Winterizing Small Greenhouse Sidewalls: Installation Steps
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This article's GPN Part 1 https://www.nxtbook.com/greatamericanmediaservices/GPN/january-2025/index.php#/p/42 concluded with the completed side wall insulation design shown in Figure 1. SGAFT's Part 2 describes the step-by-step installation of the side wall project using pictures and captions.


Figure 1

Temporary Fix, Poly Drape
Figure 2 shows a poly drape installed prior to the second heating season and before conceptualizing the polycarbonate system. The drape is shown first bunched and tied "open" during the summer ventilation season for clarity. The poly sheet is attached to an after market 1" square rail partially visible in the picture.


Figure 2

The poly drape is shown in its down (insulative) position during the heating season in Figure 3. The inner layer of poly created a dead air space between the outer roll up side wall fabric and inside heated air. The mounting rail is more visible in the picture with the drape lowered .

Figure 3

Permanent Fix, Polycarbonate

Describing the project installation from bottom to top, floor to energy curtain fabric, includes four steps. Pictures and captions present details for each step; base/ground seal, polycarbonate side wall panels, polycarbonate-to-energy curtain shoulder transition seal, and spring/fall season ventilation versatility. The completed project in Figure 4 shows the bottom to top installation progression from a different angle.

Figure 4

Step 1: Base/Ground Seal

The greenhouse structure includes four diagonally mounted corner braces, two are visible in Figure 5. Their position inside the structure presented an uneven mounting surface along the inner side wall. In order to achieve a flat insulative surface an offset was installed prior to mounting the rigid polycarbonate sheets.

Figure 5

Crushed stone was removed from side gutter, shown in Figure 6, to allow a permanent polycarbonate base strip to be buried to create a sealed interface between outer shell of unheated air and inner heated air at ground level.

Figure 6

Figure 7 shows a 2” x 2” piece of aluminum angle that was mounted on each hoop to create an offset space that would allow the polycarbonate insulative layer to be flat along the entire length of each side wall. Having square hoop posts made installation easier; however, round posts would have also accepted the structural modification.

Figure 7

The installed polycarbonate base strip is shown in Figure 8, backfilled with crushed stone. An aluminum “H” rail is in place along the top edge of this base strip to accept the main polycarbonate panels.

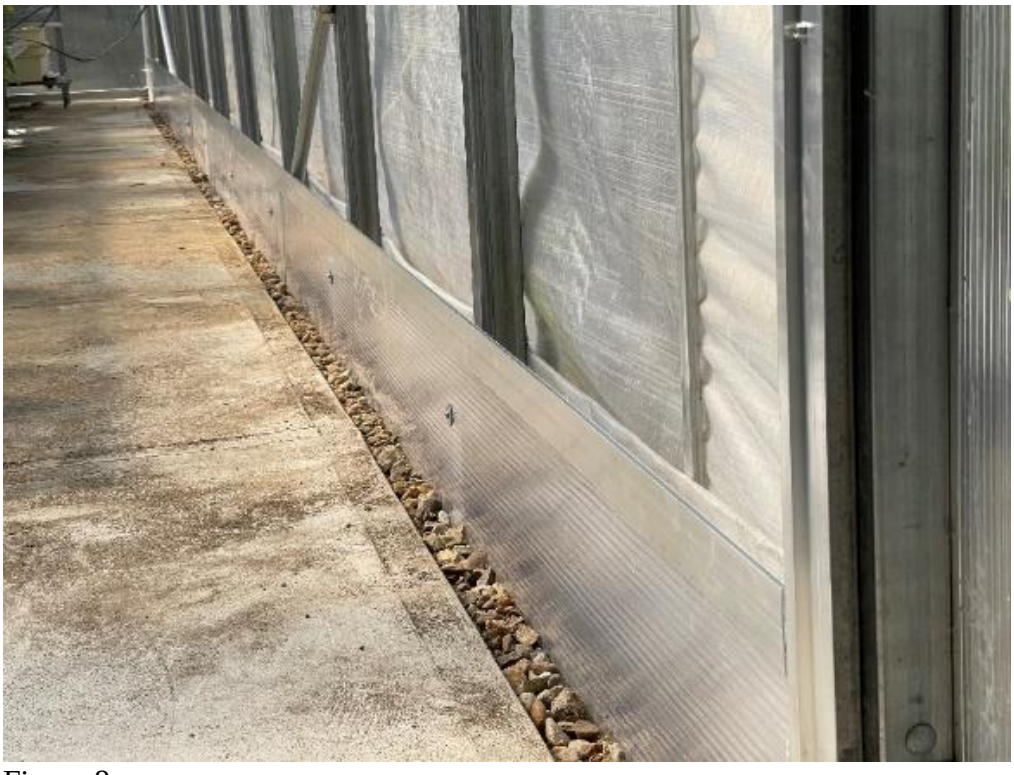

Figure 8

Figure 9 shows a side view of the polycarbonate base strip buried in crushed stone attached to the 2” x 2” angle mounting brace with installed H rail ready to accept polycarbonate side sheets. It also shows the roll up side wall fabric and outer side wall apron attached to the outside of the square hoop post. The installation creates almost 5 inches of insulative dead air space.

