Riga XL VI

Owner's Reference Manual

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PREFACE

Mark with crayon, cut with axe,
Pound to fit, and paint to match.

The axiom of rough construction

Your Riga XL is a precisely crafted structure that is manufactured to tolerances of one millimeter (0.039 inches). Rough construction techniques are not appropriate. As you assemble your Riga XL, please give it the care and consideration that it deserves.

Don't like to read instructions?
Prefer to figure out the details yourself?

Click here to skip the preliminaries and get started now.

ABOUT THIS DOCUMENT

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The Adobe Reader Navigation Pane

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The Page Thumbnails icon presents a sequence of clickable page images that you can scroll through to find a specific drawing or picture. Click the Options icon at the top left corner of the navigation pane to increase or decrease the thumbnail size.

Table of Contents

The Table of Contents is also presented inside the document. Click on an entry to view the page.

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Additional information for some items in this document is available by clicking on a hyperlink, which looks like this. Most hyperlinks in this document refer to bookmarked paragraphs elsewhere in the document but a few of them will display information from the Internet in your web browser. Internet hyperlinks are a different color. If your cursor hovers over an Internet hyperlink the address for the page will be displayed.

The More and Return Hyperlinks

Each step-by-step instruction is brief and to-the-point. Complex steps include a More hyperlink which you can click to see more details. Click the Return hyperlink to return to the step instructions.

Move backward or forward through your paging history

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Sit Back and Listen

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Table of Contents

INTRODUCTION

Welcome to the Exciting World of Riga XL Ownership

Congratulations on your wise decision to acquire a Riga XL greenhouse. You have chosen the finest personal greenhouse available.

This manual will guide you through all aspects of Riga XL ownership with special emphasis on assembly. Please read it thoroughly, even before you unpack your shipment, and refer to it throughout the assembly process. If you follow the instructions and use the recommended tools, you should be able to easily assemble the greenhouse by yourself.

Riga XL Models

All Riga XL models are identical in width and height but there are five different lengths. The model variations are identified by a Roman numeral suffix equal to the number of 1-meter length sections for that model.

The Riga XL VI is the standard 6-meter length and is the subject of this manual. Available by special order are the smaller Riga XL IV and Riga XL V, which are 4 and 5 meter lengths respectively. Also available by special order are the stretch models Riga XL VII, Riga XL VIII, and Riga XL IX, which are 7, 8, and 9 meters long respectively.

The models differ only in the lengths of the horizontal side profiles, the number of side glazing panels and curved center profiles (arches), the number of roof windows and window openers, and the quantities of supporting fasteners and seals. The horizontal side profiles for all models are one piece except those of the Riga XL IX which are two pieces spliced near the center. The IX model includes a robust welded aluminum truss for additional support of the roof beam at the splice.

Available Options

Three options and an accessory kit are manufactured for the Riga XL.

- A shelving kit to be installed along one wall.
- A door extension kit to lower one door if the greenhouse is built on a stem wall.
- An aluminum foundation frame to use if you want your greenhouse at grade level.
- Adjustable hanger accessory kit provides attachment points for plant support.

Two shelving kits are required if you want shelving on both sides, and two door extension kits are required if you want both doors lowered into stem wall openings.

Tools and Additional Materials You Will Need

Follow the assembly instructions in this manual and use the additional tools to make assembly easy and convenient for one person. If you have helpers you can get by with only the mandatory items.

Mandatory tools and materials

8-foot step ladder
#2 Phillips screwdriver
Bubble level 2 to 3 ft. long
Powered screw driver with #2 Phillips bits
Rubber mallet
28 anchor fasteners appropriate for your foundation substrate (must fit 3/8" hole)
Material to erect temporary bracing for the gables and roof beam

Recommended additional tools

10 millimeter socket wrench or nut driver
6-foot step ladder
Work table
At least three sawhorses
Rubber mallet
Industrial quality scissors to cut seal material
At least four clamps such as Irwin "Quick Grip"
Two adjustable hanger accessory kits **What is this?**
Window screen bead roller to help press in window and door seals
10-foot length of ½" EMT electrical metallic tubing (conduit) to use as a window prop

Recommended additional materials

Membrane to isolate the aluminum floor profiles from the foundation substrate **Why?**
Roll of 1-inch "Scotch blue painter's tape
Thread lubricant for self-tapping screws (a wax crayon will do)
Additional M6 stainless cap screws of appropriate length for future attachments to profiles
8 tether cables for window uplift restraints **Explain**

Tools and materials included in the Riga XL Essentials Kit

10 millimeter combination wrench
Metric measuring tape, 6 meters or longer
Two 10.1 fl. ounce tubes of medium modulus neutral cure clear silicone sealant **What is this?**
Roof beam fitment tool **What is this?**
Marking pen, such as Sharpie
At least two ratcheting cargo straps, 1-inch wide x 20 ft. long with double J-hooks **Why?**
16 UNC ¼-20 x ¾ inch stainless cap screws with nuts, and 24 ¼ inch stainless flat washers **Why?**
Stainless self-tapping Phillips pan head screws; four #10 x ¾ inch and four #8 x ¾ inch **Why?**
Drill bits; one each #31 (0.120 inch) and #27 (0.144 inch) for door holders
Four pieces of double sided mounting tape, ¾ by 2 inch, for door holders
36 M6 x 8 mm stainless cap screws **Why?**

RECEIVING INSPECTION

Your Riga XL came all the way from Germany without damage, but domestic motor freight will expose it to more serious hazards. Have a camera ready when your Riga XL is delivered and carefully inspect the packages for damage before the delivery driver leaves. The polycarbonate panels are most vulnerable; a gentle kiss from a fork lift tine can do serious damage.

Photograph any damage and describe it on both your copy and the driver's copy of the Bill of Lading. This evidence will be needed to file an insurance claim. Immediately notify Exaco Customer Service at (877) 760-8500 or (512) 407-8500.

Take Inventory

One of the most helpful things you can do to make your project go smoothly is to carefully inspect and inventory the materials in your shipment. This will familiarize you with the parts and give you time to replace any that are missing or damaged before you start construction. An illustrated check list is provided in this section to help make inspection easy and accurate. **Report any shortages or damage to Exaco Customer Service within 30 days.**

Your Riga XL VI will arrive on a very long pallet. Bound to the pallet are two large flat bundles of glazing, two curved wrapped bundles, and three long boxes. In addition to the pallet is a very long cardboard tube containing a fourth long box. If you ordered any accessories you will receive additional boxes or bundles. Some accessories, such as heaters, ventilators, and solar lights, might be shipped separately.

Start your inspection with Box 3 and continue with Box 2 and then Box 1. Inspect Box 4 last. Then open and inspect Arch bundles 1 and 2 and finish with the Glazing bundles.

Components are identified by Pos. numbers. The extruded aluminum components are referred to as *profiles*. Some of the extruded parts are referred by more specific names, such as *edge stay bar, crossbar, lateral supports, roof beam*, and *reinforcement bar*.

Box 3: Small Parts

Box 3 contains the small parts, most of which are fasteners. Several sizes of screws may be mixed in a single bag. Sort and count them, then put each size in an individual marked bag. Count carefully; extra screws are rarely provided.

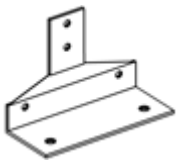
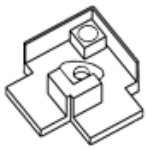
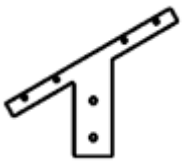
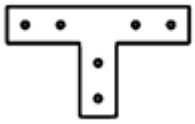
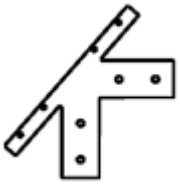
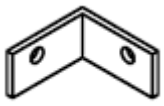
Illustration	Identifier and description	Quantity expected and where used	Quantity received
	**Pos. 6.7** Hold-down mounting bracket ***Not used if assembling on an optional aluminum foundation frame.***	**18** 8 for gables, 10 for side walls Fasten vertical profiles to floor profiles and anchor all to foundation	
	**Pos. 100** Plastic corner connector, black	**4** 1 at each floor profile corner to join profiles with edge stay bar	
	**Pos. 101** Straight connector plate	**4** Gables, fasten crossbars above doors	
	**Pos. 102** Slanted T-connector plate	**4** Gables, fasten edge stay bars to vertical door profiles	
	**Pos. 103** T-connector plate	**8** Gables, fasten lower crossbars between vertical door and middle profiles	
	**Pos. 104** K-connector plate	**4** Gables, fasten vertical middle profiles and crossbars to edge stay bars	
	**Pos. 105** Floor profile connector	**4** Floor profile, connect inside corners	
	**Pos. 107.12** Set of M6 x 12 mm hex head cap screw with nut	**188** 92 for gable connector plates, 16 for gable mounting brackets, 44 for floor profiles, 28 for side wall arches, 8 for window crossbars	
	**Pos. 107.16** Set of M6 x 16 mm hex head cap screw with nut	**36** 8 for gables, 2 for side wall arches, 8 for window crossbars	
	**Pos. 108** M6 flat fender washer	**28** Used under M6 nuts that fasten lateral supports to curved profiles	

