Assembly

Excavation

Utilize contractor for earth moving. High tunnel footprint is roughly 20’ x 48’, which is the minimum area needing excavation. A 21’ x 49’ area of soil should be excavated to a depth of 4 ½’. Relocate the soil, as it will be returned to the same place. The base of the excavated area should be relatively flat to minimize stress on the insulation sheets.

Soil Insulation

Standard insulation sheets come in 4’ x 8’ sections. Arrange 30 sheets in the bottom of the excavated area. Small gaps between the sheets are expected and necessary for drainage. The sides can be lined after; small brackets can be used to keep panels in place until dirt is put back in. It is important that the side insulation is not located directly underneath the stake locations of the high tunnel. The insulation sheets on the 20’ walls will need to be cut to fit properly. A hack saw or similar tool can cut through the insulation with ease.

Heating Cables

Begin returning the soil into the high tunnel; roughly 2 feet of depth. Heating cables will then be installed under the three planned beds. Three 40’ x 5’ sections will have heating cables at the 2’ depth. Un-spool the heating cables in an evenly distributed pattern across the bed. Allow enough extra cable to reach to the surface and attach to a thermostat. Depending on thermostat location this length may change. Cut the heating cable at the desired length if it comes from a large spool. If heating cables were pre-made for this location, do not cut but ensure the coupling will reach the thermostat. Depending on stiffness of wire, the heating cables may need to be attached to a wire mesh to maintain shape and distribution. Repeat for the two other beds.

Return Soil

After all three beds have heating cables installed at the 2’ depth, return the remainder of the soil. Additional soil may be needed to return the entire area to nominal ground level. Be mindful of the heating cable ends.

Return Structure to Bed Area

Move the high tunnel area back to the now level area.

Cover Roof

Locate all aluminum U-channels. These will be attached via self-tapping metal screws to the curved section of the high tunnel, just above where the hoops engage the side walls. One screw per hoop is sufficient; one 8’ section of U-Channel will span four to five hoop supports. On the two end walls (the side with the door and its mirror, there will be no U –Channels. The polyethylene roll is of sufficient width to cover the whole roof as one sheet. Several inches of extra material is needed on the end walls in order to secure it, so total length of the unrolled sheet will be ~50’. The extra material will be tucked over and held in place by the paneling on the end walls.

Side wall panels – Hinged

The acrylic panels will come in 4’ by 5’ sections which is the final dimensions of each panel. Depending on the direction of the flutes within the panel, plugging the holes in the panel may be desired. This can be done by tape or something equivalent. First, line all edges of the sidewalls with the weather-sealing foam tape. Cut piano hinges to match the width of the panel, roughly 4’. These will be screwed to the horizontal square tube, on the front face. Self-tapping metal screws are sufficient, but drilling holes before screwing the hinges is advisable. Drilling the holes will allow for easier panel installation. Flathead screws can be drilled straight through the acrylic panels to attach to the hinges. Clear epoxy can also be used to secure this connection and minimize screw wear in the panel holes. Once hinges are attached to the panel, the hinges can be screwed into place on the high tunnel.

The temperature controlled hinges are attached at the bottom of each panel. The same self-tapping screws should be used to attach the hinge to the base of the side wall, at the center of each section. The other end will attach to the side panel via the same process used on the top hinge.

End Walls

Insulation tape will be placed on all existing metal on the outer surface of the end wall (where the panels will be in contact with the frame). Pull the excess polyethylene sheeting over the foam tape, so that it is between the tape and the panel once installed. The rectangular sections will work well for all but the upper portion of the end walls. For the curved areas, hold the panels up and mark the curve before using a saw to cut. The panels will be screwed to the frame in the designed layout. It is important to note that caution should be taken while drilling the panels to the frame, as the panels are prone to cracking from excessive tightness.

Lighting System & Other Electronics

(12) 600 watt metal halide luminaires will be hung on the cross beams of the high tunnel in the formation below via pulley system. An electrical contractor may be required to place the wiring layout of these fixtures. The lighting system will be powered via standard outlet, which will require an extension cord from the building providing the power. Additionally, the heating cables may need to be wired to a thermostat if a full package is not purchased. This should be done by an electrical contractor as well.

Gutters

The gutters will be attached to the hoops that is already covered in the polyethylene sheeting. Long, straight 2”x4” boards will be used to hold the gutters. Cut these pieces diagonally using a table saw. These will be screwed through both the polyethylene and the steel hoops. Mount one end of the boards at a slight angle so that a 6” change in elevation from far end of the gutters to the side by the entrance exists.

Water Catchment and Irrigation

Follow the guide given by Iowa State University for catchment and tank preparation:

http://www.leopold.iastate.edu/sites/default/files/pubs-and-papers/2012-01-rainwater-catchment-high-tunnel-irrigation-use.pdf

To convert the outlet of the tank to be useable with a garden hose follow the following guide:

http://www.instructables.com/id/DIY-275-Gallon-Rainwater-Collection/step3/Converting-the-Drain-to-Garden-Hose-Connection/

Connect the two garden hoses to the spigot. Garden hoses must be long enough to reach a point where they can be joined together. (Each hose should be over 10')

Run the garden hoses to a y fitting

> At this point the hoses should have been routed inside the high tunnel.

Connect this y fitting to the mesh filter

Connect this mesh filter to the pump using a ¾" to ½" reducer

> It is suggested that you purchase a pump enclosure and one has been listed in the BOM though any standard pump enclosure should work fine.

From the pump, use a ½" to ¾" adapter and connect the to another y fitting

> Keep one section of the y fitting closed as this will be used to hook up a hose from an external water source during droughts. It is possible to use a hose in the winter though it will need to be buried below the frost line or disconnected and reconnected every time. It may be more convenient to fill barrels of what inside the high tunnel and source water from those.

Connect a pressure regulator to the end of this y fitting

From this, you can set up your drip irrigation system Emitters and clamps are included in the bill of materials if you would like to purchase new material. The system was designed to be used with the material listed in the bill of materials and as such it is not guaranteed to work with your current system. There should not be any harm done to components by using your current system of drip lines.