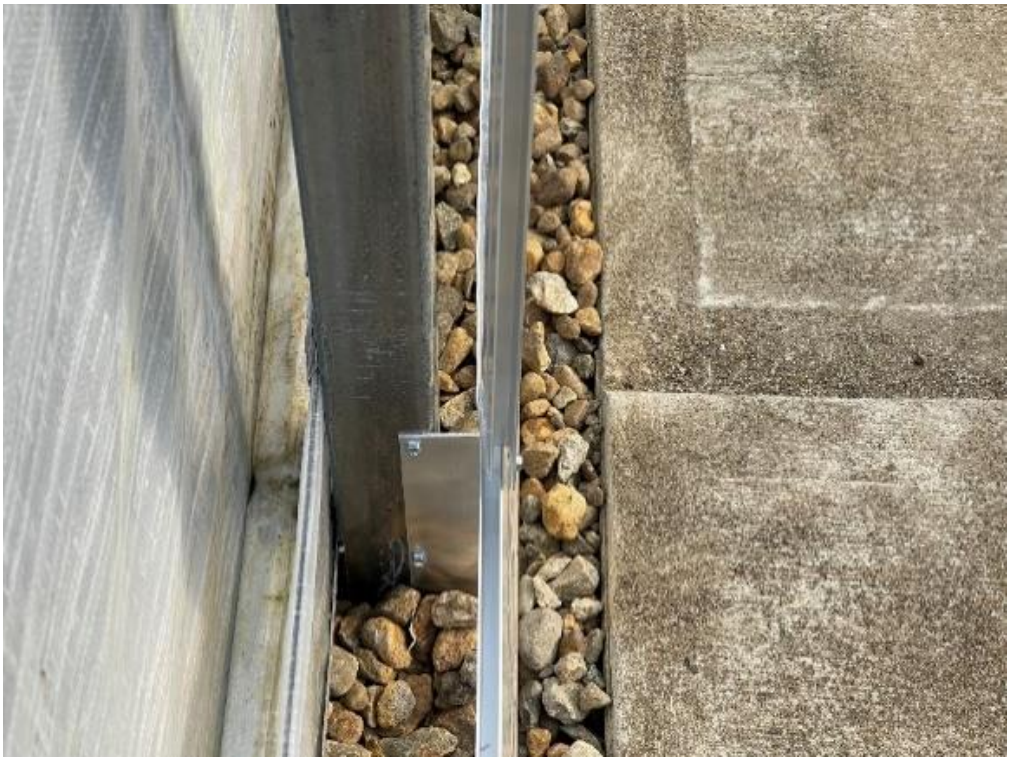

Figure 9

Figure 10 shows a closer view of the 2” x 2” angle mount used to create the offset that accommodated the corner braces to achieve a flat polycarbonate surface.

Figure 10

Figure 11 is an outdoor view of the installation during shoulder season ventilation showing a polycarbonate panel removed to allow partial side wall ventilation to occur. In the picture the roll up side wall is partially open showing outer side wall apron seal and inner polycarbonate base strip with H rail. Note the inner polycarbonate base strip being similar in height (slightly higher) to the outer apron resulting in minimal reduction of side wall opening height and full ventilation capacity.

Figure 11

Electrical Track Multi-Function

Referred to earlier, an after market 1” square galvanized steel track (pseudo purlin) was installed on the inside of the structural hoops along each side wall. This multi-functional rail serves as an electrical raceway, support for mounting the temporary poly drape, and provides a structural anchor for stabilizing miscellaneous pieces of equipment. Figure 12 shows the tracks during concrete floor pouring mounted slightly higher than the outside knee rails to which roof poly and roll up side wall fabrics are attached.

Figure 12

Figure 13 shows the multi-function service provided by the after market rail. The temporary poly drape is shown in the down (insulative) position and a temporary mist system for a research project is shown hanging from and supported by the rail. The 1” rail also provided a matching offset to the 2” x 2” angle mount along the floor resulting in a clean, plumb installation of the polycarbonate panels around the corner braces.

Figure 13

Step 2: Polycarbonate Panel Installation

Installation of polycarbonate side wall sheets is shown in Figure 14. Each sheet sits in the H rail along polycarbonate base strip and is attached to the 1” square rail along top of the side wall with a J rail.

Figure 14

Figure 15 shows sheets of polycarbonate being fitted around electrical outlets.

Figure 15

The finished installation of polycarbonate sheets along entire side wall is shown in Figure 16. A complete, tight seal was achieved between the outer roll up fabric and inside heated air. Also visible is the corner brace and flat polycarbonate surface resulting from offsetting the panels.