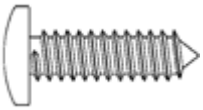
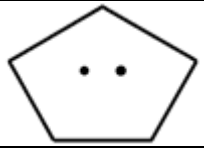
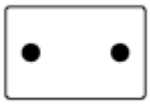
Illustration	Identifier and description	Quantity expected and where used	Quantity received
	**Pos. 110** Insulation seal, 6 x 8 mm thick shipped as dual-strand coil. Separate the strands and cut lengths to fit.	**1 dual-strand coil** Install in gap inside greenhouse between glazing and floor profile, 20 places.	
	**Pos. 111** Phillips head screw, 4.2 x 13 mm pan head	**12** 4 for roof beam end cap cover plates, 8 to fasten gable profiles to floor profiles	
	**Pos. 112** Phillips head screw, 4.2 x 60 mm flat head ***Caution! Do not confuse with Pos. 142 which is a 4.2 x 50 mm pan head screw.***	**64** 8 on each of 2 top and 2 bottom doors, 8 on each of 4 roof windows	
	**Pos. 113** Phillips head screw, 4.8 x 16 mm pan head	**16** Fastens floor profile corner connector covers (Pos. 116) 4 places	
	**Pos. 114** Roof beam end cap cover plate	**2** Covers and retains the roof beam ends	
	**Pos. 115** Connector plate **NOTE: Might be bundled with large connector plates, Pos. 101 through 104.**	**8** Retains crossbars under roof windows	
	**Pos. 116** Floor profile corner connector cover. **NOTE: Might be bundled with large connector plates, Pos. 101 through 104.**	**4** Reinforce floor profile corners Fasten with 4.8 x 16 mm Phillips pan head screw (Pos. 113)	
	**Pos. 117** Phillips head self-drilling screws, 3.5 x 13 mm pan head	**32** Fastens K-connectors & slanted T-connectors (Pos. 102 & 104) to edge stay bars	
	**Pos. 126, Pos. 138, Pos. 153 combined** T-seal, cut from coil as required to fit	**1 coil** Weather seal for roof windows and doors	
	**Pos. 127A** Plastic corner connector, black, used at upper left and lower right window and door corners	**14** 2 for each of 4 roof windows 2 for each of 2 bottom doors 1 for each of 2 top doors, upper corners only	

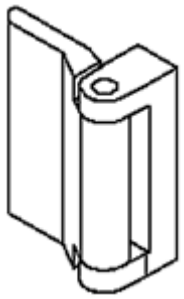
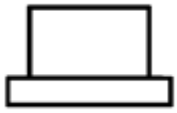
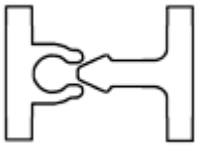
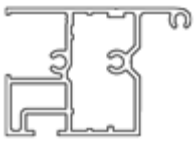
Illustration	Identifier and description	Quantity expected and where used	Quantity received
	**Pos. 127B** Plastic corner connector, black, used at upper right and lower left window and door corners	**14** 2 for each of 4 roof windows 2 for each of 2 bottom doors 1 for each of 2 top doors, upper corners only	
	**Pos. 135** Hinge set, black	**8** 2 for each of 2 bottom doors 2 for each of 2 top doors	
	**Pos. 136** Sash lock, black	**4** 1 for each of 2 bottom doors 1 for each of 2 top doors	
	**Pos. 137** End cap for rectangular tube, black	**4** 1 at each end of 2 rectangular tubes (Pos. 47) on bottom doors	
	**Pos. 139** Phillips head screw, 4.8 x 25 mm flat head	**16** Fasten 4 door hinges to each of 2 right vertical door profiles (Pos. 7)	
	**Pos. 140** Phillips head screw, 4.8 x 16 mm flat head	**16** Fasten 2 door hinges to each of 4 door frame profiles (Pos. 42 & 45)	
	**Pos. 141** Phillips head screw, 3.5 x 22 mm flat head	**8** Fasten 1 sash lock to each of 4 door frame profiles (Pos. 43 & 44)	
	**Pos. 142** Phillips head screw, 4.2 x 50 mm pan head ***Caution! Do not confuse with Pos. 112 which is a 4.2 x 60 mm flat head screw.***	**8** 4 (2 each door) to fasten rectangular tube (Pos. 47) to bottom door frame profiles (Pos. 46). 4 (2 each gable) to fasten crossbar to vertical door profiles	
	**Pos. 143** Glazing block, white, 30mm x 16mm x 4mm	**16** 2 for each of 4 roof windows 2 for each of 2 top and 2 bottom doors	
	**Pos. 150** Door lever sets, 8 boxed components	**2** Door lever sets for each of 2 top doors	

Illustration	Identifier and description	Quantity expected and where used	Quantity received
	**Pos. 158** Two-part door holder set	**2** 1 set at each of 2 top doors	
	**Pos. 159** Phillips head screws, 3.5 x 16 mm pan head	**8** Intended to fasten door holder sets (Pos. 158) but these screws are incorrect. Instead use #10 x ¾ inch Phillips pan head for the male part and #8 x ¾ inch Phillips flat head for the female part.	
	**(No Pos. assigned)** Automatic window opener assembly	**4** 1 opener for each of 4 windows	

Box 2: Window and Door Profiles

Box 2 contains the profiles to construct four roof windows and two each upper and lower Dutch doors. All of the window and door profiles except Pos. 43 and Pos. 47 are cut from the same extrusion, differing only in length and borings for hinges or other attachments. Except for Pos. 43 and Pos. 47, the profiles are conveniently bundled as follows:

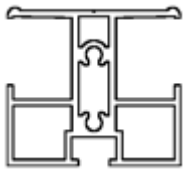
Four window bundles, each with two Pos. 34 and two Pos. 35.
Two lower door bundles, each with one Pos. 44, one Pos. 45, one Pos. 46, and one Pos. 48.
Two upper door bundles, each with one Pos. 41 and 1 Pos. 48.

Cross section	Identifier and description	Quantity expected and where used	Quantity received
	**Pos. 34** Roof window profile, 865 mm long	**8** Top and bottom of each of 4 roof windows	
	Pos. 35 Roof window profile, 993 mm long	**8** Left and right sides of each of 4 roof windows	
	Pos. 41 Upper door profile, 949 mm long, edge bored for latch and sash lock	**2** Left side of each of 2 upper doors	
	Pos. 42 Upper door profile, 949 mm long, bored for hinges	**2** Right side of each of 2 upper doors	
	Pos. 44 Lower door profile, left side, 887 mm long, bored for sash lock	**2** Left side of each of 2 lower doors	
	Pos. 45 Lower door profile, right side, 887 mm long, bored for hinges	**2** Right side of each of 2 lower doors	
	Pos. 46 Lower door profile, top side, 864 mm long, bored to attach rectangular tube	**2** Top of each of 2 lower doors	
	Pos. 48 Upper and lower door profile, 864 mm long	**4** Top of each of 2 upper doors and bottom of each of 2 lower doors	
	**Pos. 43** Upper door profile, bottom side, 864 mm long, bored for lever set	**2** Bottom of each of 2 upper doors	
	**Pos. 47** Rectangular tube, 933 mm long, 2 holes bored on one face	**2** Attach to Pos. 46 to fill space at top of each lower door	

Box 1: Profiles for Gables

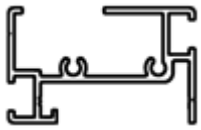
Box 1 contains the straight vertical and horizontal profiles used for the two gables, and the crossbars used beneath the roof windows. All of these profiles are cut from the same extrusion, differing only in length, end finishing, and borings.

The gable floor profiles are contained in Box 4.

