SOLARIG™ TUNNEL KIT

Installation Manual Model Alpine 135

Version 1.0

Document Version Control

Version	Date	Changes	Author
1.0	July 2014	Initial version	Anne Lustig-Picus

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Contents

SOLARIG™ Tunnel Kit Model Alpine 135

PIC-PLAST thanks you for purchasing the SOLARIG™ TUNNEL KIT. We are certain that the correct use of our product will yield improved growth results.

This manual includes all relevant details to allow optimal installation of the product. Read the instructions carefully and make sure to follow all the guiding information in the order shown, to benefit from the product in the years to come.

Warning **Installing the product not in accordance with the instructions may cause damage to both the product and crops growing within.**

Please contact us directly with any questions by phone: +972-4-6426141 or via the website: **WWW.PIC-PLAST.COM**

This manual covers the alpine version. A tunnel kit suitable for tropical climates is also available. Dimensions of the basic structure: 15m x 9m (135 square meters). There are no external cables in the alpine version. You can make the basic structure longer by adding more internal arcs.

This product is available in two versions:

- Closed roof (SOLARIG™ cover)
- Ventilated roof with a roll-up system (VRR)

There are a number of additions to these versions:

- Ventilated side with curtain (VSC) – sides covered with a 50MESH insect net plus a roll-up curtain with a SOLARIG™ cover
- Additional lower air-flow protection
- Front metal door (FMD)

The overall installation process is identical for all versions. If you purchased additions to the basic product, follow the installation instructions, which are detailed in separate manuals.

Related Publications

➔ For more information about PIC-PLAST, refer to the following documentation:

- Alpine-135BoxContents – Lists the contents of each box in the kit. The list is supplied with the boxes
- Tropical-135InstallationManual – For installing the kit in tropical climates
- FMD-Installation Manual – For installing the front metal door
- VSC-Installation Manual – For installing the ventilated side with curtain

Equipment

This section lists the required tools and equipment, and shows pictures of the parts.

The contents of the boxes are detailed in a separate document.

Because the tunnel kit is modular, you can add more internal arcs, thereby making the tunnel longer. The basic kit has five arcs total and covers 135m^2.

NOTES: These instructions are based on the 5-arc version, suitable for alpine climates.

Tools and Equipment

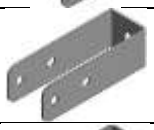
For the installation you need these tools:

- 2kg hammer
- Marking stakes, 8 units 60cm long
- Spray paint
- Builder twine for marking and measuring 100m
- Measuring tape, 30m long
- Level tool
- Colour marker
- Digging tools
- Knife/scissors
- 2 ladders, 4m high
- Rope, to pull the roof covering
- 10 x wood planks (2 x 4s), 70 cm long
- Concrete: 350kg of cement, 1 cubic meter of gravel, 1 cubic meter of sand

Parts Inventory

Table 1: Part identifiers

Part ID	Description	Qty.	Graphic
METAL			
ARC2410	Arc pipe 70mm x 40mm x 2410mm	30	
ARC1600	Arc pipe 70mm x 40mm x 1600mm	5	
HOR3784314	Horizontal pipe ø42.7 x 3780mm x 1.4mm	8	
HOR2324318	Horizontal pipe ø42.7 x 2320mm x 1.8mm	6	
VER2213514	Vertical pipe ø35mm x 2210mm x 1.4mm	4	

Part ID	Description	Qty.	Graphic
DIA4585318	Diagonal pipe for PSS ø53mm x 4580mm x 1.8mm	4	
PVR2304318	Pole vertical reinforcement ø42.7mm x 2300mm x 1.8mm	10	
PHR563214	Pole horizontal reinforcement ø32mm x 560mm x 1.4mm	10	
PHR403214	Pole horizontal reinforcement ø32mm x 400mm x 1.4mm	10	
PDR1003214	Pole diagonal reinforcement ø32mm x 1000mm x 1.4mm	10	
HORU3706040	C Profile 60mm x 40mm x 3698mm x 1.4mm	8	
OVKU7042	U Clamp 70mm x 42mm x 2.5mm	15	
OVKU13142	U Clamp 131mm x 42mm x 2.5mm	6	
OVKU16047	U Clamp 150mm x 47mm x 2.5mm	20	
OVKSL1	Connection plate (pole/arc) 2.5mm	20	
OVKL7040	L Bracket 70mm x 40mm x 3mm	32	
OVKL4040	L Bracket 40mm x 40mm x 3mm	20	
MTTA10040	L Bracket 30mm x 100mm x 3mm	30	
HTOM40R	Omega clip ø42.7mm x 2.5mm (closed)	4	
OVKW4030	Square washer 40mm x 30mm x 4mm	27	
IA1040	Anchor nail for assembly only	8	
RW1035	Rubber washer 35mmX10mm	69	

Part ID	Description	Qty.	Graphic
BW1035	Bent washer 35mmx10mm	24	
FW1035	Flat washer 35mm x 10mm	95	
TKRP3852518	Rolling pipe (dia. 25x1.8mmx3.85m) net length 3.79m (only the male end is shown)	8	
CHZ25N	Curtain handle for roof ventilation (dia. 25mm)	2	
OR08	Open ring wrench for B08	2	
SD1/4	Screwdriver for SDS1/4	1	
PF09	Perforator	1	
SC04	4mm galv. cable	152	
CL05	5mm cable locker (used for PSS wires)	26	
CC04	Cable clamp 4mm (includes fixing process)	55	
B0830	Bolt 8mm x 30mm	166	
B0840	Bolt 8mm x 40mm	25	
B0860	Bolt 8mm x 60mm	258	
B0870	Bolt 8mm x 70mm	22	
B0890	Bolt 8mm x 90mm	20	
B08R60	Eye bolt 8mm x 60mm	4	

Part ID	Description	Qty.	Graphic
B08R90	Eye bolt 8mm x 90mm	80	
N08	Nut 8mm	700	
W08	Washer 8mm	730	
SDS1/4	Self-drill screw SDS 1/4 X 3/4	128	
LP3750	Locking profile 3750mm	8	
LS200	Locking spring 2000mm	16	
HSW25	Galv. wire 2.5mm	230	
CSH04	Carabine (locking ring) 4mm	32	
MCH30	Metal chain ø3mm for PSS (cut in units of 2.1m)	13	
PC25100	Plastic clip dia. 25mm x 100mm for pipe ø 25	50	
BRB4170	Black rubber band ø4mm x 170mm (with ball)	100	
PLASTIC			
Roof	SOLARIG Top BC MATT cover (11.04m x 15.8m) rope both edges (2.08mx3+2.50mx2)	1	
VSC Side + bottom protection	SOLARIG Classic with net (16m X 2.6m) + SOLARIG curtain	2	
	25mm grey strip	50	
Front	50-Mesh insect net, one with Velcro door and one without Velcro door	2	
Winter Fronts	SOLARIG Classic (9.5x3m+7.5x3m) x 2 sets	2	

Part ID	Description	Qty.	Graphic
CABLES			
Cable-1	Length - 4020mm (end to end of bolts)	4	
Cable-2	Length - 4380mm (end to end of bolts)	4	
Cable-3	Length - 4330mm (end to end of bolts)	4	
Cable-4	Length - 7390mm (end to end of bolts)	2	
Cable-5	Length - 6670mm (end to end of bolts)	3	
Cable-6	Length - 4970mm (end to end of bolts)	10	
Cable-7	Length - 2330mm (end to end of cable loop) - used for PSS	6	

Phase 1: Raising the Arcs

This phase consists of site preparation, digging holes, constructing the arcs on the ground, and raising them into position.

Preparing the Site

The dimensions of the tunnel are 15m X 9.04m.

The Alpine-135 model kit requires a cleared space of roughly 19m by 12m.

1. Make sure the planned tunnel area is clear of hazardous objects.
2. Make sure the area planned for the tunnel is level. The maximum permitted incline is 2% (20cm in height per 10m length).
3. Make sure there is water drainage out of the tunnel.
4. Determine wind direction and place the structure so that the wind will blow at a 45° angle.
5. Inspect the figures and instructions before starting measurements and make sure the instructions are clear.
6. Make sure you have the tools required for measurement and labelling, listed in the Required Tools and Equipment section.

Digging Holes

1. Examine Figure 1. Set out marking stakes at points A, B, C, and D. You will leave these stakes in place during the entire construction process.
2. Use spray paint to mark the outline of each hole to be dug.
3. Dig 10 holes.

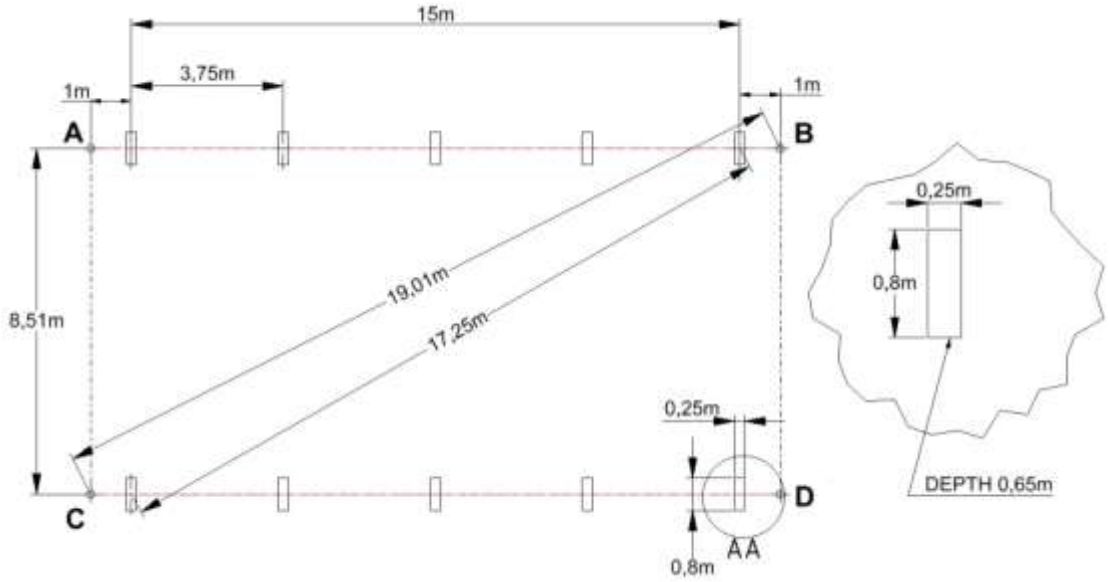


Figure 1: Digging holes

Assembling the Arcs

Assemble each of the five arcs separately, on the ground, roughly in place:

- The first (arc 1) and last (arc 5) arcs are identical.
- All the middle arcs are identical.

First and Last Arcs

You will need the parts shown in the figures. Assemble as shown.

