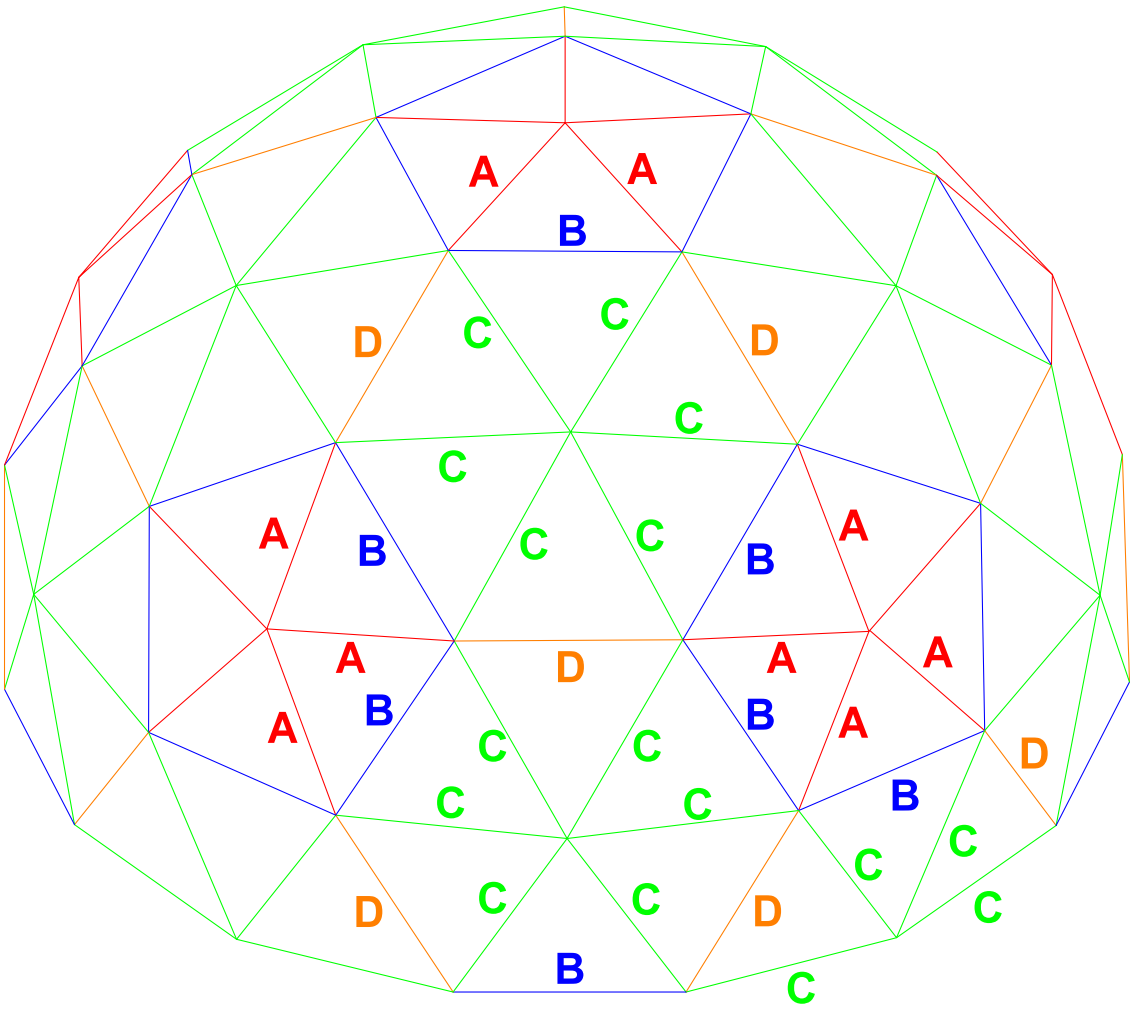
GEODESIC DOME DIAGRAMS

DOME COVERING PIECES LABELED



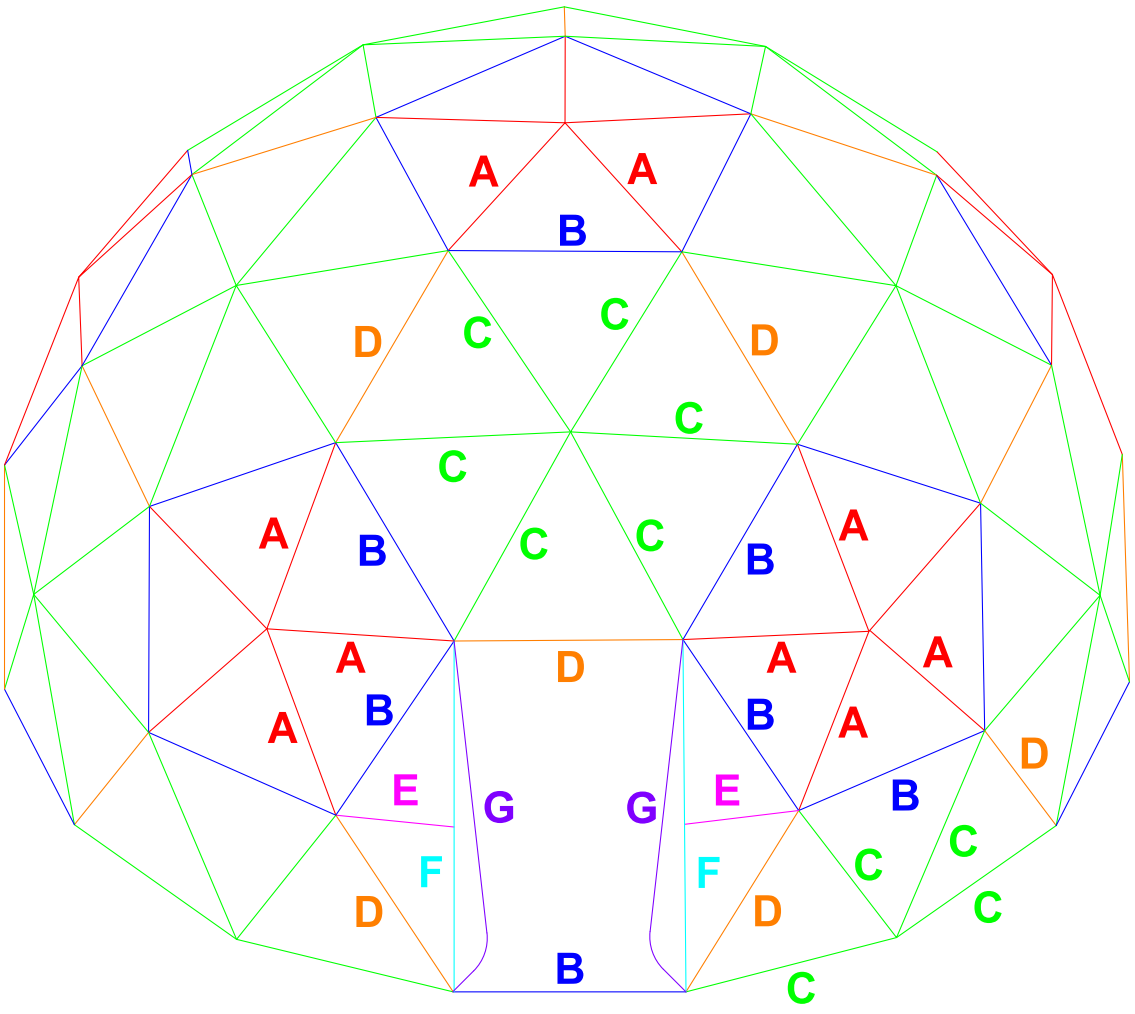
GEODESIC DOME DIAGRAMS

DOME ASSEMBLY MAP



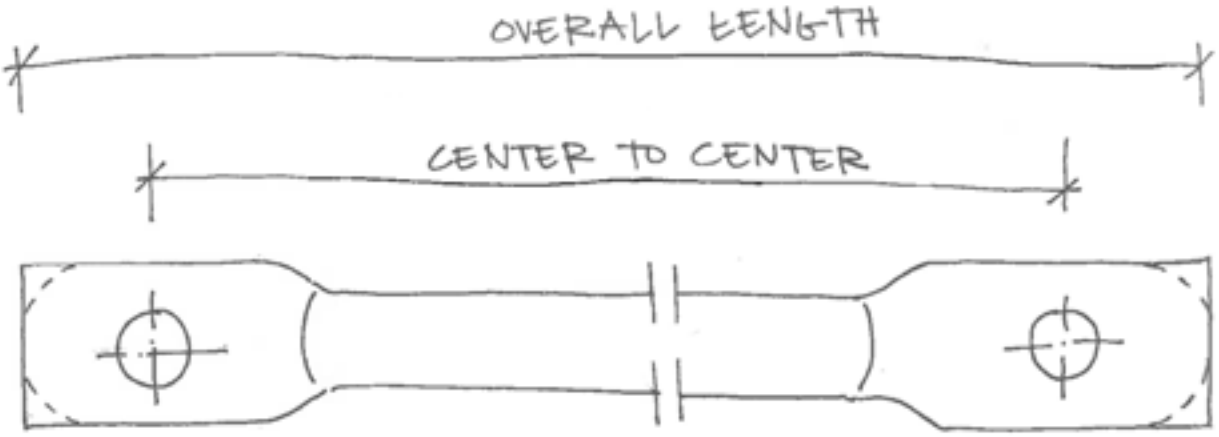
GEODESIC DOME DIAGRAMS

DOME ASSEMBLY MAP WITH DOOR

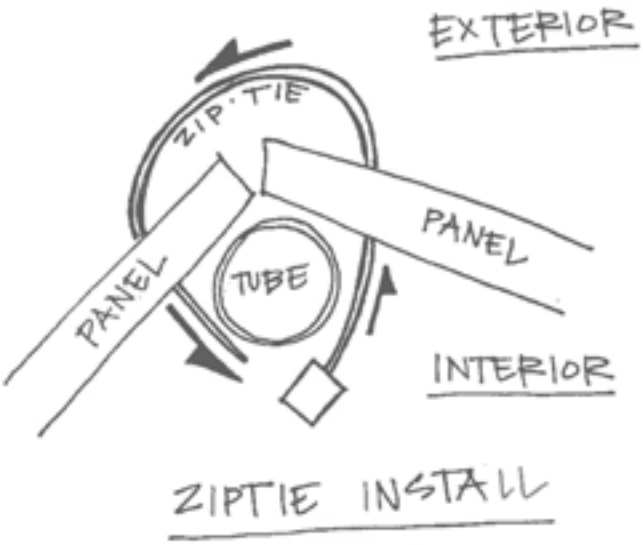


GEODESIC DOME DIAGRAMS

STEEL TUBE FABRICATION GUIDE

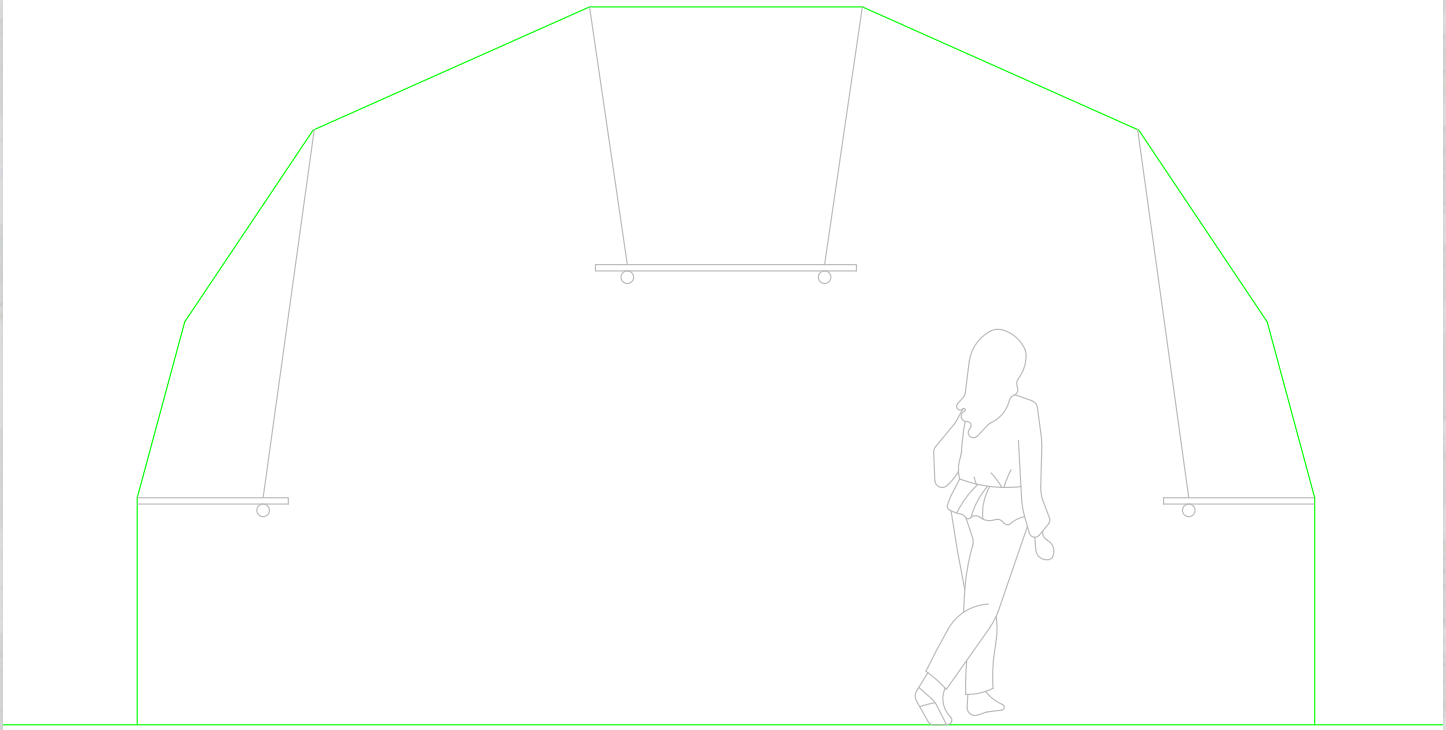


TRIANGULAR PANEL ATTACHMENT WITH ZIPTIES