Cross section	Identifier and description	Quantity expected and where used	Quantity received
	**Pos. 4** Vertical profile, middle left, 1929 mm long, 50° top angle	**2** Vertical profile midway between left side door jamb and right outside corner of greenhouse	
	Pos. 5 Vertical profile, middle right, 1929 mm long, 50° top angle	**2** Vertical profile midway between right side door jamb and right outside corner of greenhouse	
	Pos. 6 Vertical door profile, left, 2641 mm long, 30° top angle, bored for 4.2 x 50 mm crossbar screw (Pos. 142)	**2** Vertical profile used as left side door jamb in each of two gables	
	Pos. 7 Vertical door profile, right, 2641 mm long, 30° top angle, bored for 4.2 x 50 mm crossbar screw (Pos. 142) and hinges	**2** Vertical profile used as right side door jamb in each of two gables	
	Pos. 8 Crossbar, 952 mm long, identical to Pos. 25	**10** Five horizontal glazing supports in each of two gables	
	Pos. 25 Crossbar, 952 mm long, identical to Pos. 8	**4** Support top edge of side wall glazing beneath each of 4 roof windows	

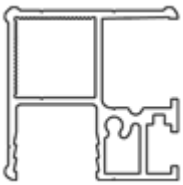
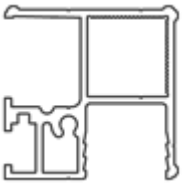
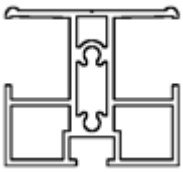
Box 4: Long Profiles

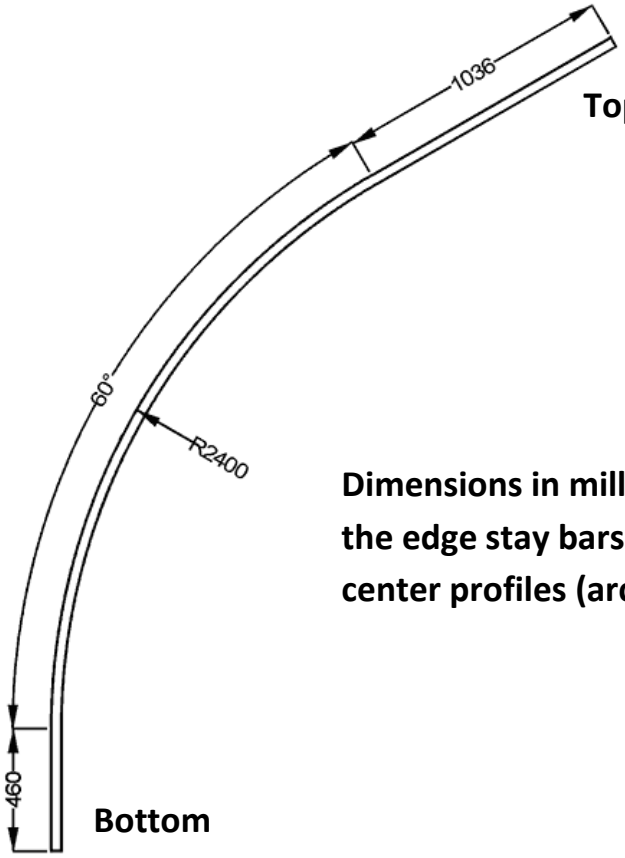
Box 4 is shipped inside of a heavy cardboard tube for additional protection during shipment. This box contains the longest straight parts; the floor profiles, the lateral supports, the roof beam, and the roof beam reinforcement bar.

Cross section	Identifier and description	Quantity expected and where used	Quantity received
	**Pos. 1** Gable floor profile, 4145 mm long	**2** 1 for each of 2 gables, retains bottom end of all vertical profiles	
	Pos. 18 Floor profile for side walls, 5903 mm long	**2** 1 for each of 2 side walls, retains bottom end of all curved center profiles (arches)	
	**Pos. 22** Lateral supports, 5960 mm long	**4** 2 for each of 2 side walls, these full length horizontal braces index the position of the curved center profiles and provide longitudinal resistance to wind forces. They also provide attachment points for shelving and plant support systems.	
	**Pos. 28** Roof beam, 6002 mm long	**1** Main support beam at greenhouse ridge, also anchors top ends of edge stay bars and curved center profiles (arches)	
	**Pos. 31** Roof beam reinforcement bar, 5960 mm long (will be bound to the roof beam)	**1** Fortifies the roof beam and provides M6 cap screw capture slots to attach plant support systems	

Arch Bundles 1 and 2: Curved Profiles

There are two models of curved profiles. The curved center profiles (Pos. 19) form the arched framing for the side walls, and the edge stay bars (Pos. 2 and 3) form the arches of the gables. The curved center profiles are all identical, but the edge stay bars come in left and right configurations.

Cross section viewed from top	Identifier and description	Quantity expected and where used	Quantity received
	**Pos. 2** Edge stay bar, right side (also known as right edge clamp or right gable arch)	**2** Right side of each gable as viewed from outside the greenhouse	
	**Pos. 3** Edge stay bar, left side (also known as left edge clamp or left gable arch)	**2** Left side of each gable as viewed from outside the greenhouse	
	**Pos. 19** Curved center profile (also known as center clamp or side wall arch)	**10** Side walls between the two gables	



Dimensions in millimeters of the edge stay bars and curved center profiles (arches).

Glazing Bundles 1 and 2

There are eight shapes of polycarbonate glazing panels, two of which exist in both left and right side version. All panels are 16 mm thick triple-wall. The illustration is as viewed from outside the greenhouse, looking at the ultraviolet-protected face.

Do not store glazing where any portion of it will be exposed to direct sunlight.

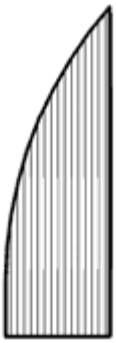
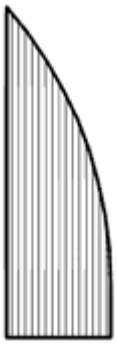
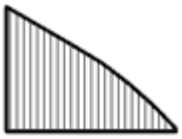
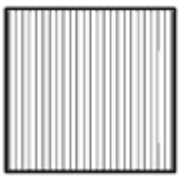
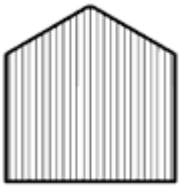
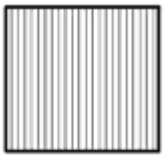
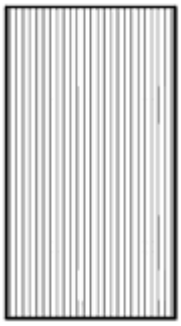
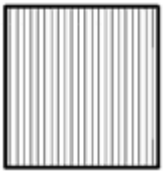
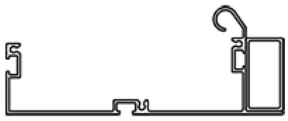
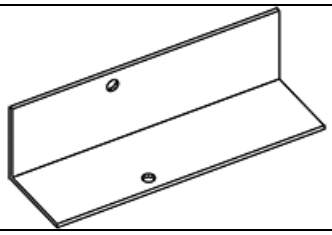
Illustration (Not to scale)	**Overall dimensions (width x height) in millimeters**	**Quantity expected and where used**	**Quantity received**
	**602 x 1922** **Curved glazing panel**	**2** Left outer cell of each gable	
	**602 x 1922** **Curved glazing panel**	**2** Right outer cell of each gable	
	**980 x 727** **Curved glazing panel**	**2** Upper left inner cell in each gable	
	**980 x 727** **Curved glazing panel**	**2** Upper right inner cell in each gable	
	**980 x 944**	**8** Four inner cells either side of door in each gable	
	**980 x 1008** **5-sided glazing panel**	**2** Cell above door in each gable	

Illustration (Not to scale)	**Overall dimensions (width x height) in millimeters**	**Quantity expected and where used**	**Quantity received**
	**888 x 835**	**4** Top and bottom door panels in each gable	
	**980 x 3893**	**8** Side wall bays without roof windows	
	**980 x 2830**	**4** Side wall bays with roof windows	
	**888 x 943**	**4** Roof window panels	

Options and Accessories

Aluminum foundation frame

Cross section or illustration	Identifier and description	Quantity expected and where used	Quantity received
	**Pos. 6.1** Foundation frame profile for gables, 4100 mm long	**2** Supports each gable floor profile	
	Pos. 6.2 Foundation frame profile for sides, 5858 mm long	**2** Supports each side wall floor profile	
	**Pos. 6.3** Foundation corner connector, 40mm x 40mm x 135mm (1 mm thick)	**4** At each corner of the foundation frame	
	**Pos. 6.4** Hold-down plate	**18** Connect each vertical profile to the foundation frame	
	**Pos. 117** Phillips head self-drilling screw, 3.5 x 13 mm pan head	**20** Four for each gable floor profile and six for each side floor profile to fasten the profile to the foundation frame	
	**Pos. 107.12** Set of M6 x 12 mm hex head cap screw with nut	**44** Two to fasten each corner connector to foundation profiles (4 places), two to fasten each hold-down plate to vertical profile and foundation frame (18 places)	

Shelf kit

This is preliminary information will be completed a future release of this manual.

A new style shelf system for Riga greenhouses began shipping in 2012. The suspension chains of the older system have been replaced by brackets attached to the arches.

Door extension kit

This preliminary information will be completed in a future release of this manual.

A kit is available for a Riga XL built on a stem wall. Use the door extension kit to relocate the doorway 500 millimeters downward for easy entry through the stem wall.

Adjustable hanger accessory kit?

The adjustable hanger accessory kit is an assortment of parts to install hooks on the roof beam reinforcement bar, or on any of the lateral supports. In fact the hooks can be installed in the screw capture slot of any profile. A kit includes parts for five hanging points.

In addition to hanging things, the components of the hanger kit can be helpful during assembly.