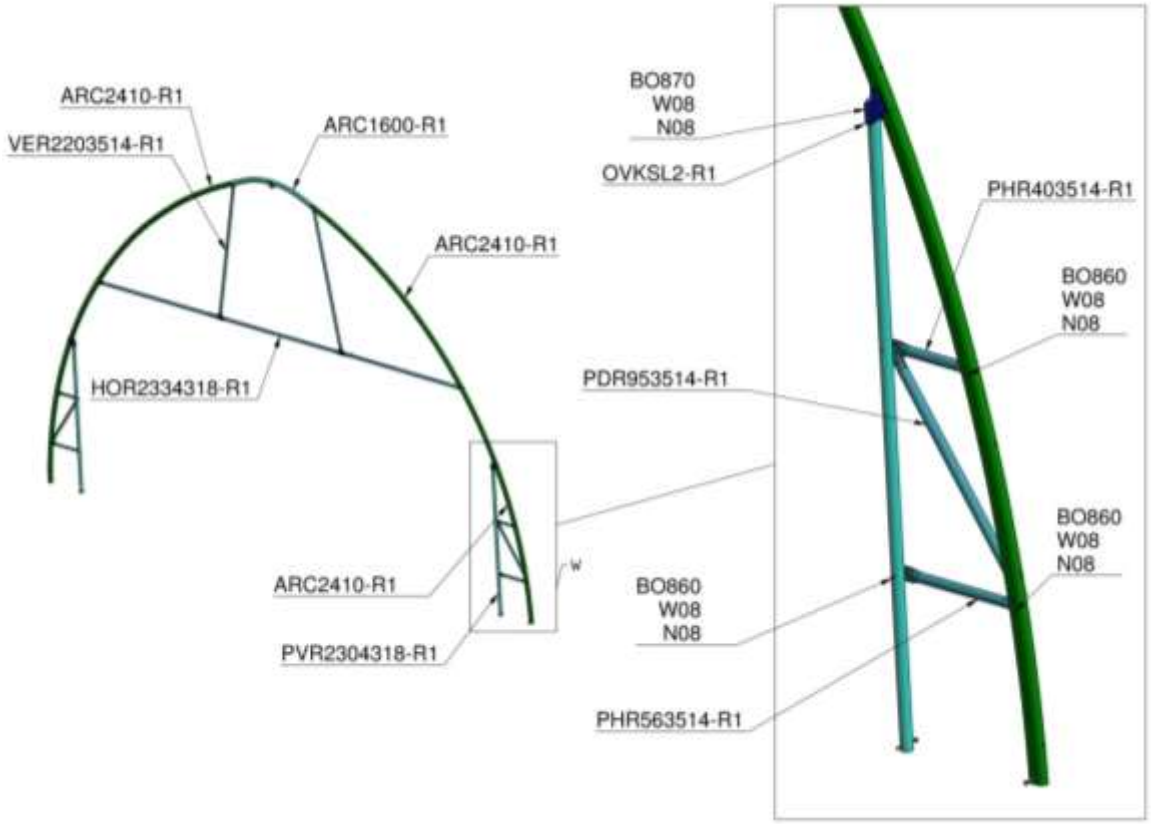


Figure 2: First and last arcs parts

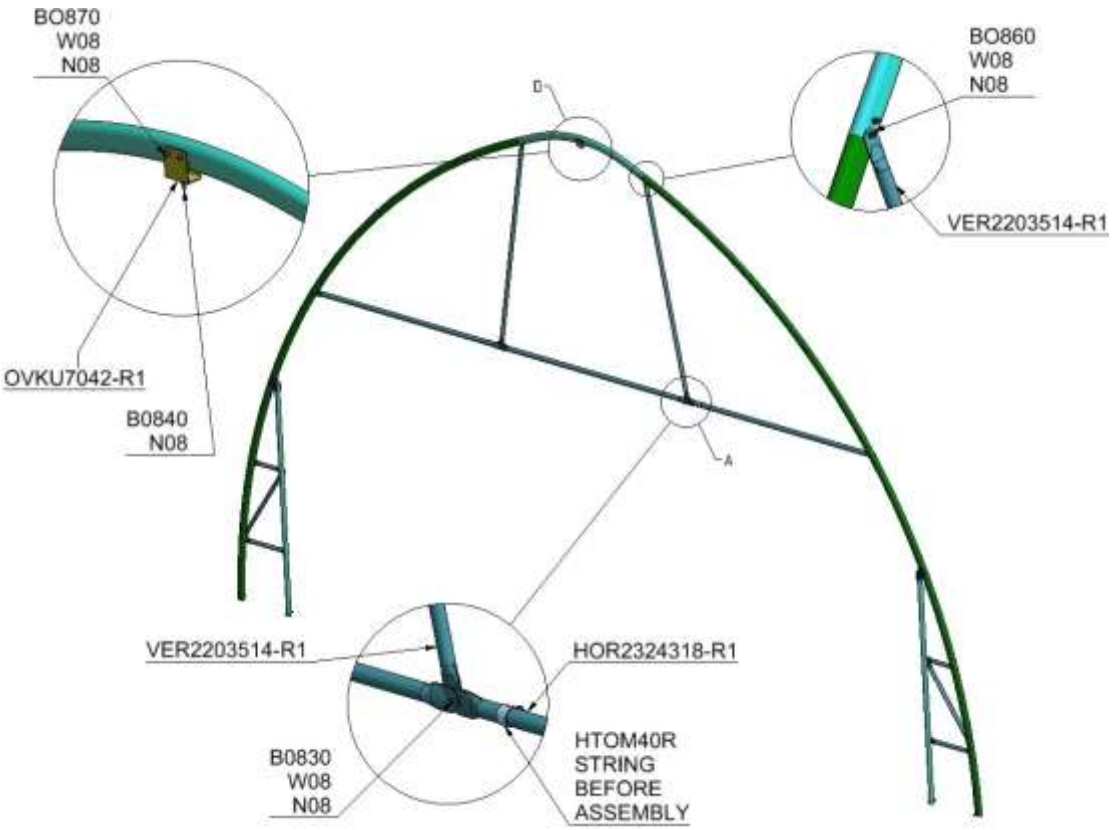


Figure 3: First and last arc connections

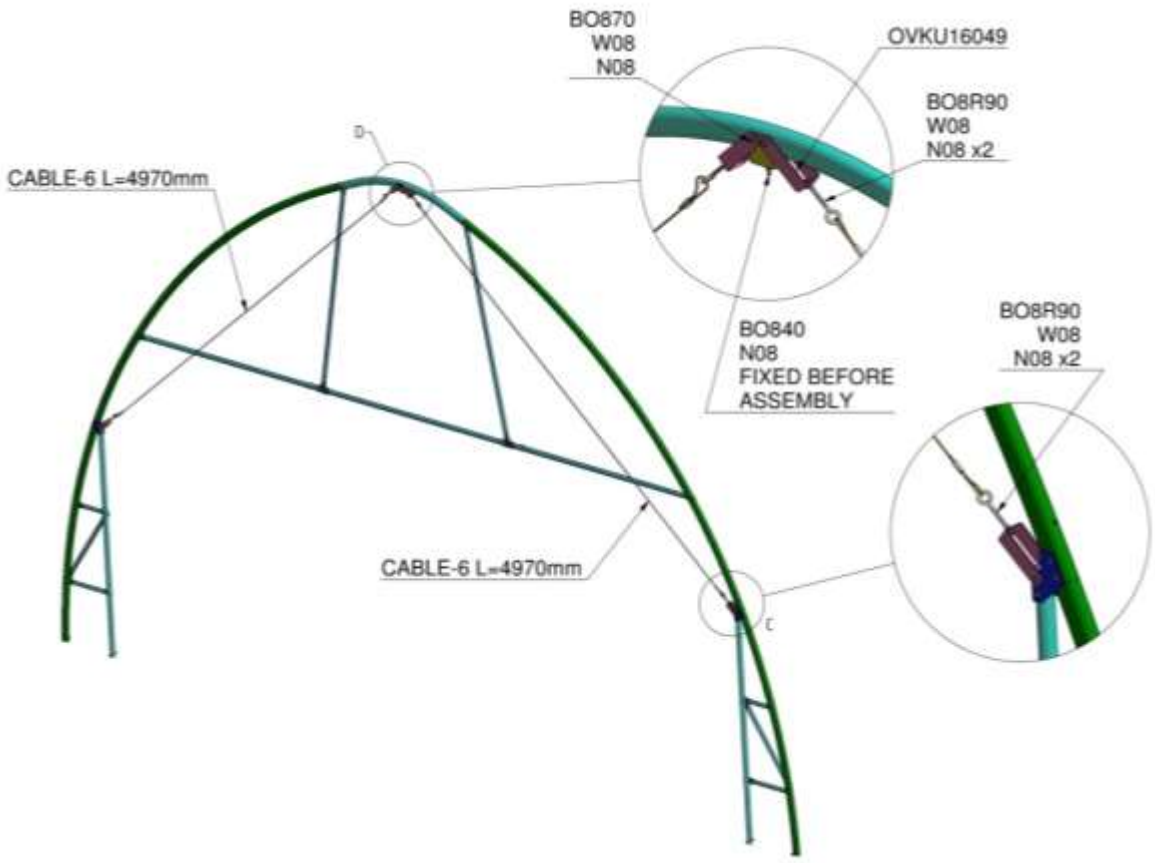


Figure 4: First and last arcs: reinforcements

Middle Arcs

For all arcs except the first and the last, you will need the parts shown in the figures. Assemble all the middle arcs as shown.