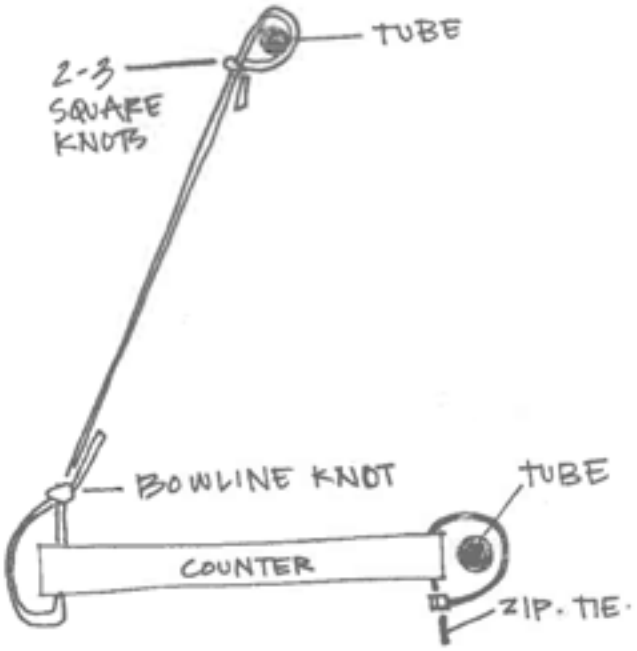
GEODESIC DOME DIAGRAMS

ASSEMBLED DOME SECTION VIEW WITH COUNTERS AND PLANT HANGERS

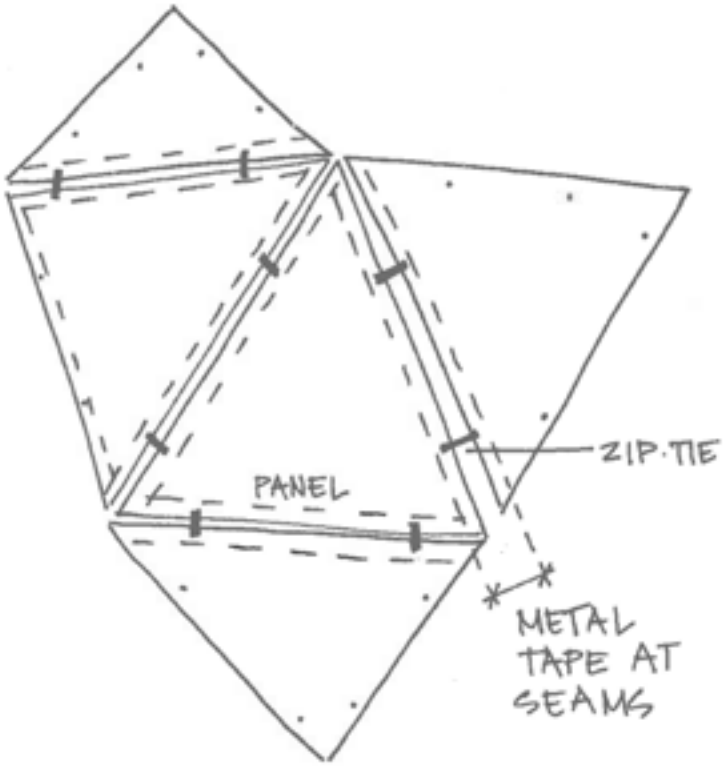


GEODESIC DOME DIAGRAMS

HANGING COUNTER

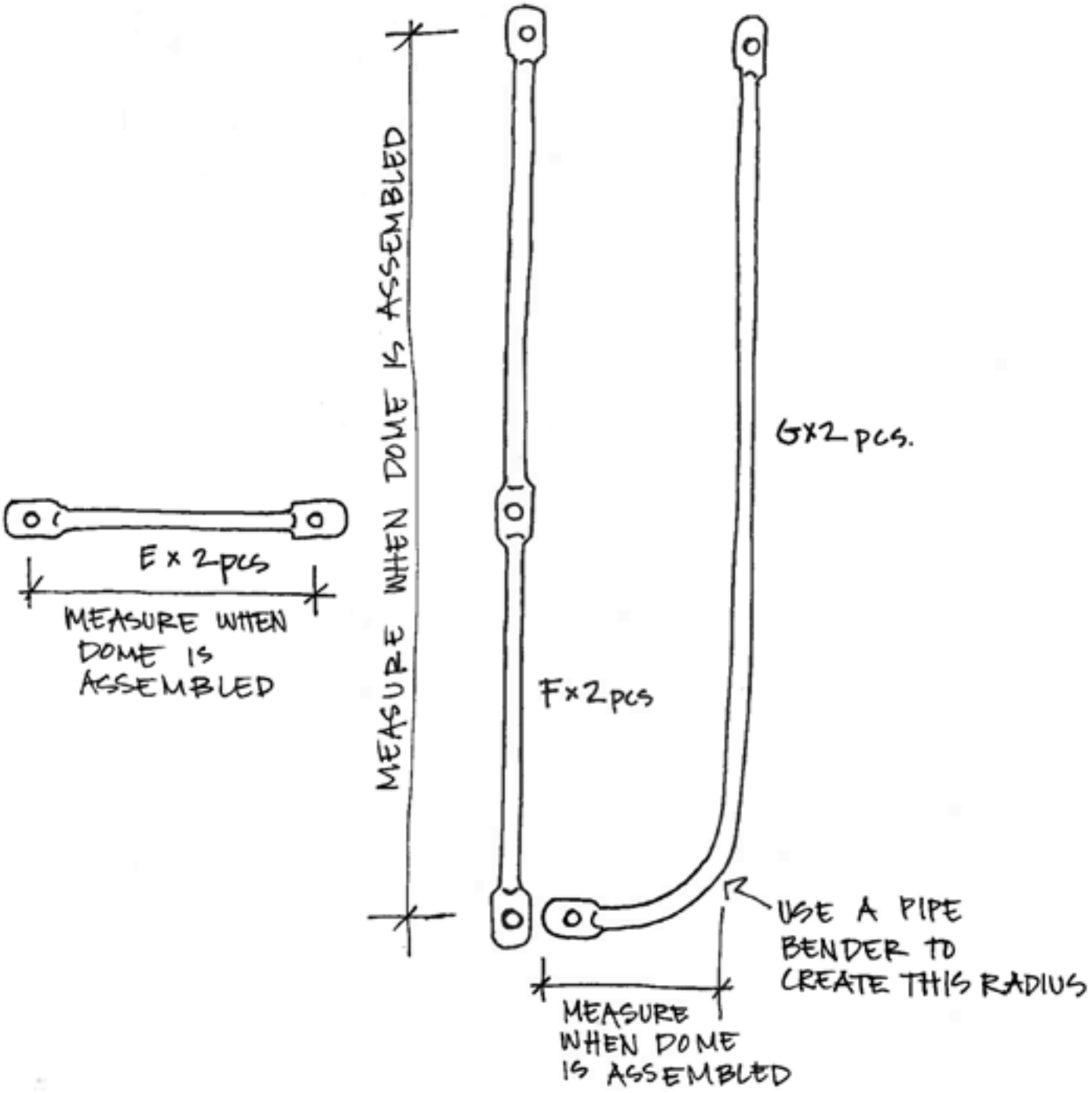


TRIANGULAR PANEL ASSEMBLY



GEODESIC DOME DIAGRAMS

DOOR ASSEMBLY DIAGRAM



ABOUT WILDER

WILDLY INTERDEPENDENT LIVING + DESIGN EDUCATION for RESILIENCE