WHAT YOU SHOULD KNOW BEFORE STARTING TO ASSEMBLE

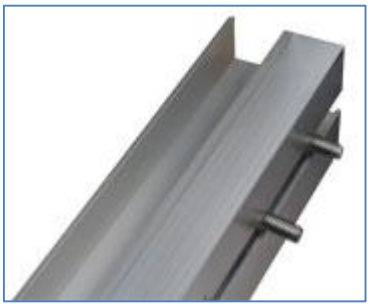
About the Assembly Step Drawings

*By the manufacturer's convention, parts with left or right designations are as viewed from **outside** the greenhouse. All drawings in the assembly steps of this document that illustrate left or right parts are viewed from **inside** the greenhouse because this is where the assembly work is done, therefore left and right callouts will always be reversed.*

Components in the drawings that are gray-shaded have been installed in a previous step. Active components of the step are highlighted red.

Callouts in the drawings for M6 screws will not appear in drawings for subsequent steps if they have fastened the parts they support.

About the Captive M6 Hex Head Cap Screws



Most of the greenhouse fasteners are M6 (diameter 6 millimeters) stainless steel hex head cap screws, each with a companion nut. Washers are not used except when fastening the lateral supports (Pos. 22). Historically all provided M6 cap screws have been 16 millimeters long (M6x16) but the trend is moving to 12 millimeter length (M6x12). Shipments may include a surplus of M6x16 during the transition.

The M6 screws are loaded into capture slots in the various profile extrusions. All of these slots, and consequently all M6 screws, face the interior of the greenhouse. The M6 screws are loaded into the slots from the open ends and should therefore be loaded before the profile is secured in place. Loading a screw after the profile is in place is inconvenient and may require some disassembly.

A special M6x16 cam head screw (also known as T bolt) can be loaded anywhere in a capture slot. The head can be oriented to pass into the slot then turned right to bind against the slot walls. Contact your Riga dealer or Exaco customer service to order these screws.

As a last resort, afterthought screws can be accommodated by cutting a strategically located loading port in the capture slot flanges. Click **here** for more information.

About Loading Extra Screws

Loading extra M6 screws of appropriate length is recommended where there might be future needs. Wood substrates (typically ¾ inch thick) to support heating / ventilating equipment and associated electrical distribution components can be attached to vertical profiles with M6x40 cap screws.

Non-metric cap screws can also be used to mount accessories. A UNC ¼-20 cap screw can be loaded in the capture slots of all profiles except the roof beam reinforcement bar. A UNC ¼-20 cap screw must be loaded from the open end of the profile; it will not fit through a loading port.

About Connecting Vertical Profiles to Floor Profiles

The vertical profiles have machined slots that engage with the floor profiles. Engage the vertical profile at one end of a floor profile and slide it into position. Keep the profile reasonably square with the floor profile to prevent binding. The curved vertical profiles of the side walls are more difficult to maneuver because they also engage with the roof beam, and both joints must slide in unison. If the vertical profile binds during movement it can be restored to a non-binding position by gentle taps with a rubber mallet.

The curved vertical profiles of the side walls are fastened to the floor profiles and to the substrate by the mounting brackets (Pos. 6.7). The vertical profiles of the gable walls are initially fastened to the floor profiles with 4.2 by 13 mm self-tapping Phillips head screws and ultimately by mounting brackets.

About Self-Drilling and Self-Tapping Stainless Steel Screws

The provided self-tapping and self-drilling screws, often referred to as sheet metal screws, are made of stainless steel. This alloy is relatively soft and has a tendency to gall under thread pressure. To assure that these screws are safely driven please consider the following suggestions:

- Use a Phillips bit that fits the screw tightly with no wobble.
- Apply wax or other thread lubricant to both the screw and the hole before driving.
- Drive straight in; do not allow the driver to drift from perfectly square alignment.
- Maintain force on the screw; do not allow the bit to cam out.
- Set the driver for a low torque and increase no more than absolutely necessary.
- Impact drivers are better than clutch-release drivers.

The 4.2 by 13 mm screws (Pos. 111) that fasten the gable vertical profiles to the floor profiles are in an awkward location for driving. The screw will be damaged if you allow the Phillips bit to cam out even once, and you will be unable to continue driving the screw in either direction.

If you should need additional screws in a hurry try your local hardware store. Sheet metal screws available in numbered sizes are reasonable equivalents to the provided metric self-tapping and self-drilling Phillips head screws. **Always use stainless steel screws in a greenhouse environment.**

Provided Metric Screw	Replacement Number-Size Screw
3.5 x 13 mm	**#6 x $^{1}/_{2}$ inch**
3.5 x 16 mm	**#6 x $^{5}/_{8}$ inch**
3.5 x 22 mm	**#6 x $^{7}/_{8}$ inch**
4.2 x 13 mm	**#8 x $^{1}/_{2}$ inch**
4.2 x 50 mm	**#8 x 2 inch**
4.2 x 60 mm	**#8 x 2 $^{5}/_{8}$ inch**
4.8 x 16 mm	**#10 x $^{5}/_{8}$ inch**
4.8 x 25 mm	**#10 x 1 inch**

About the Polycarbonate Glazing Panels

The glazing surface is protected by a removable film on both sides. The film can be left in place briefly after installation but must be completely removed by the end of the workday. Exposure to sunlight will polymerize the adhesive, making removal difficult.

Do not store the glazing in the presence of sunlight.

One face of the polycarbonate glazing is treated for protection against ultra-violet exposure. **How will this affect my plants?** This face, which is clearly identified on the protective film, must be on the outside of the greenhouse. It is prudent to mark this face at an inconspicuous edge before the protective film is completely removed. Experienced installers peel the protective film back from the edges only as needed to stay clear of the retaining slots, and install with the film still in place. This helps prevent scuffing as the glazing is being worked into position, and the printed film that identifies the UV protected face is visible for post-assembly inspection to confirm proper orientation.

The glazing panels are properly oriented when the interior cells are vertical and the ultra-violet defense face is outside the greenhouse.

Some of the glazing panels might have cutting chips in the cells. If appearance is important to you, blow the chips out with an air stream before assembly.

About Anchoring to Concrete

Use of non-removable anchors such as concrete wedge anchors can make subsequent repairs to floor profiles, vertical profiles, or side glazing much more complicated. Please read **Anchoring to Concrete** for a solution to this problem.

About Window Uplift Restraints

A strong gust of wind can exert enormous upward force on a partially opened window, damaging the opener and possibly the window. Consider installing restraints to limit the upward window travel to 330 millimeters (about 13 inches). Extra screws for the restraints are suggested in assembly steps 1 and 11. Uplift restraints are aftermarket parts that are available from your Riga dealer, but you might have to ask for them. They are not a standard part from the Riga manufacturer. Click **here** to learn more about uplift restraints.

FOUR THINGS YOU CAN DO TO STAY OUT OF TROUBLE

It is easy to make some mistakes that will lead to serious problems that are difficult to reverse. Please give your best attention to the following:

Erect Sturdy Bracing for Gables and Roof Beam

An improperly braced gable can easily be toppled by a light gust of wind. A fallen roof beam will be damaged beyond repair, and if engaged with a gable will destroy the edge stay bars. Please erect sturdy bracing to prevent costly accidents. Here are some examples:

Seal the Roof Windows Before Installing Them

The roof windows must have a bead of silicone sealant applied over the outer glazing-to-aluminum interface. Failure to do this guarantees plentiful rainwater leakage into the greenhouse. It is very difficult to seal the windows in place, but practically impossible to remove them for worktable sealing.

Drive the Plastic Corner Connectors Fully Into the Edge Stay Bars

An improperly seated corner connector (Pos. 100) will disrupt the alignment of its corresponding gable and side wall, but you might not notice this until it is too late to fix the problem. Follow the instructions in assembly **Step 10** to avoid this problem.

Engage a Roof Beam Fitment Tool before Fastening the Edge Stay Bars

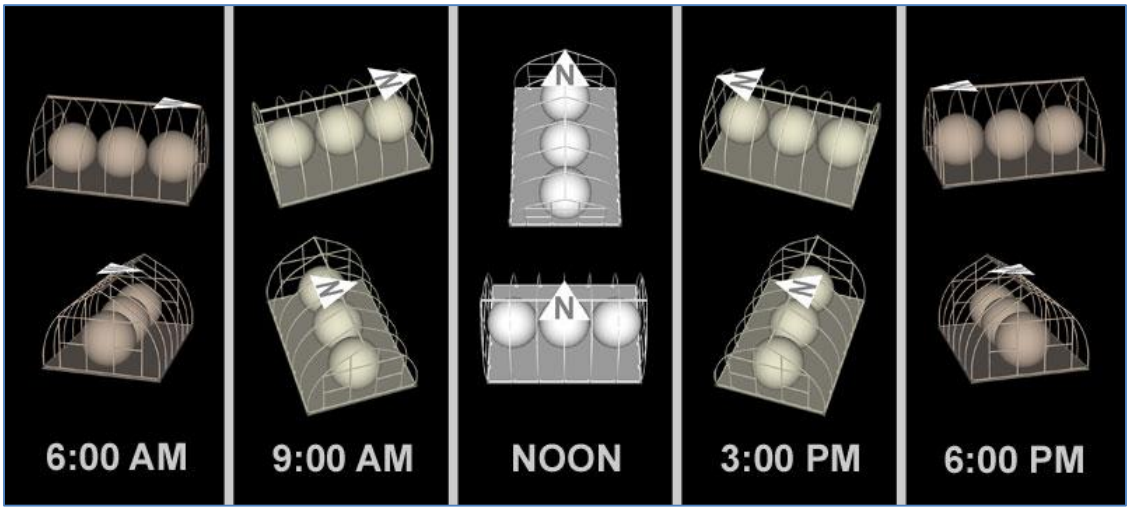
The edge stay bars (gable arches) are fastened to the slanted T and K connectors with self-drilling screws in Step 10. Once fastened, you will be unable to make fine adjustments to the position of their upper ends as you later attempt to engage the roof beam. Avoid these problems by engaging a roof beam fitment tool, or the roof beam itself, before driving the self-drilling screws.