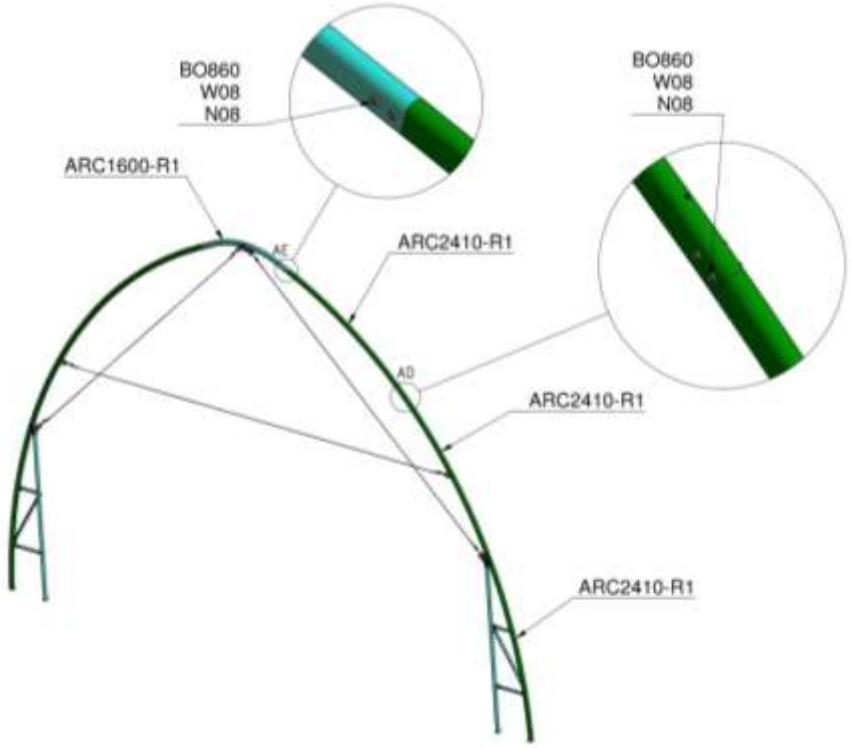


Figure 5: Middle arc parts

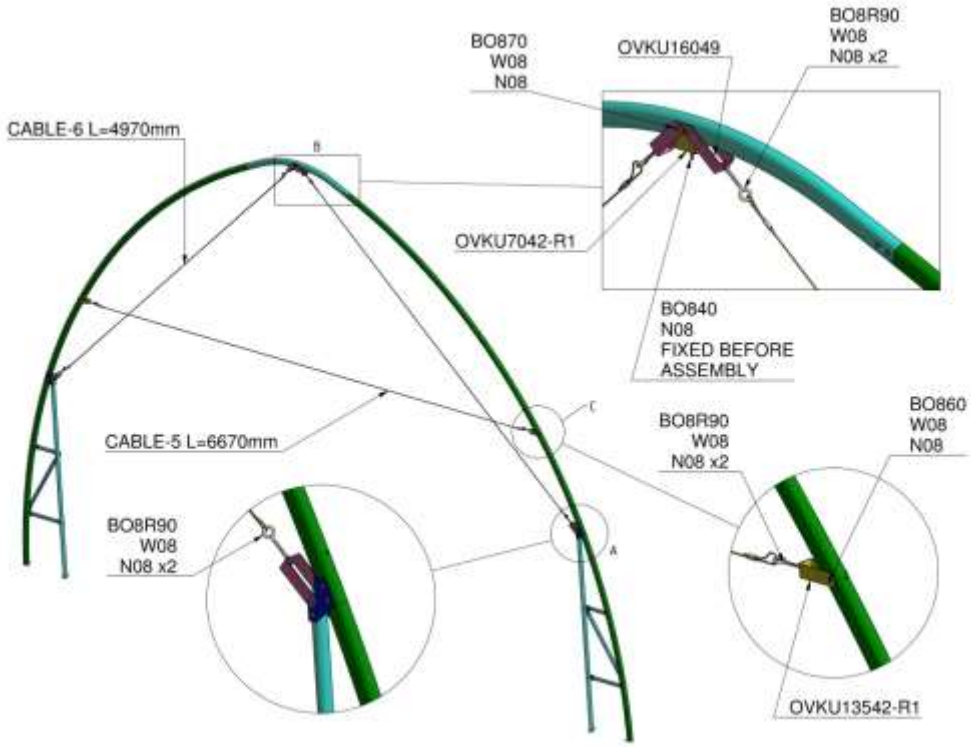


Figure 6: Middle arc connections

Stretching a String Frame

NOTES:

- Keep the marking stakes **in place** until the end of the pouring concrete stage, to keep the base marking.
- Pull the builder twine taut (tightly), ensuring that it does not touch any obstacle.

Steps:

1. Stretch builder twine between the marking stakes, 15 cm above ground level.
2. Use a marker or coloured chalk to mark the centre of each dug hole on the builder twine, where the centres of each arc will be.
3. Determine the corners according to the figures below and use the golden triangle (Figure 8) to create 90° between the sides of the structure.
4. Establish the basis for further measurements by creating a frame 17m long by 9.04m wide using builder twine.

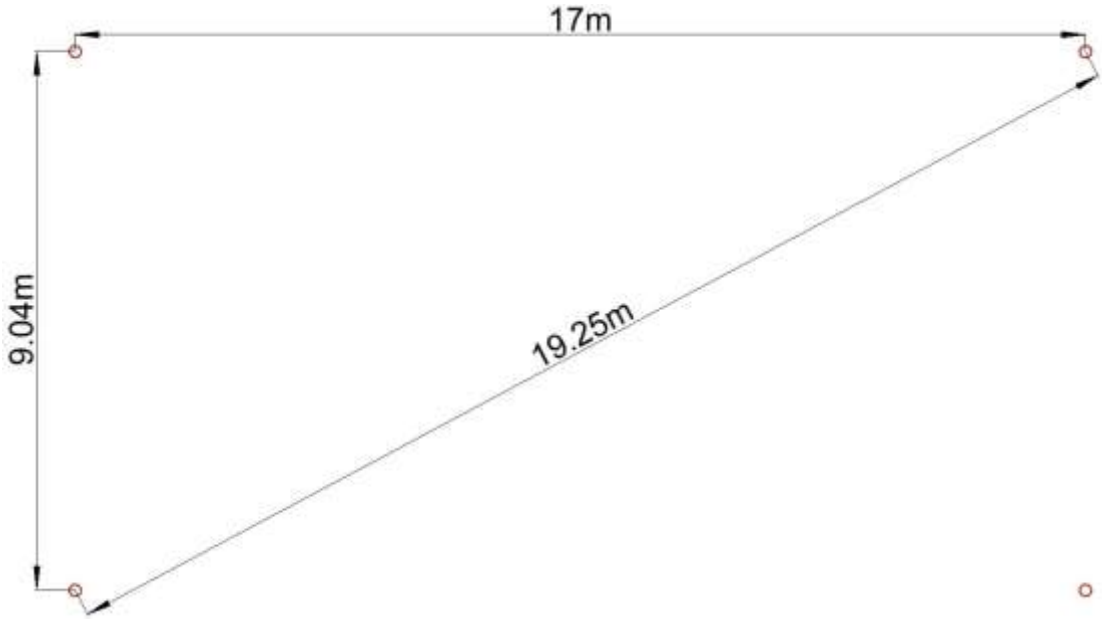


Figure 7: Marking distances

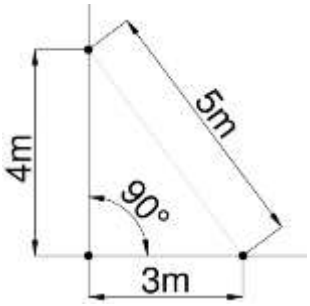


Figure 8: Golden triangle

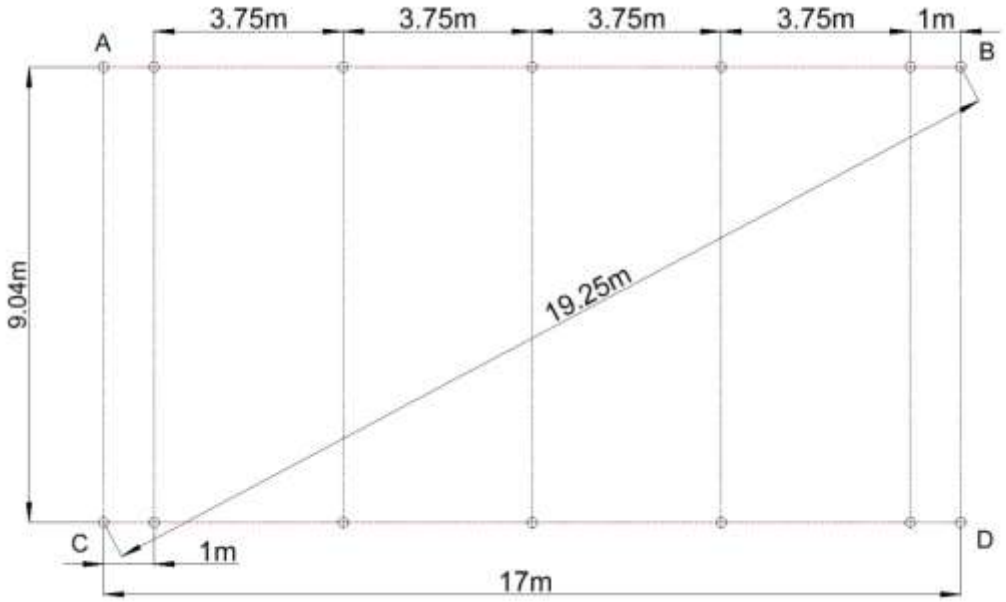


Figure 9: Marking distances between arcs

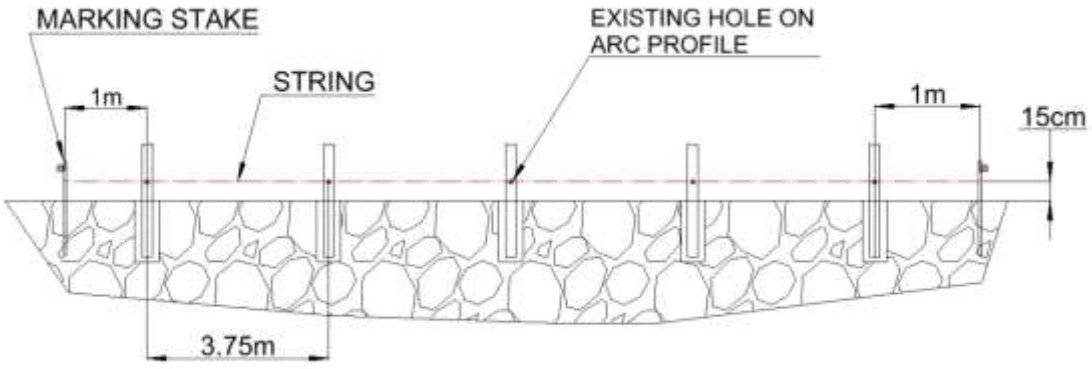


Figure 10: Marking points on the string

Raising the Arcs

1. Raise the first and second arcs as shown in the following figures:
   - See the depth of the arcs in the holes (Figure 11).