Figure 16

Step 3: Polycarbonate-Energy Curtain Shoulder Seal
Figure 17 shows the customized poly shoulder (transition) seal creating a continuous shell between the ceiling energy curtain fabric and polycarbonate side wall insulation. The result is a complete envelope separating inside heated air from ceiling and side wall unheated air.

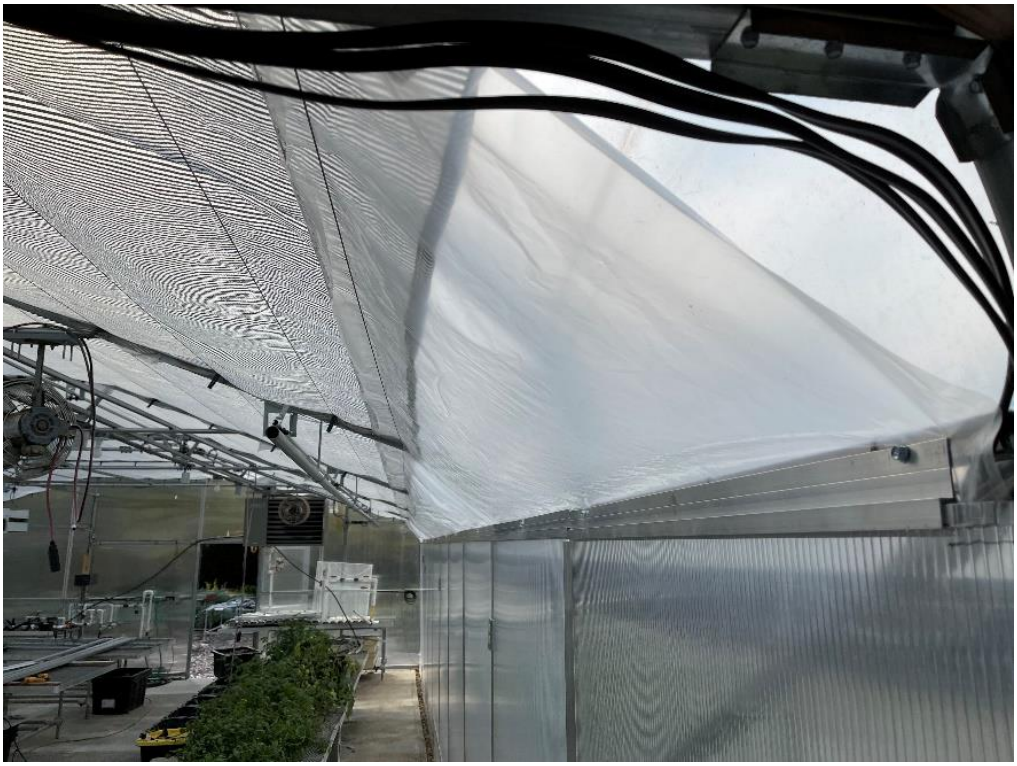
Figure 17

The poly shoulder seal seen in Figure 18 is held in place by the polycarbonate J rail attached to the 1” square support rail. It hangs below the J rail providing a tight, continuous seal under the polycarbonate sheets.


Figure 18

Figure 19 shows the completed view of the poly shoulder seal hanging behind the polycarbonate sheets forming a tight seal.


Figure 19

Full winter insulation is shown in Figure 20. From top to bottom; energy curtain fabric riding on top of shoulder seal poly, shoulder poly seal anchored behind J rail and polycarbonate side wall panels, polycarbonate side wall panels sitting in H rails along polycarbonate base strip, base strip buried in crushed stone to complete the continuous outer envelope of unheated air separated from the inside heated space.


Figure 20

Step 4: Spring/Fall Shoulder Season Ventilation
Figure 21 shows the roll up side vents during shoulder season operation. The picture shows fall ventilation mode where all polycarbonate sheets except two have been installed prior to the heating season. The last two sheets are installed when ridge vent operation alone becomes sufficient for greenhouse cooling and roll up side vents are deactivated (sealed) for the winter. This view also depicts how one or more panels would be removed during the early spring season to provide tempered side wall ventilation in conjunction with the ridge vent.


Figure 21

Comments
Several observations were made during the installation of this project as well as comments regarding seasonal management.

1. For standard (longer than 40 feet) greenhouses installing the polycarbonate sheets in landscape vs portrait orientation would reduce the number of panels and associated H rail joints.

2. Removing one or more polycarbonate panels for partial ventilation in spring is quite easy. Re-installing the last panel during fall season winterization is challenging depending on how tightly the panels were fitted. Fall installation of the last panel might be easier if it is trimmed to more loosely fit into place but not so loose as to allow a gap to open in the joint.

3. The next and final article in this series will present a cost analysis of the two systems (energy curtain, side wall insulation) installed in this greenhouse to maximize energy use efficiency.

4. Access to the side wall in terms of benches and bench height impacts ease of removal and replacement of the polycarbonate panels in spring and fall. Figure 21 shows my research setup along one side wall with benches lower than standard height providing convenient access.