SITE PREPARATION

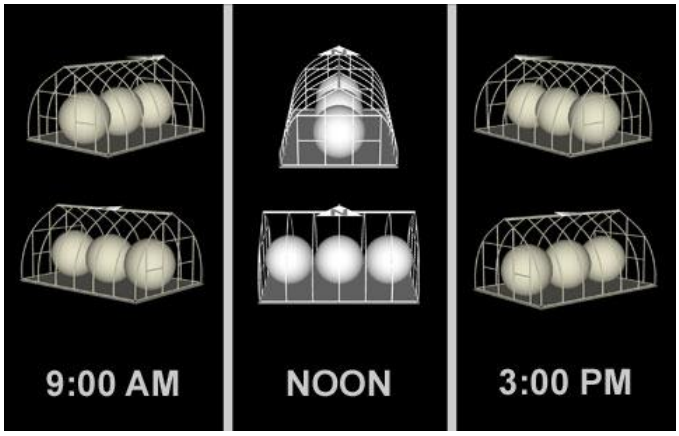
Orientation

Optimal orientation for a greenhouse is that which maximizes sunlight exposure throughout the day or throughout the season. The images below illustrate a six-meter Riga XL viewed along the path of incident sunlight (as if being viewed from the sun) at specific times of day. Use these views to estimate which orientation presents the largest target for sunlight during your preferred growing period. Keep the following in mind as you plan your orientation:

- Compared to mid-day sunlight, morning and afternoon light is subdued because it must travel much greater distances through the atmosphere. This is called extinction.
- Light that strikes perpendicular to the glazing surface is admitted with less loss than that which strikes at an oblique angle. The curved sides are better optical surfaces than the gables.
- If plant rows are aligned with the greenhouse length, the north-south orientation favors summer growing because it accommodates balanced exposure on both sides of the rows.
- The east-west orientation favors winter growing because it presents a larger target to mid-day sunlight and admits more light and heat. Balancing row exposure is not practical during winter.



Incident sunlight for North-South and East-West orientations at the summer solstice, 46.6° latitude (Seattle)



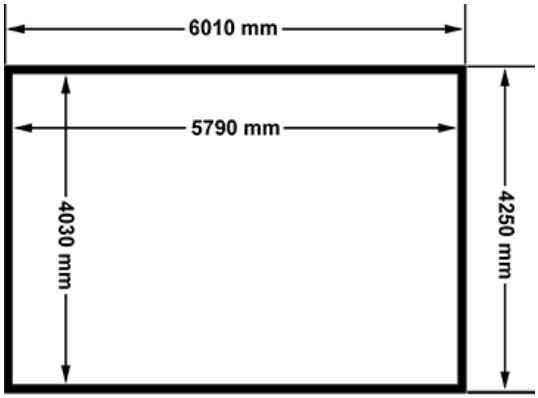
Incident sunlight for North-South and East-West orientations at the winter solstice, 46.6° latitude (Seattle)

Foundation

A foundation consists of subsurface footings or piers and a substrate that is at or above grade level. Your Riga XL requires a stable, robust foundation with a substrate that is flat, level, and square. Footings are always made of cast concrete while piers can be either concrete columns or wood posts set in concrete. The bottoms of footings and piers must be well below the ground frost line. Descriptions of some popular foundations and substrates follow.

Greenhouse dimensions

The footprint of your six-meter-long Riga XL VI forms a rectangle with the dimensions shown. The thickness of this footprint includes the floor profiles and mounting brackets, which must be anchored to the substrate. The substrate must provide additional space both inside and outside of the footprint to accommodate construction and placement tolerances and to keep the anchors a safe distance from the inside edge.

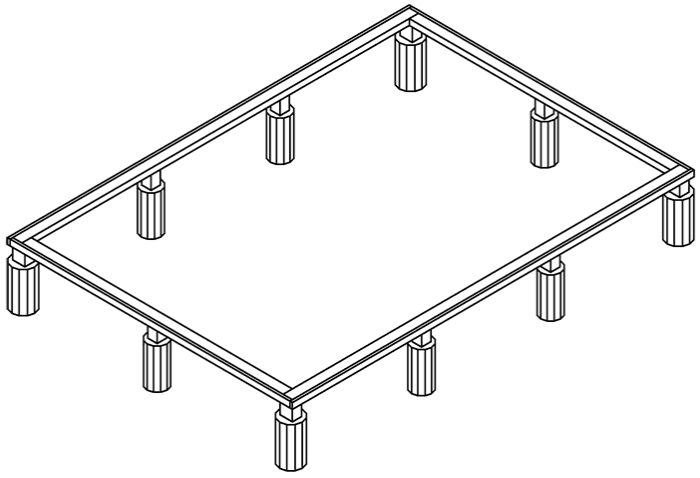


Substrate elevation

A substrate and floor at grade level accommodates a simple entry into the greenhouse, but might not provide adequate drainage and protection against water intrusion. A slightly raised substrate with a raised floor, improves these issues. The floor can be as simple as a layer of crushed rock.

Pier and beam foundation

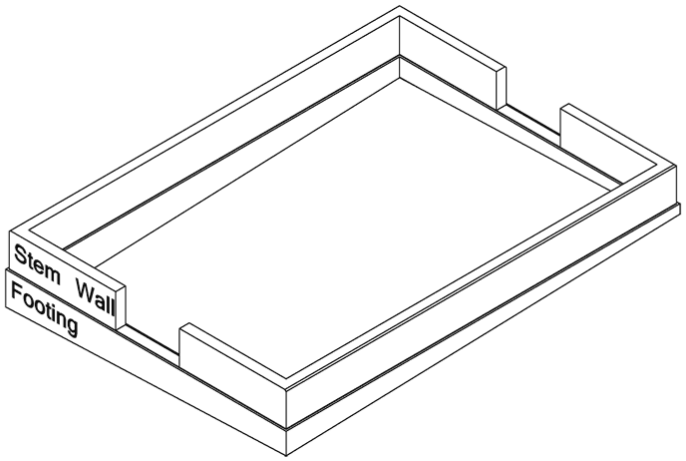
Pier and beam foundations are made mostly of wood, but usually include some concrete. The substrate on which the greenhouse rests is formed by wood beams supported by vertical piers. The piers can be concrete columns or wood posts set in concrete. Wood components must be chemically treated to retard deterioration caused by ground contact. For improved longevity the wood components should be elevated above ground level, even if they are treated. A pier and beam foundation constructed in this way could be considered a very low stem wall.



Pier and beam foundation with piers set in concrete below grade

Stem wall foundation

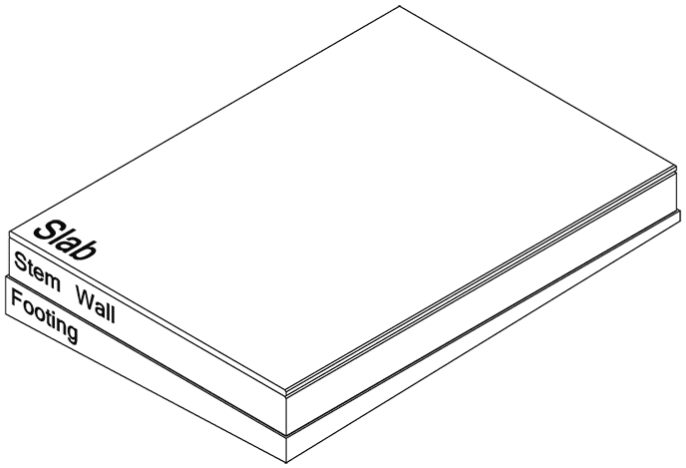
A stem wall is a low wall made of wood, grouted concrete blocks, or cast concrete. It is a solution for sloped sites. The wall elevates the greenhouse well above the floor level to provide additional interior height. This requires modifying the Riga door openings to extend them down to floor level. A kit is available to extend the door for a standardized stem wall height of 500 millimeters (19.69 inches). The profiles included in the kit can be cut for heights less than 500 millimeters.