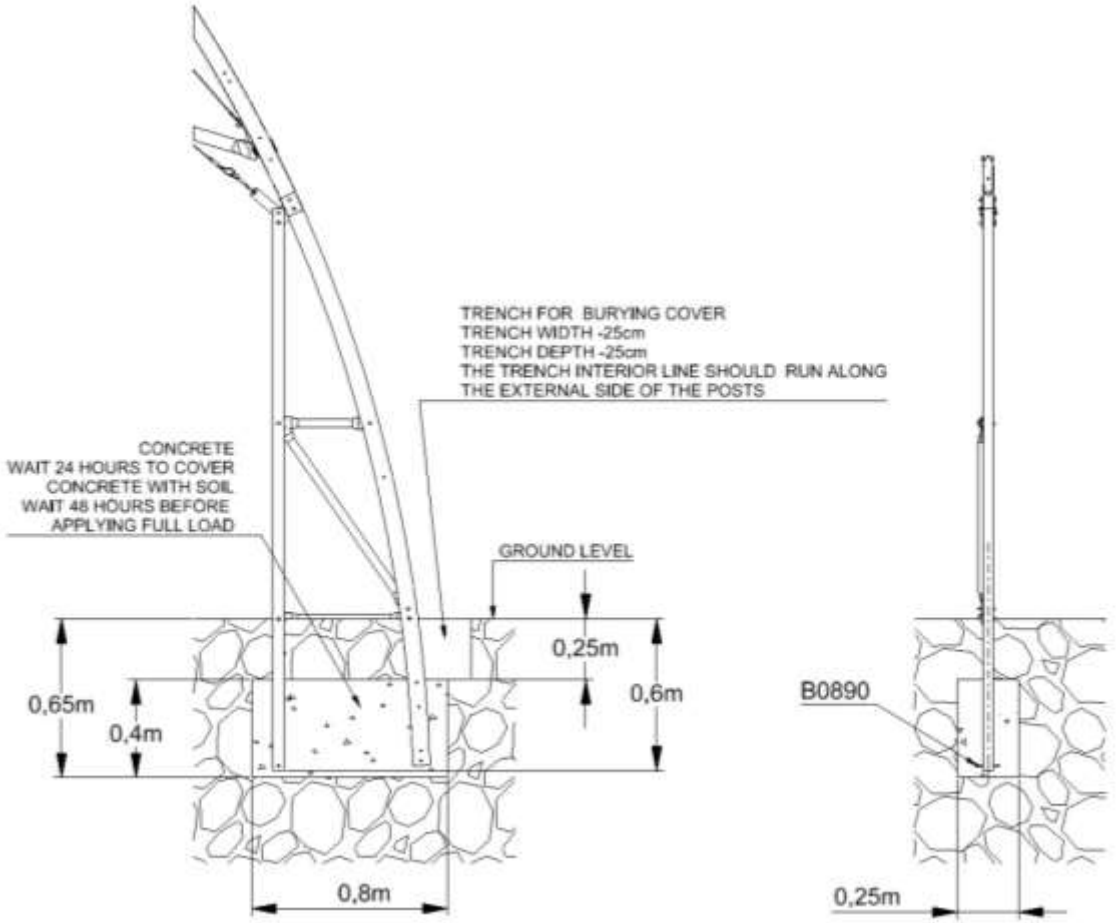


Figure 11: Placement of the arc in the hole

- Stabilize with two ropes and anchors (Figure 12).

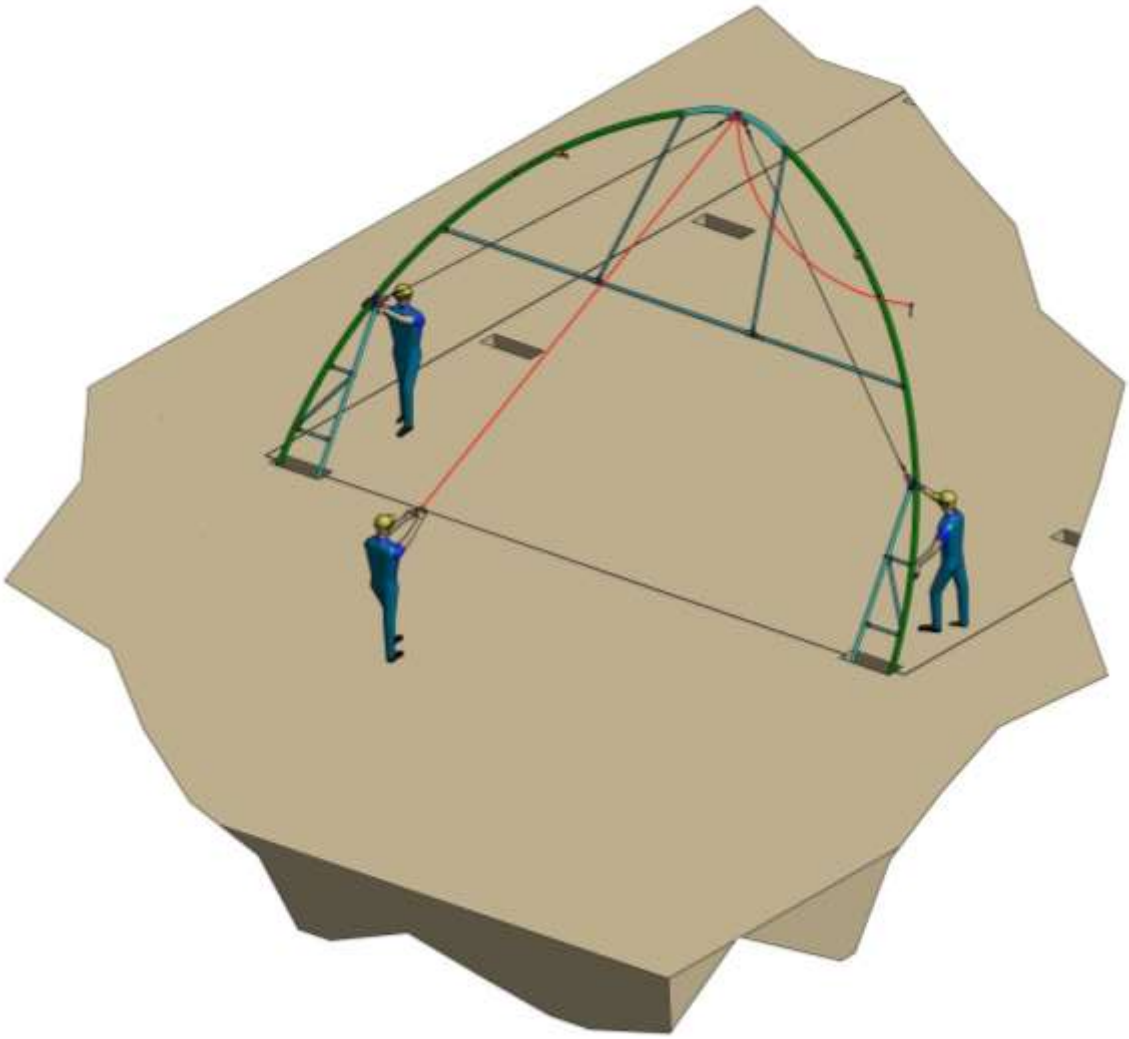


Figure 12: Raising the first arc

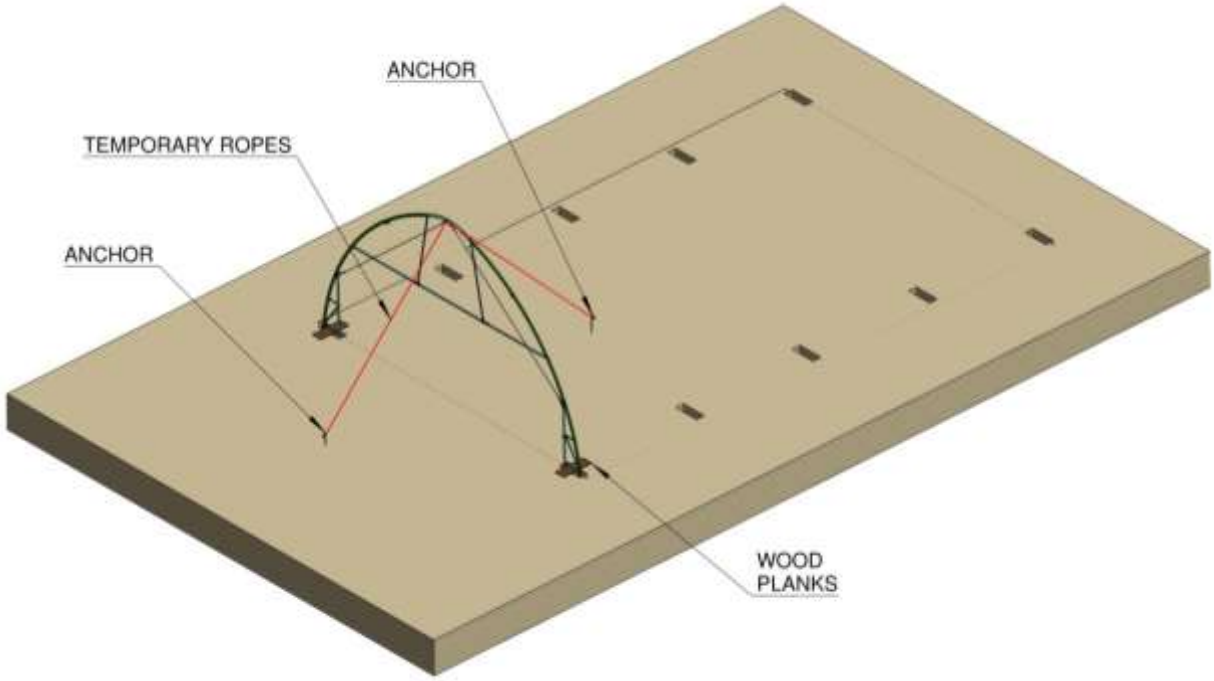


Figure 13: Position of anchors for first arc

- Add C-profiles at 1/3 height and HOR3784314 pipes at the peak.
- Add pipes between arcs 1 to 2 and arcs 5 to 4, at 2/3 height on both sides.