In the spring of 2014, The Canary Project launched its first Modern-Primitive Exchange workshop series in partnership with Brooklyn-based designer Jill Allyn Peterson. Through discussions about the roles of design and education in building self-reliance skills as a response to climate change, WILDER Compound was born, **W**ildly **I**nterdependent **L**iving + **D**esign **E**ducation for **R**esilience.

The series brought together students from Syracuse University and local high school students to build these projects found in the complete WILDER Handbook:

WILDER WORKSHOPS WERE MADE POSSIBLE BY:

THE CANARY PROJECT: Edward Morris, Susannah Sayler and Ethany Uttech **CREATIVE DIRECTION AND DESIGN:** Jill Allyn Peterson **WORKSHOP LEADERS:** Jill Allyn Peterson, Molly Rose Kaufman, Steve and Sara Morris of Mello Velo Bicycles, designer Kelley Sullivan and Ariel Surun **WORKSHOP HOSTS:** Jillian Nakornthap and 601 Tully, Jessi Lyons and Jessica Maxwell at Southwest Community Farm, and Samuel Van Aken and Dave Conway at the COMART shops at Syracuse **STUDENTS:** Marcy Ayres, Shomita Bhattacharya, Alexander Velez Burgos, Augie Cummings, Govind Deecee, Anna Delapaz, Bianca Drevensek, Christine Edgeworth, Sara Erdman, Katie Garrison, Spencer Garrison, Patrice Gonzalez, Yucel Guven, Ra'Shon Isaac, Lizzy Kahn, Milan Karki, Kelly Kazmierczak, Vizma Leimanis, Miles Marcotte, Erol Ozcelik, Heather Richardson, Hillary Stallings, Shane Stone, Amrita Stuetzle, Rose Tardiff, Anna Thor, Michaela Thorley, Andrew Trenton, Julian Velandia, Malik Warden, Kaylah Wicks, Philip Wong, Michael Zhang, Yinglan Zhang **SPECIAL THANKS:** Evan Weissman, Marion Wilson, Jubilee Houses, Students of Sustainability at Syracuse, Sarah Sandman and Emily Edwards. **FUNDING PROVIDED BY:** David Rockefeller Foundation, Soling Program at Syracuse University, The Canary Project and 601 Tully.