Concrete stem wall foundation with door openings

Concrete slab foundation

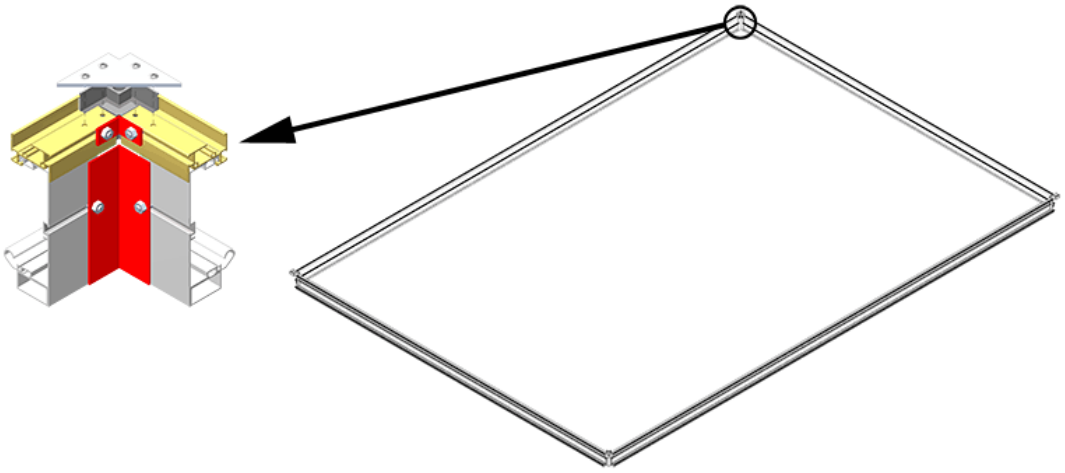
A concrete slab is usually cast at grade level but can also be elevated. An elevated slab is formed by first building a concrete stem wall. The volume within the wall perimeter is then filled with compacted sand, and the slab is cast over the entire upper surface.



Raised slab foundation

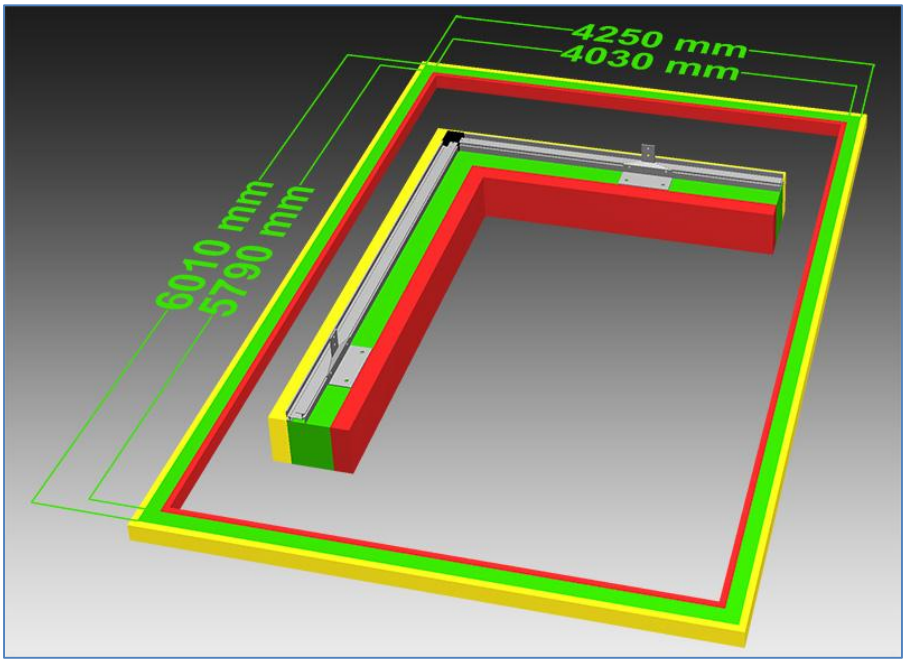
Aluminum foundation frame

A grade-level foundation can be implemented with an optional aluminum foundation frame made specifically for the Riga XL. The frame is buried with the greenhouse floor profiles already attached, and then the greenhouse is erected on the floor profiles. The frame cannot elevate any portion of the greenhouse above grade and is therefore appropriate only for sites that are perfectly level. With this foundation the grade becomes the greenhouse floor.



Optional aluminum foundation frame with floor profiles

Substrate Dimensions



The overall substrate dimensions are the combination of several dimensions. Only the overall greenhouse dimensions are specified by the manufacturer. You must calculate the others.

- **The anchor zone** is occupied by the Riga's floor profiles and mounting brackets and is 110 millimeters across. Margins must be added to its edges to set the final substrate dimensions.
- **The inner margin** extends inward beyond the anchor zone to keep the mounting bracket anchors a safe distance from the inner substrate edge.
- **The outer margin** extends outward beyond the anchor zone to keep the floor profiles a safe distance from the outer substrate edge.
- **To determine the size of the substrate** first determine the margins by considering the accuracy to which your substrate can be constructed, and to which you can place the greenhouse on it. Combine the margin dimensions with the anchor zone dimensions to obtain the substrate dimensions.

Determining the inner margin

The mounting brackets are fastened to the substrate by anchors, such as wedge anchors for concrete or lag bolts for wood. The anchors should be alloy 316 stainless steel, $^{3}/_{8}$ inch trade size. Consult the anchor manufacturer's specifications to determine the minimum edge distance. Extend the substrate from the mounting bracket holes by at least this distance plus additional safety margin to compensate for expected construction and placement errors. This forms the inner margin.

Determining the outer margin

The outer margin is determined by two distances; compensation for expected construction and placement errors and the minimum amount of reveal you want wherever the errors occur.

If your greenhouse doors are extended downward into a stem wall, the outer margin will interfere with fully opening the doors. Try to minimize the outer margin size and chamfer the corners of the door opening.

A simplified example

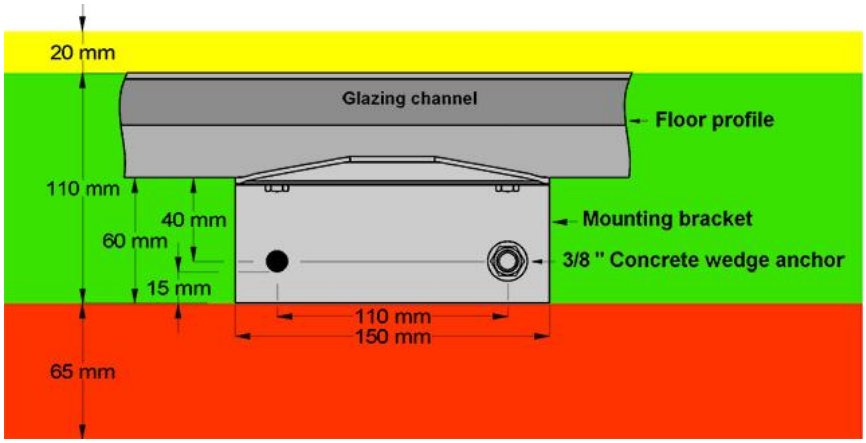
This is a simplified example, not a specification. *A professionally designed substrate would include additional features, such as chamfered edges, that would require larger margins.*

- Let's presume your foundation contractor has promised that the substrate will be straight and square within ± ½ inch of the specified dimensions. The substrate will be cast concrete.
- You are confident that you can place the greenhouse on the substrate keeping the sides perfectly straight and the footprint perfectly square. You have thus decided to add no additional safety amount to the substrate dimensions to tolerate placement errors.
- You have selected concrete wedge anchors whose specified minimum edge distance is 2 $^{5}/_{8}$ inches.
- You have decided to add an additional ¼ inch reveal to the outside margin so the floor profiles will never be closer than this distance to the outside edge in places where the maximum errors occur.
- You will work in metric units to simplify the arithmetic and to avoid making mistakes when trying to combine fractional values. The final substrate dimensions will be expressed in inches for the benefit of your foundation contractor.

The inner margin

The inner edge of the 10 mm anchor holes in the mounting brackets is 15 millimeters inside of the anchor zone. The inner margin must extend 3 $^{1}/_{8}$ inches from this point (2 $^{5}/_{8}$ inches for the minimum edge distance plus ½ inch for the error tolerance). Consider this to be 80 millimeters.

The anchor holes are 15 millimeters back from the edge of the anchor zone so you need to extend only 65 millimeters more to form the 80 millimeter inner margin.



The outer margin

Combine the ½ inch expected error with your ¼ inch minimum reveal and call it 20 millimeters. You need to extend this distance from the outer edge of the anchor zone to form the outer margin.

The final substrate dimensions

The inner anchor zone dimensions are reduced by 130 millimeters (65 millimeters inward each side) to become 5630 millimeters by 3870 millimeters (5790 - 130 = 5660, 4030 – 130 = 3900). Convert to inches and round down to ¼ inch. **The final inner dimensions are 222 ¾ inches by 153 ½ inches.**

The outer anchor zone dimensions are increased by 40 millimeters (20 millimeters outward each side) to become 6050 millimeters by 4290 millimeters (6010 + 40 = 6050, 4250 + 40 = 4290). Convert to inches and round up to ¼ inch. **The final outer dimensions are 238 ¼ inches by 169 inches.**

Your anchor zone is 4.33 inches across. The substrate with the added margins is 7 ¾ inches across.