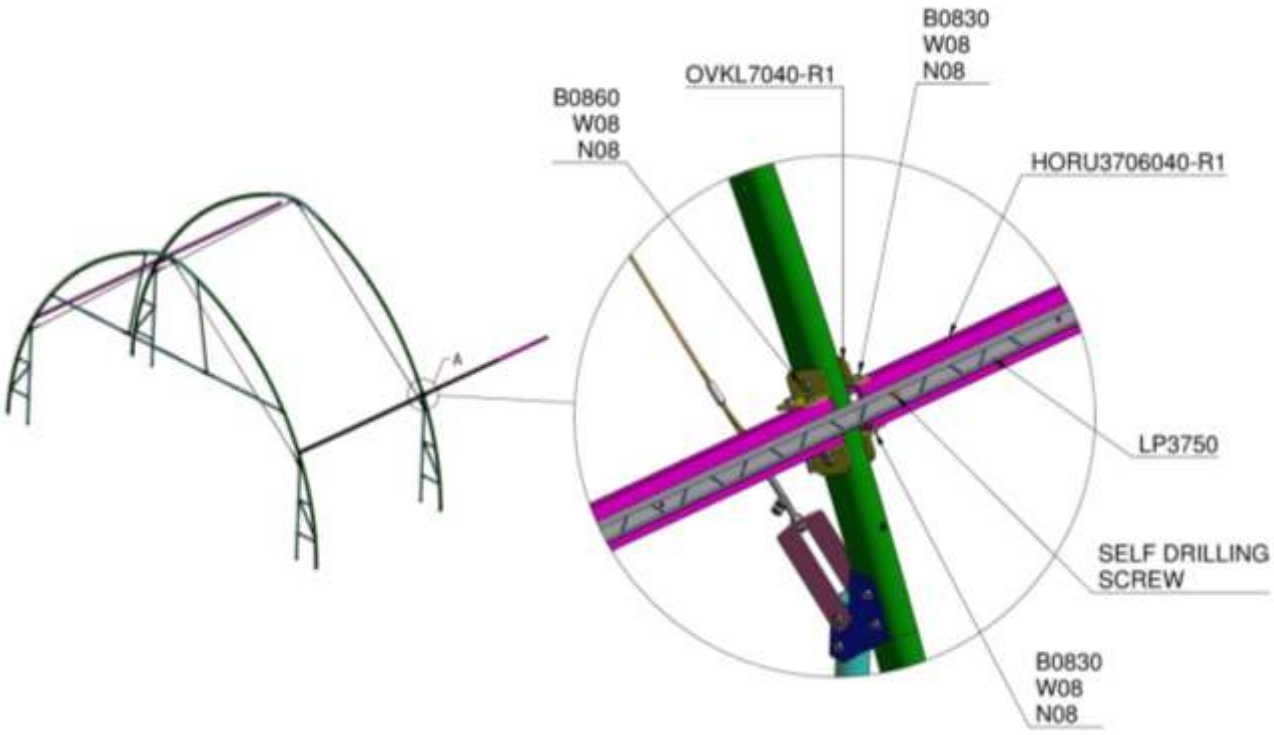


Figure 14: Connecting first arc to second arc

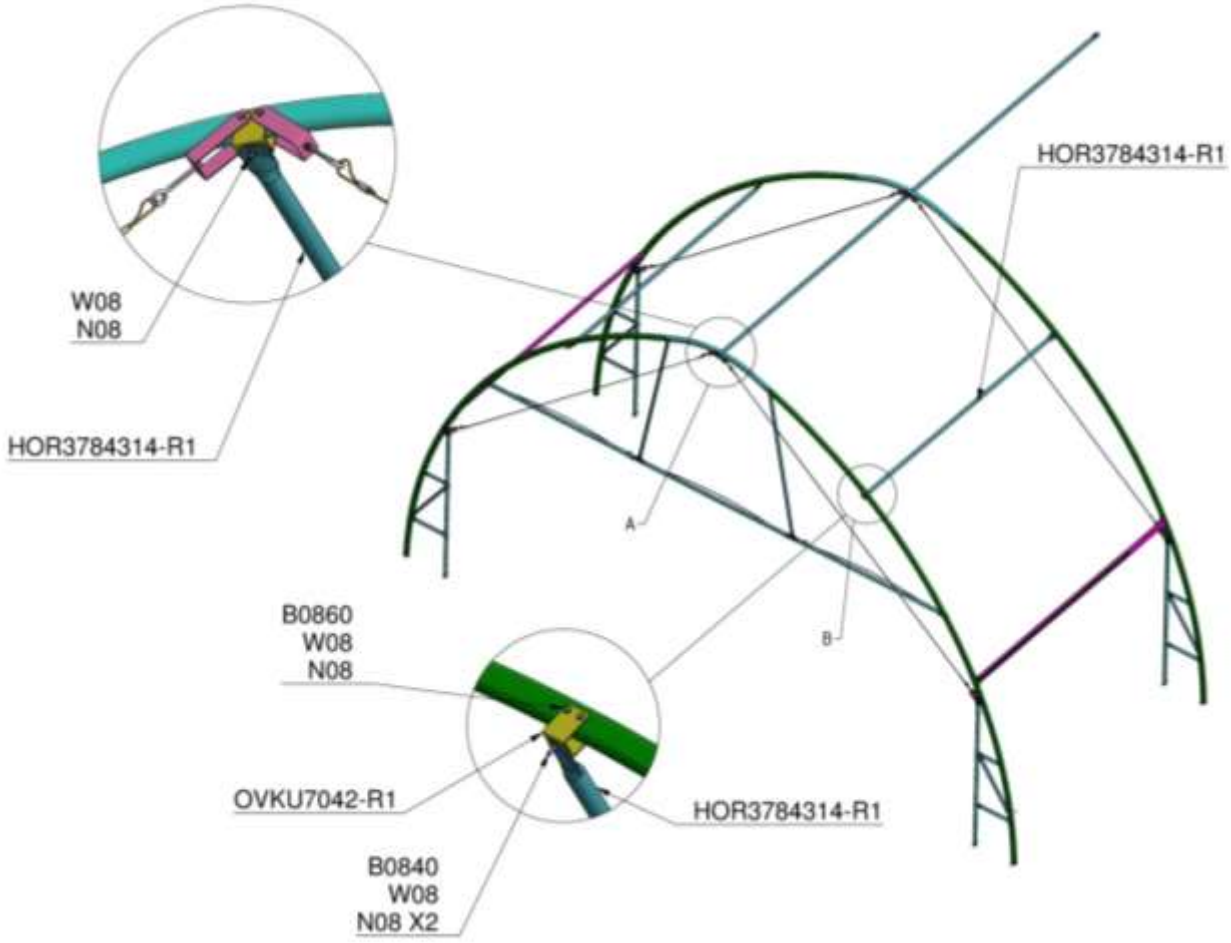


Figure 15: Stabilizing first and second arcs

2. Continue adding arcs, one at a time, stabilizing as shown above. Release ropes from the previous internal arcs before adding a new arc. (Leave the ropes attached to the first arc in place.)
3. Align in all directions:
    - Heights of arcs: align the first hole above ground with the string. Use wood planks (Figure 16).
    - Width of arcs: check the distance between anchors.
    - Sides of tunnel: check they form a straight line.

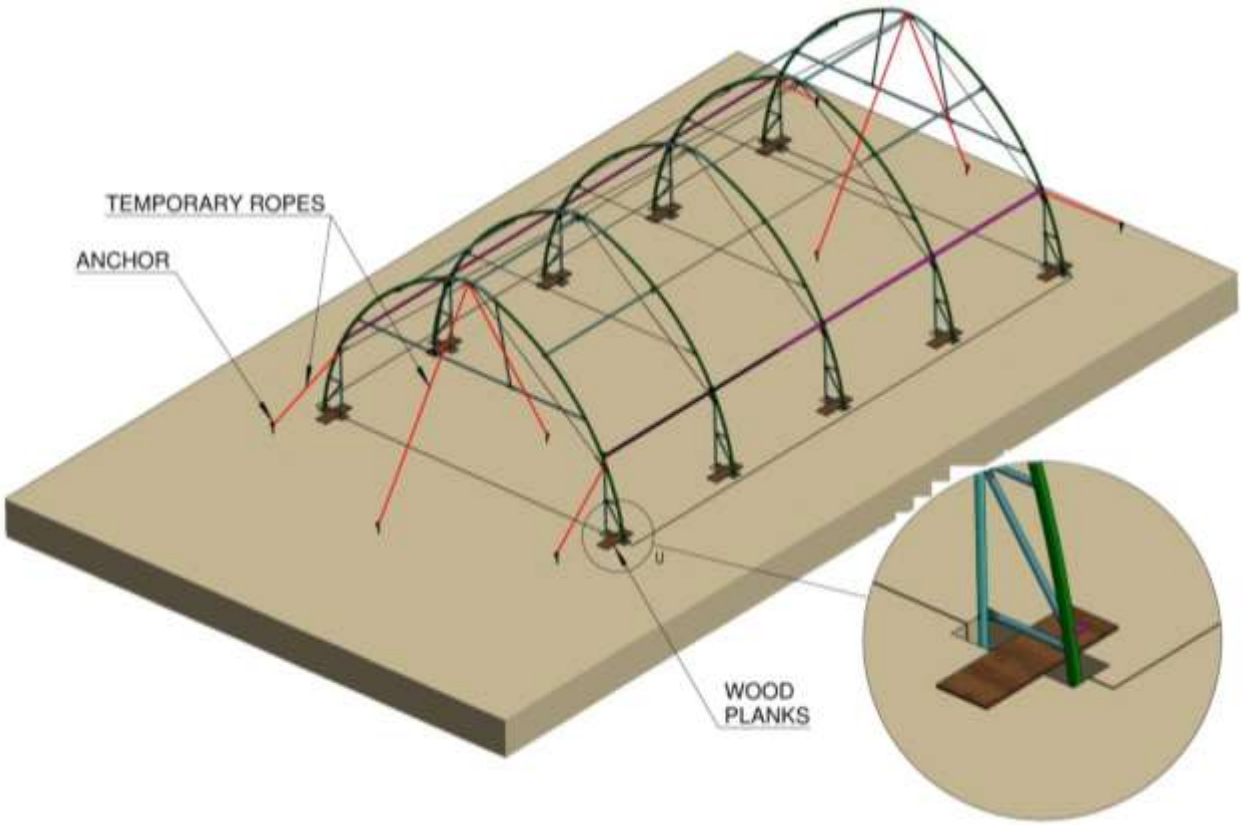


Figure 16: Securing the arcs. Note the wood planks

4. Between all arcs, add:
    - C-profiles HORU3706040 at 1/3 height on both sides of the structure.
    - Pipe HOR3784314 at peak.
5. Only between arcs 1 to 2 (and arcs 4 to 5): add pipe HOR3784314 at 2/3 height on both sides of the structure.
6. Add short ropes lengthwise and width-wise to first and last arcs at 1/3 height to stabilize (Figure 16).

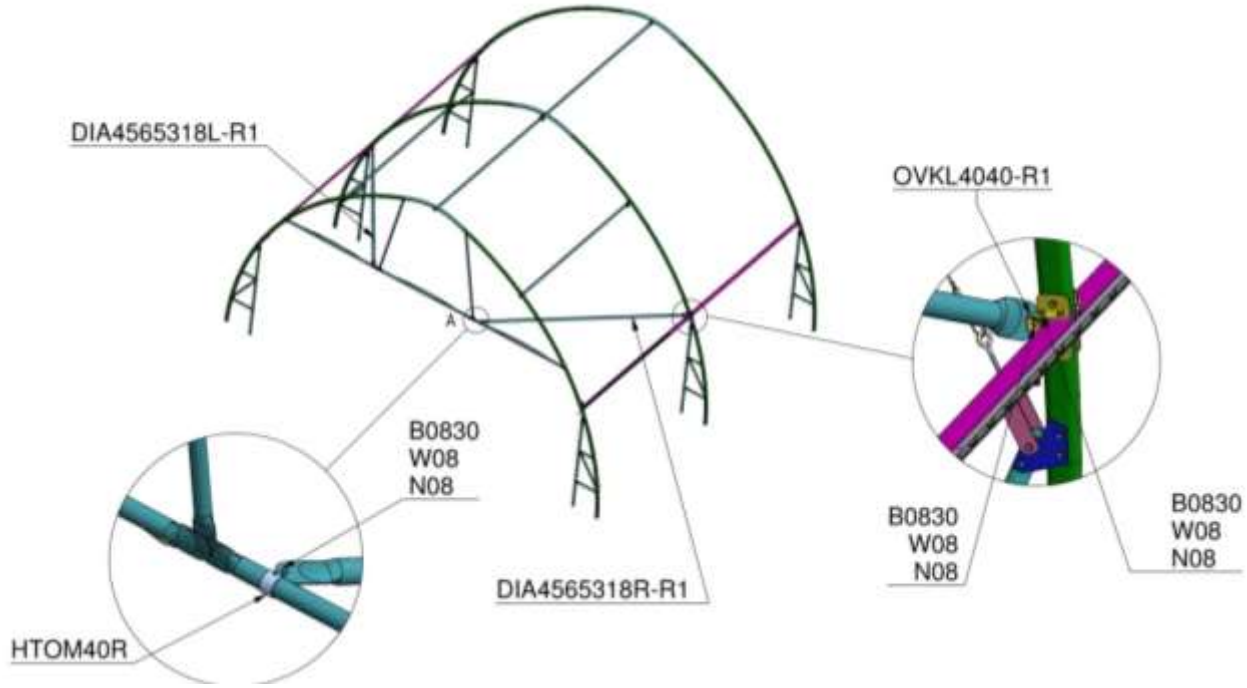


Figure 17: Angled PSS pipes (DIA4565318R) from arc 1 to arc 2

7. Add angled pipes from the horizontal pipe on the first arc to 1/3 height on the second arc. Use metal clip HTOM40R and L-bracket OVKL4040-R1. Repeat for the last arc.

Phase 2: Pouring Concrete

In this phase you mark the area again and pour concrete into the holes.

Measuring and Marking

1. Re-measure the distances between the marking stakes and correct if necessary.
2. Stretch the builder twine 15cm above the ground over the holes. The distance between the lines should be exactly 9.04m. Mark the centre of the poles on the builder twine so that when pouring concrete you will have a reference point.

Pouring Concrete

This section discusses concrete for the 10 holes you dug earlier (Figure 11).

1. Fill the hole with concrete to 25cm below ground level while keeping the arcs in position. To set the pole's height, use the builder twine as a reference and hold the pole where the hole is aligned with the twine, 15cm above ground level.
2. Repeat the process for all poles, making sure that the distance between the centres of the poles is exactly 3.75m.

Phase 3: Stabilizing

In this phase you add a trench around the tunnel and reinforce the arcs.

Digging Trenches

Let the concrete dry for approximately 24 hours. While you are waiting, you can dig trenches around the poles (Figure 18). Figure 19 shows the poles after pouring concrete and digging a circumferential trench.

NOTES:

- Dig all the trenches **outside** the pole line.
- If you intend to install a door at the front of the tunnel (FMD), dig the holes for the door while digging the trenches, using the instructions provided with the door.

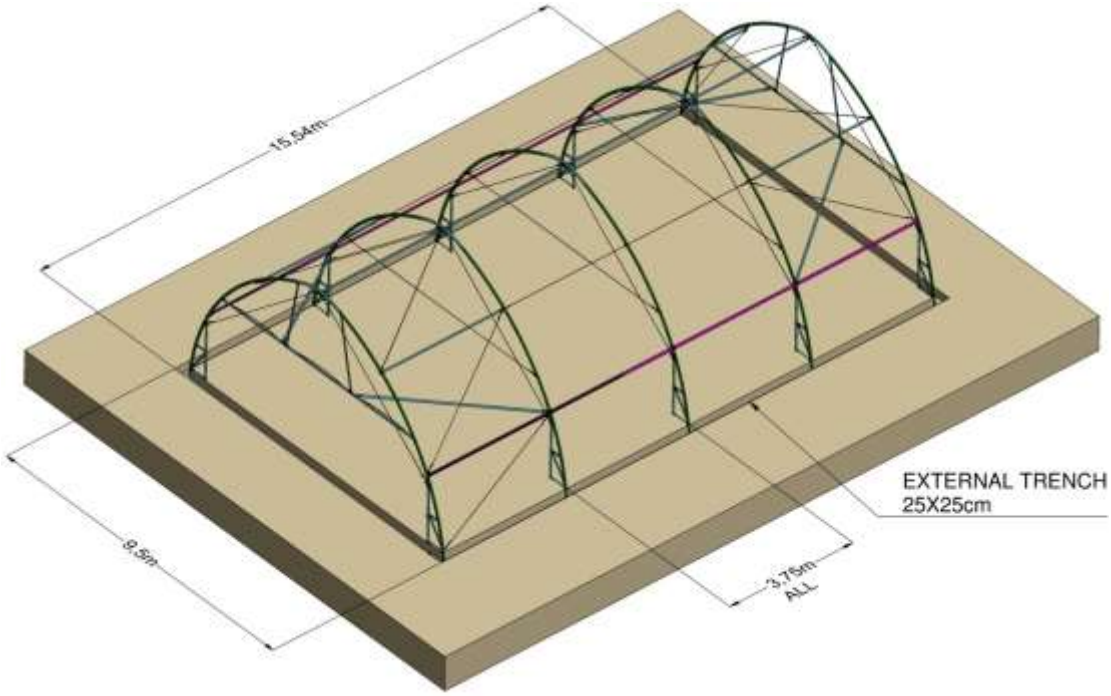


Figure 18: Trench details

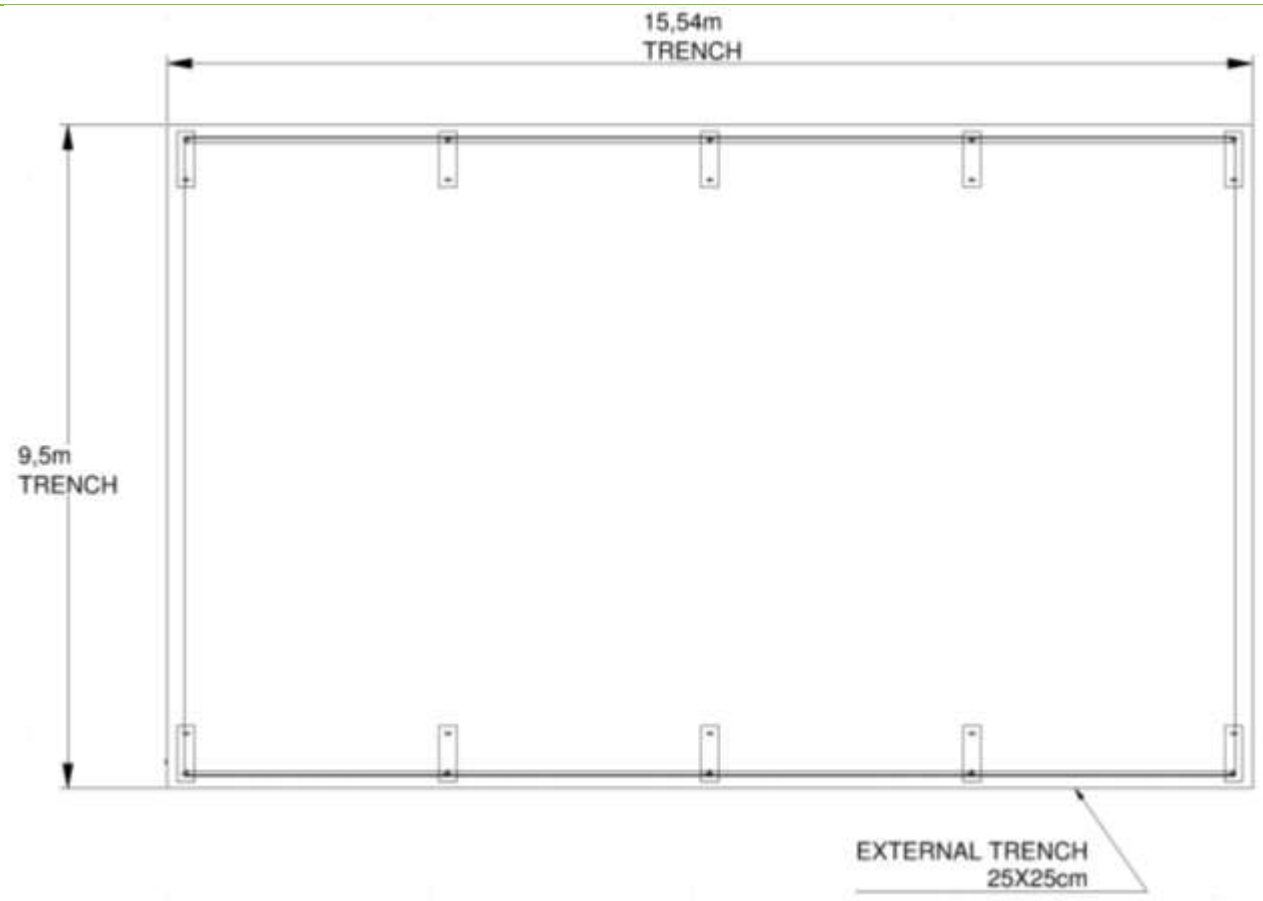


Figure 19: Trench measurements

Reinforcing, Post-Concrete

After concrete is dry (or nearly dry), perform the following steps, as shown in the figures:

1. Reinforce the arcs with cable #1 (Figure 20). This is only between arcs 1 and 2, and between the last two arcs (4 and 5).

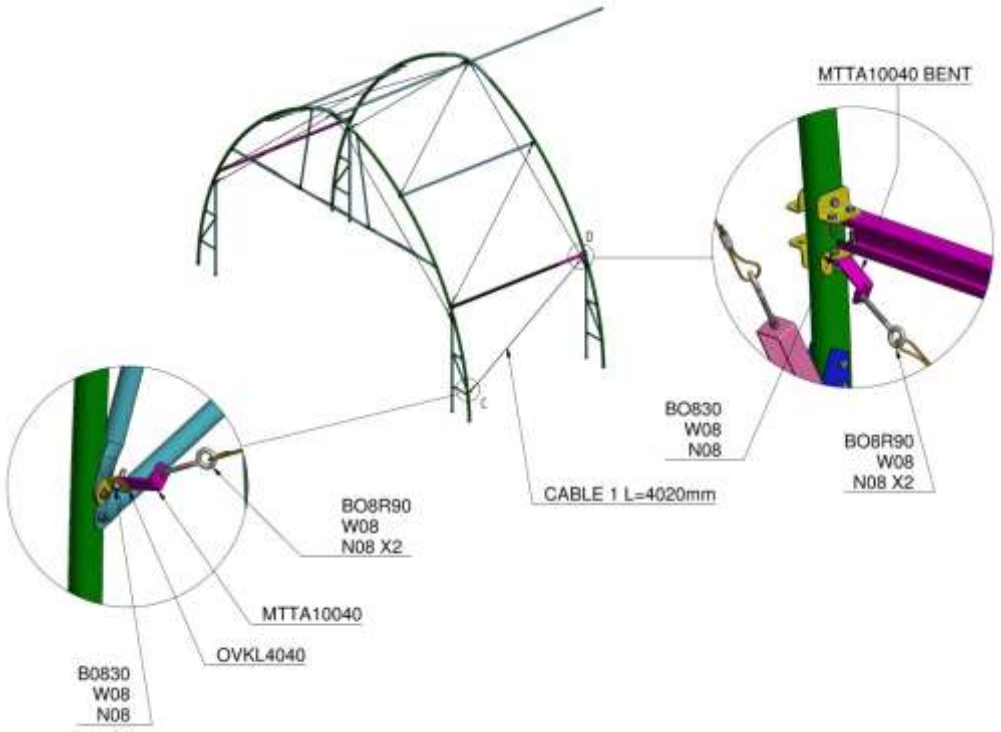


Figure 20: The cable (#1) connecting between end arcs

Figure 21 shows how to connect cables #2 and #3. They are only used only for the ends (between arcs 1 and 2, and between the last two arcs 4 and 5).