Isolation Membrane

Unless you use the optional aluminum foundation frame for your Riga XL, the substrate material will probably be concrete or pressure-treated alkaline copper quaternary ammonium (ACQ) lumber. ACQ is incompatible with aluminum. Prolonged contact will lead to corrosion. Prolonged contact between concrete and aluminum may cause abrasion and, in rare cases, electrolysis. In either case you should isolate the aluminum floor profiles and mounting brackets from the substrate material.

You can isolate the aluminum by applying a membrane to the substrate before you place the floor profiles. Some suitable products are Grace Vycor® Plus, Grace Vycor® V40, and Protect Wrap BT25-XL. If you wish to prevent rainwater from seeping beneath the floor profiles, consider using a thicker compressible membrane, such as Owens Corning Foam Seal, that functions as a gasket.

Isolation membrane beneath floor profile and mounting bracket

The membrane should be at least three inches wide and centered under the floor profiles. Excess portions can be trimmed away after the floor profiles are fastened in place. The outside edges of a foam membrane should be painted or sealed after trimming to resist degradation in sunlight.

Protect the membrane by restraining the floor profiles. Moving a profile over the membrane while building the gables and side walls can lift or tear portions of it.

STEP-BY-STEP ASSEMBLY GUIDE

The assembly guide, summarized below, is presented in brief steps with pictures and detailed drawings. Supplemental instructions are available for builders who prefer closer guidance and clarification of details (click the **More** button). Do not begin a step until the previous steps are complete.

Some of the assembly steps will differ if your Riga is built on the optional aluminum foundation frame. ***Click here*** *to view the foundation frame assembly instructions.*

Summary of Assembly Steps

Steps 1 and 2: Assemble the roof windows and doors.

Assembling windows and doors is a good starting point because it helps initiate the builder and can be done indoors. The doors are the final items to be installed, but the roof windows must be ready for installation during Step 16.

Steps 3 through 10: Build the first gable.

The gable (end wall) can be assembled in place in its normal vertical position or if space permits it can be assembled horizontally on a flat surface with the interior face upward, and then tilted into position. Click **here** for suggestions. You must provide temporary bracing to safely support the upright gable. Some builders assemble the gable off-site and transport it to the final site. These steps are repeated later for the second gable.

Steps 11 through 16: Build the roof and side walls.

Many steps are involved in building the greenhouse walls, which also form the roof. Begin by placing indexing marks on the floor profiles and roof beam, and load the required M6 screws into the profile capture slots at the approximate locations of use.

The roof windows must be ready for use in Step 16, and you must provide temporary support for the roof beam. Depending on your specific situation, you may or may not anchor the gable and side walls to the foundation during these steps. Follow the step sequence exactly to avoid problems.

Step 17: Build the second gable and join it to the side walls.

Step 17 is a repeat of steps 3 through 10 as you build the second gable. Erect temporary bracing to support the gable, and position a few inches away from the side walls during the assembly process. When the gable is completed you will move it and join it to the side walls, threading the edges of the side wall glazing panels in the process.

Step 18: Anchor the greenhouse to its foundation.

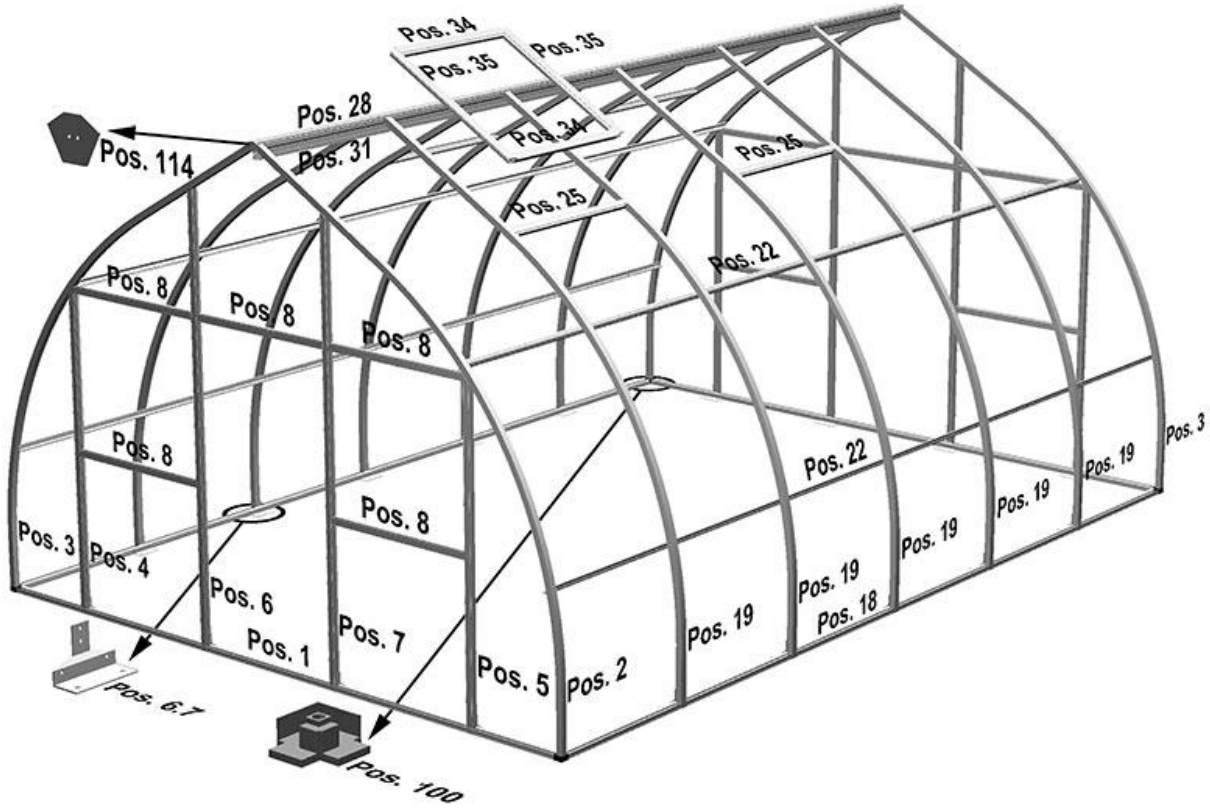
The greenhouse will be securely anchored to the foundation during step 18. Depending on your specific situation you may have already anchored the first gable and the two side walls in step 14, leaving only the second gable to be anchored in step 18.

Steps 19 through 23: Finish the interior and exterior.

The hard work is over by Step 19. You will install the lateral supports, floor profile seals, and roof window openers. Eventually you will apply sealant beads to specific places on the outside of the greenhouse. Finish by hanging the doors, then step back and admire your new Riga XL.

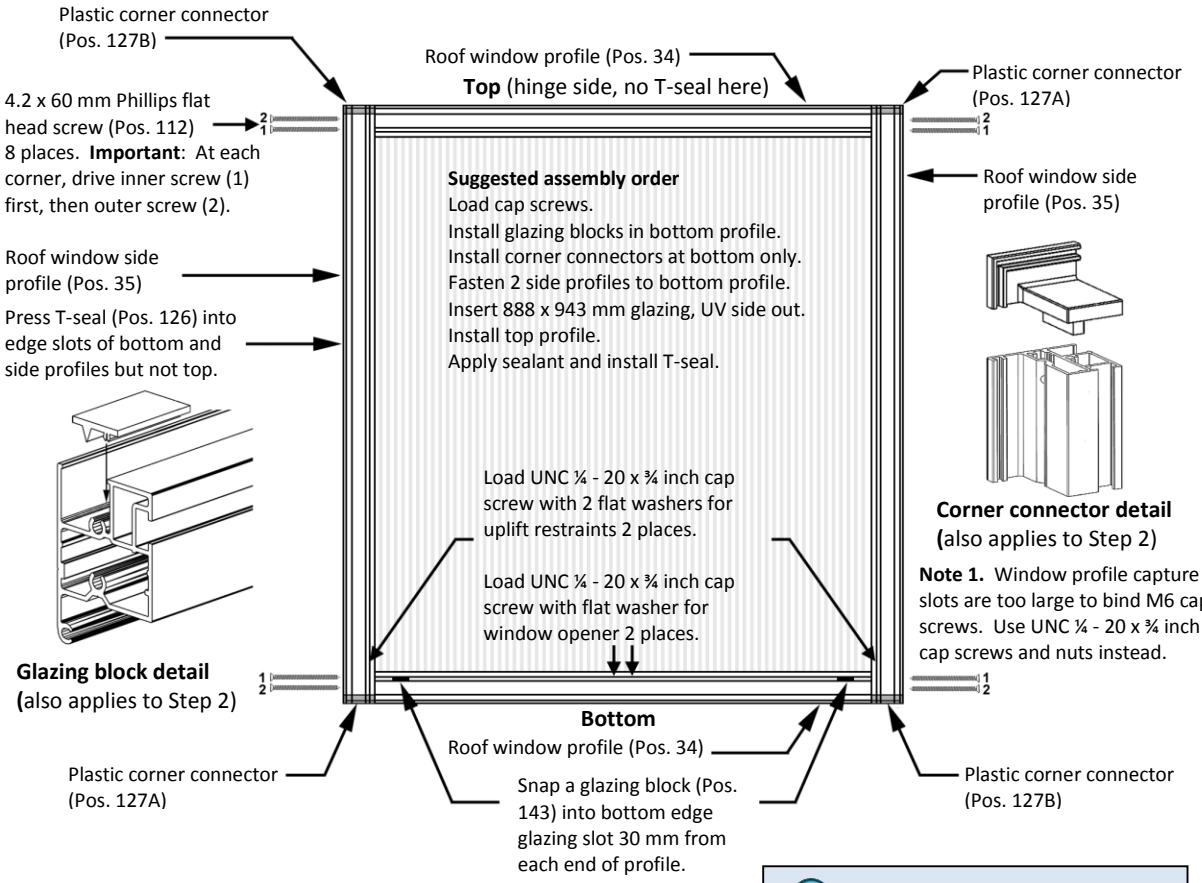
Locations of Frame Components

The components of your Riga XL are cataloged by Pos. number. Here are shown the Pos. numbers, names, and placements of the frame components.