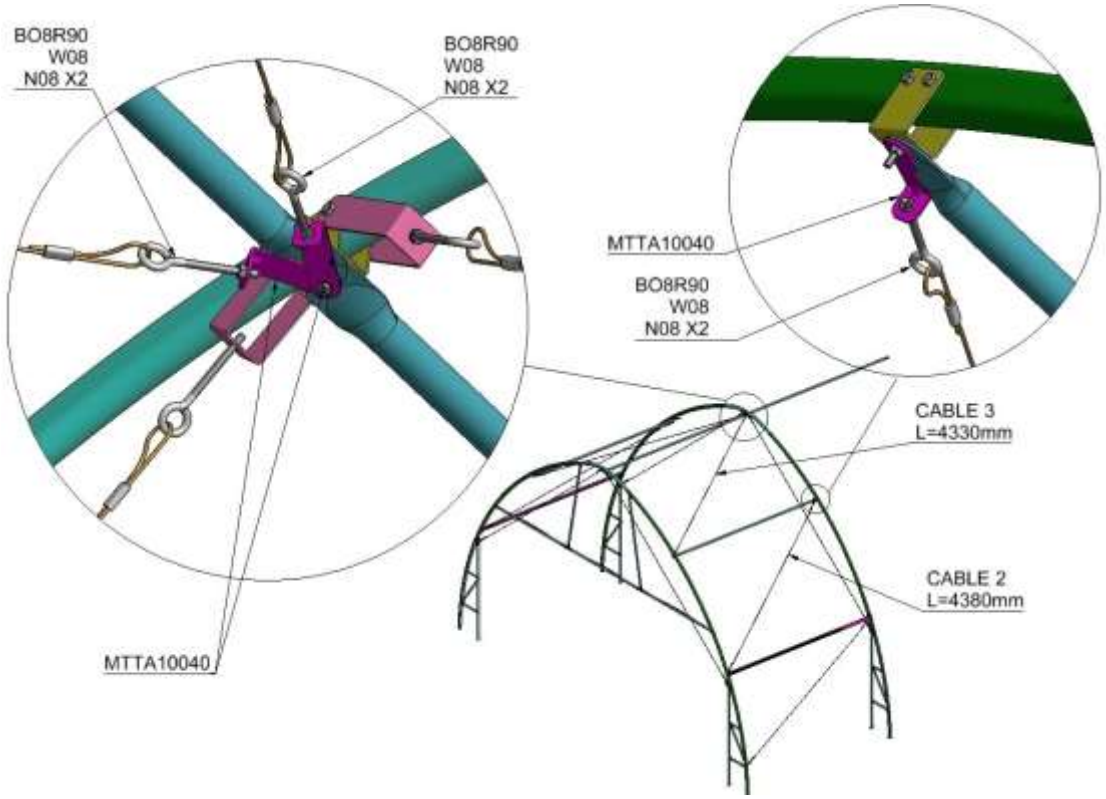


Figure 21: Cables #2 and #3

2. Add L brackets MTTA10040 to middle arcs (all arcs except for the first and last) at the peak.
3. Add cables (#4) between middle arcs at 2/3 height on both sides of the structure (Figure 22).

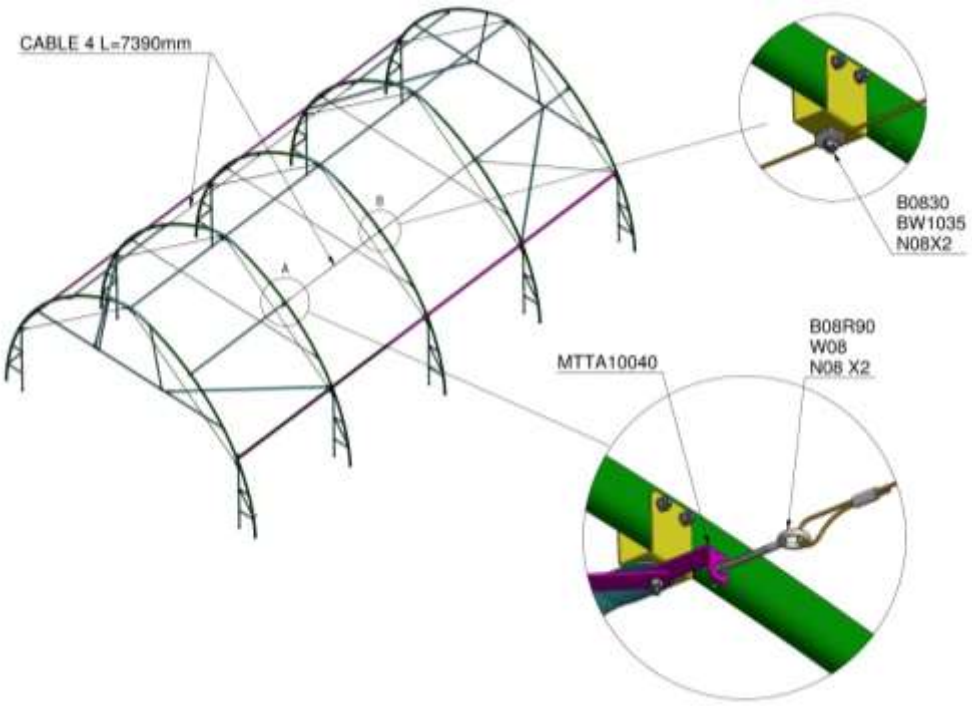


Figure 22: Middle arcs. stabilized at 2/3 height

4. Add three cables (#7) to the horizontal pipe on the first arc (Figure 23).

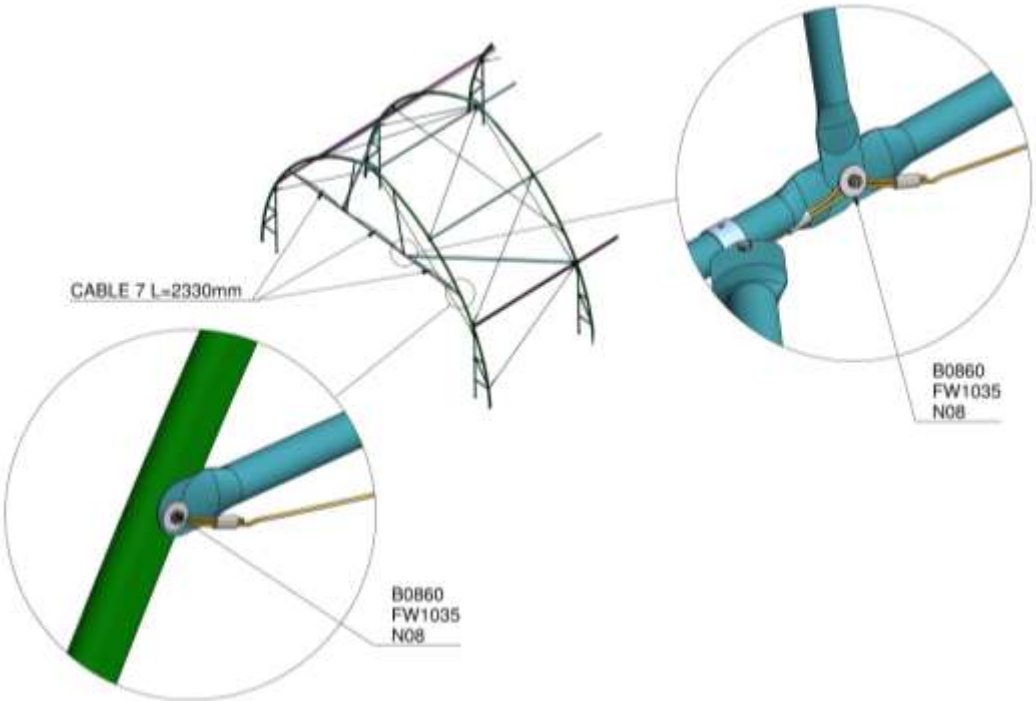


Figure 23: Reinforcements for plant support system

5. Repeat (add #7 cables) for the last arc.

Phase 4: Covering with Nets

Before adding nets, remove all supporting ropes. You will need the ropes when you add the roof net.

Nets for Front and Back

The instructions are identical for the front and back nets.

1. Find the mid-point of the net by folding it in two. Mark the centre point.
2. Attach the eyelets to the front arc using the fabric-coated rubber bands (Figure 24). Use the external row of eyelets. (The inner eyelets are for the winter front cover.)

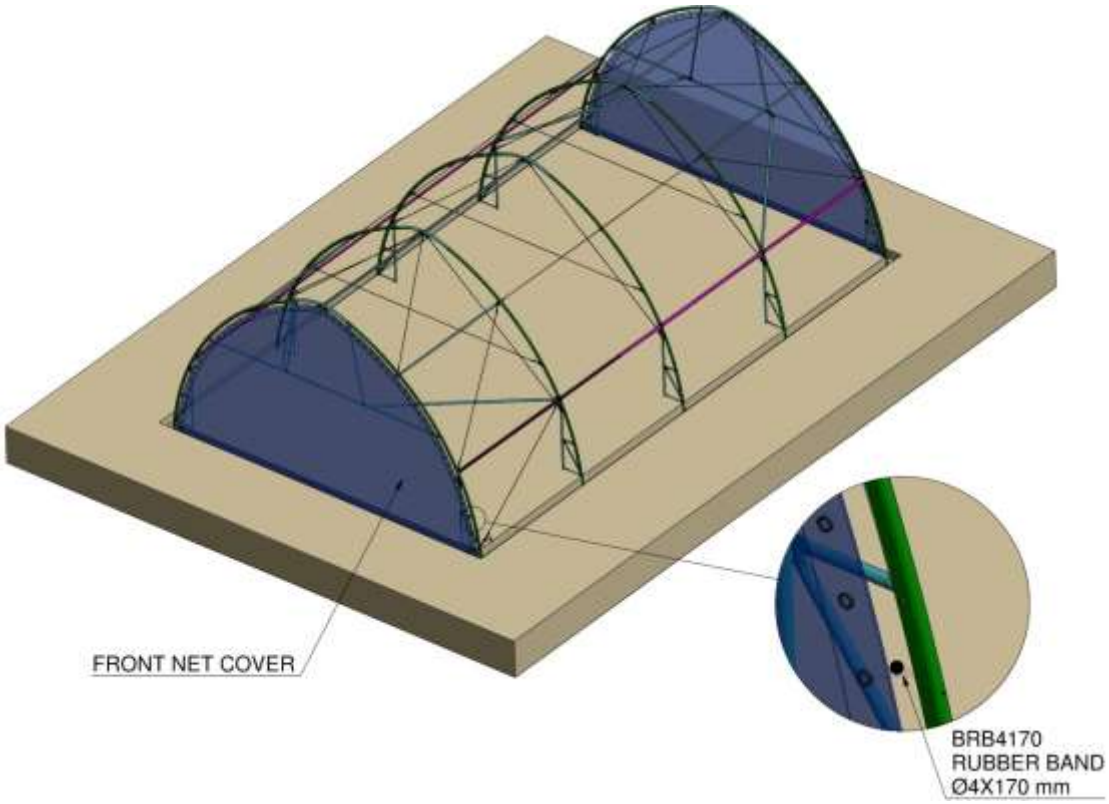


Figure 24: Front and back nets, including rubber bands

Folding down the length of the front net.

Attaching the middle eyelet.

Attaching eyelets with rubber bands.

Stretching the net.

Working on both sides simultaneously.

Continuing down to the ground.

Stretching at ground level.

Burying the excess under dirt.

Adding more dirt.

3. Cover net lying on the ground with dirt, except for the area around where the FMD will be.
4. If you have the FMD kit, follow those instructions now.

Nets for Sides

Equipment:

- 4 people
- SDS1/4 screws
- SD1/4 (screwdriver)
- 8 locking profiles

Instructions:

1. Lay out one side net along the length of the structure:
    - Centre the net so there is an equal quantity of excess fabric at each end of the structure. There should be roughly 50cm spare at each end.
    - Ensure the 10cm SOLARIG strip is at the top.
    - If you have a ventilated side curtain (VSC), ensure it faces outwards.
2. Attach the side nets using the locking profile and self-drill screws (SDS1/4).
3. Stretch the net lengthwise while maintaining the height of the net.
4. The locking profiles have holes that fit the holes on the C-profile.

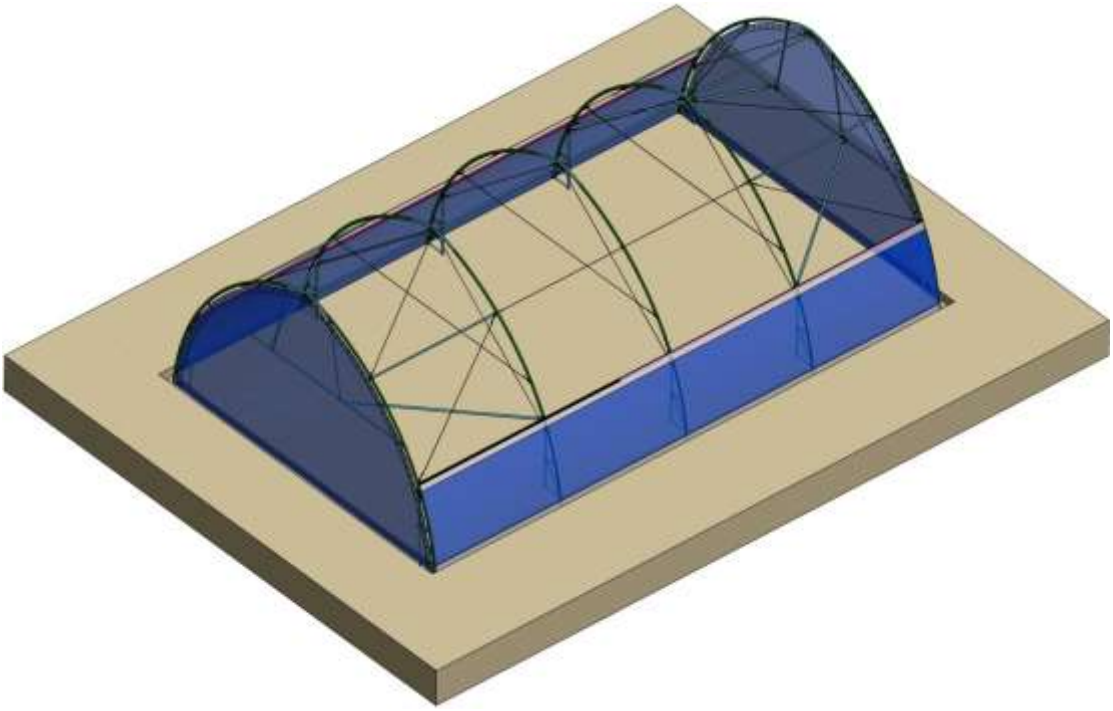


Figure 25: Side nets

5. Cover the net remaining at the bottom with half of the dirt, stretching the net along its width and length.
6. Cover with the remainder of the dirt.

Ensuring excess on both ends.

Attaching with self-drill screws.

Attaching at the ends.

Stretching while maintaining height.

Close-up.

Working along the length.

Stretching tightly.

Burying the excess with half the dirt.

Stretching the net.

Securing completely with dirt.

7. Continue the excess net from the sides around to the front eyelets so that the net overlaps the corner of the tunnel, and attach them on the front (and back). One person will need to be inside the structure. Use bolts, nuts, flat washers, and rubber washers.
8. Cut off excess fabric from the sides.
9. Flatten the edge of the locking profile with a hammer so it doesn't damage the net.

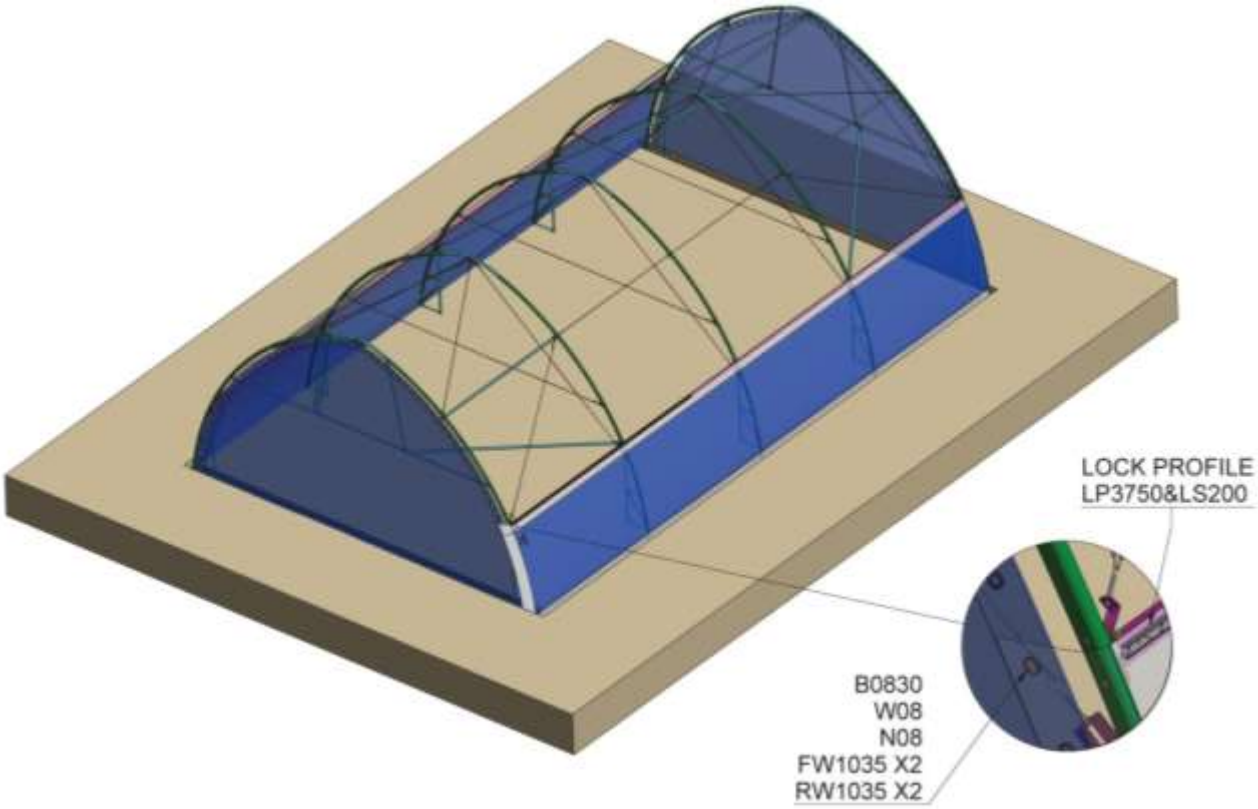


Figure 26: Side net connection to front net

	
Pulling excess to the front.	Utilizing the person on the inside.

Cutting off the excess.

Burying the corner excess.

Flattening the edge of the locking profile.

Roof Cover

Equipment:

- A minimum of six people.
- Ladder
- Pulling ropes

Warnings

- **Tightly secure the SOLARIG™ roof cover for optimal strength and so it will last longer.**
- **Installation is prohibited when windy.**
- **Before spreading out the cover, make sure the ground is clear of sharp objects.**

Instructions:

1. Spread out the cover on one side of the tunnel. Fold the cover in accordion style and lay it along the tunnel structure. If the roof includes a curtain, take into consideration its orientation.
2. Connect three 15m ropes to one long side of the cover and throw them over the tunnel structure.
3. Three people pull these ropes to get the cover over the tunnel top. Two people stand between the cover and the tunnel at the corners, releasing and pushing the cover. A responsible person coordinates the entire process from within the tunnel, pushing up with a padded stick where necessary to avoid snagging and tearing the cover. This process is sensitive and must be handled with care.
4. Move the front and back sides over the arcs and anchor them with ropes to stakes close to the corner poles. It is important to keep the cover centred so that the surplus is equal on both sides.
5. Repeat the stretching several times until the anchoring ropes are perfectly stretched and the excess cover is equally distributed on both ends.

Laying out the roof cover.

Folding the cover, accordion-style.

Laying the cover alongside the structure.

Pulling the cover over the roof structure.

Spreading the roof cover.

Holding the corners.

Checking equal distribution of the cover.

Threading string through sleeve.

Tightening the rope.

Tightening at other end.

6. Use the locking springs to stretch and anchor the sides to the locking profile. Anchor one side of the roof cover with screws while stretching and ensuring a uniform surplus length through the entire length. Manually fix the cover on the opposite side so that it does not slip.
7. Repeat the operation on the other side and install the springs with the same orientation as on the first side.
8. On every intersection with an eye bolt, cut and move the SOLARIG™ strap over the eye bolt.

Inserting locking spring.

Starting from the middle of the structure.

Starting the final spring from the end, causing overlap.

Curtain for Side (VSC)

Instructions:

1. Thread the sleeve with a rolling pipe, inserting the female end first.
2. Add more pipes, securing them one to the other with bolts and washers.
3. Attach a universal joint (Cardan joint) to the last pipe. (The first and last pipes may extend roughly 10cm beyond the end of the structure.)
4. Add another pipe and handle to the universal joint.
5. Lock the pipe along the length of the sleeve with plastic clips.
6. Add clips where the sleeve goes over the arcs.
7. Secure the end of the sleeve with clips.

Threading the sleeve with the pipe.

Cutting off excess net.

Cutting off excess net.

Adding the handle.

Adding clips to lock the pipes to the sleeve.

Connecting the ropes between the eyelets above and below the curtain.

Attach a handle to the last pipe.

Phase 5: Maintenance

You should perform preventive maintenance on the Alpine-135 structure once a month:

- SOLARIG™ plastic covers and nets: Verify that the plastic sheets are stretched out and not flapping. Check for holes and cuts in the nets and plastic sheets. Sew cuts or holes closed with a needle and thread.
- Cables: Make sure the cables are tight. If the cable is slack, tighten using the tension tool and investigate the state of the clamps.
- Structure: Make sure that all screws are tight and in place.