Pos. 1 Gable floor profile, 2 places
Pos. 2 Right side edge stay bar, 2 places
Pos. 3 Left side edge stay bar, 2 places
Pos. 4 Left side vertical middle profile, 2 places
Pos. 5 Right side vertical middle profile, 2 places
Pos. 6 Left side vertical door profile, 2 places
Pos. 6.7 Mounting bracket, 18 places
Pos. 7 Right side vertical door profile, 2 places
Pos. 8 Crossbar for gables, 10 places
Pos. 18 Side floor profile, 2 places
Pos. 19 Vertical curved profile, 10 places
Pos. 22 Lateral support, 4 places
Pos. 25 Crossbar for window opening, 4 places
Pos. 28 Roof beam, 1 place
Pos. 31 Roof beam reinforcement bar, 1 place
Pos. 34 Top and bottom window profile, 8 places
Pos. 35 Left and right side window profile, 8 places
Pos. 100 Plastic corner connector, 4 places
Pos. 114 Roof beam end cap cover plate, 2 places

Step 1 Roof Windows



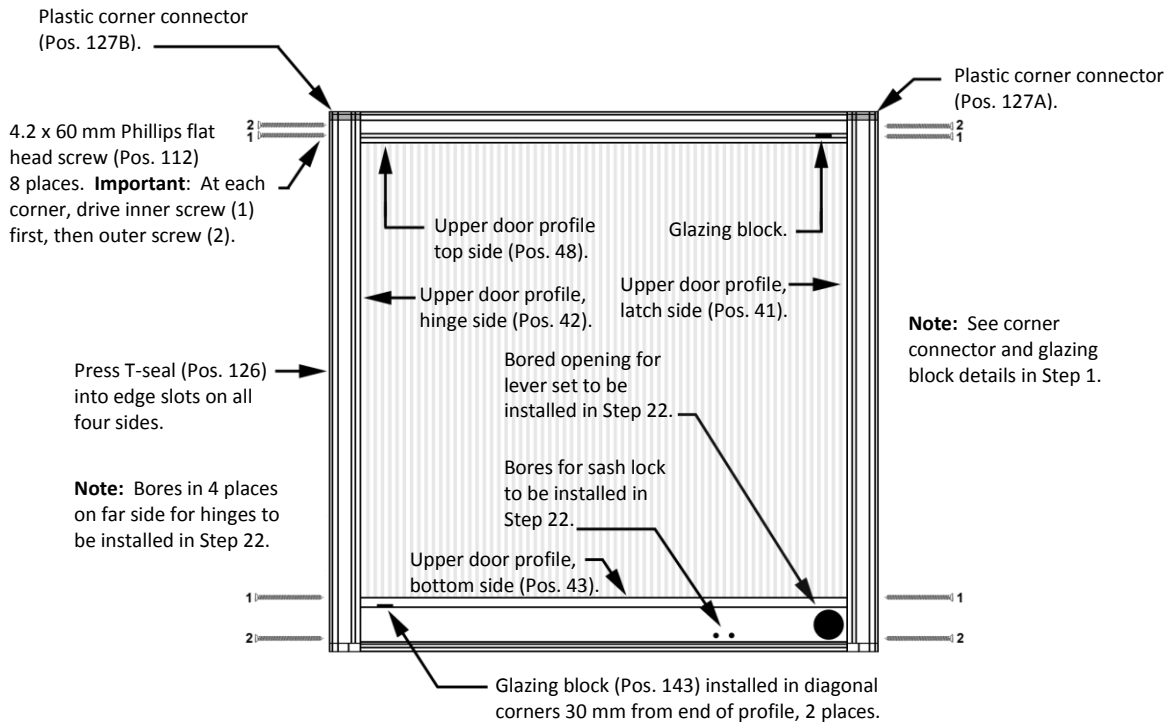
The drawing view is from inside the greenhouse.

Parts required for four windows

8	Pos. 34	Roof window profile, 865 mm long, top and bottom
8	Pos. 35	Roof window profile, 993 mm long, left and right sides
8	Pos. 127A	Plastic corner connectors, configuration A
8	Pos. 127B	Plastic corner connectors, configuration B
8	Pos. 143	Glazing block, white, 30mm x 16mm x 4mm
32	Pos. 112	Phillips flat head screw, 4.2x60 mm stainless
4	(no Pos. #)	Polycarbonate glazing, 888 by 943 mm
	Pos. 126	T-seal, approximately 13.2 meters
16	REK	Hex head cap screw with nut, UNC ¼-20 x ¾ inch stainless
24	REK	Flat washer, ¼ inch stainless
	REK	Silicone glazing sealant

More

Step 2a Upper Doors



Parts required for two upper doors

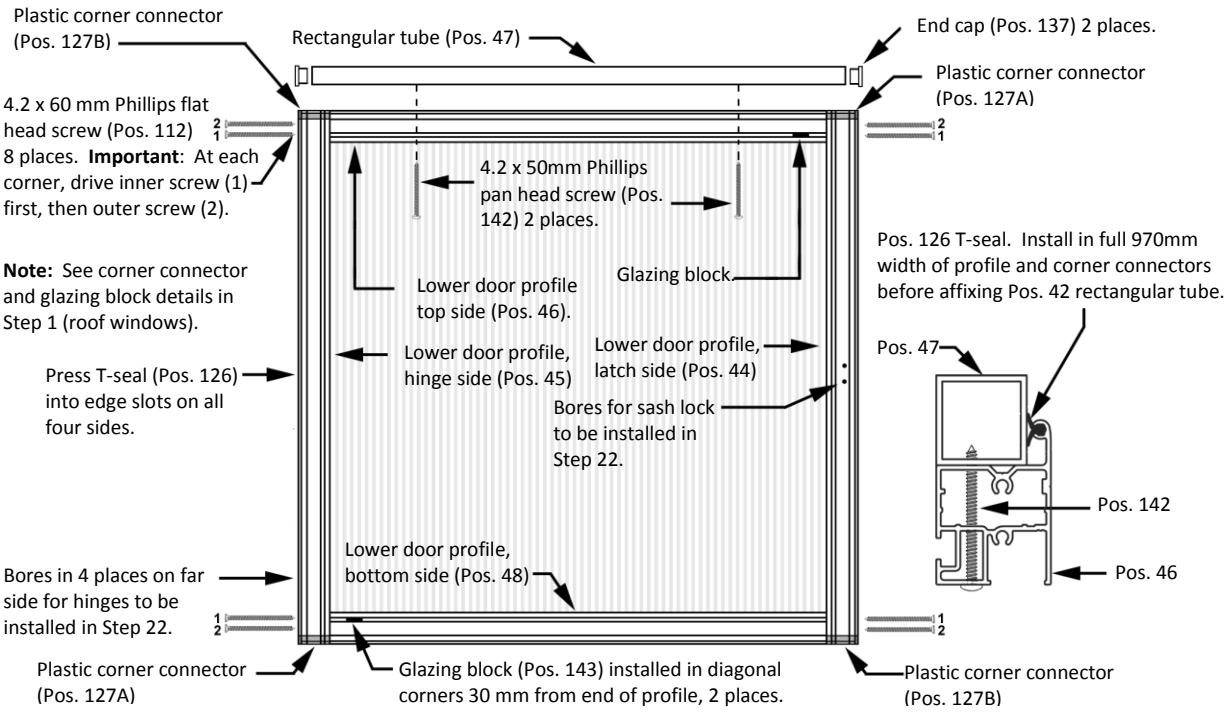
2	Pos. 41	Upper door profile, latch side (left)
2	Pos. 42	Upper door profile, hinge side (right)
2	Pos.43	Upper door profile, bottom
2	Pos. 48	Upper door profile, top
16	Pos. 112	4.2 x 60 mm Phillips flat head screw
4	Pos. 143	Glazing block
2	Pos. 127A	Plastic corner connector A
2	Pos. 127B	Plastic corner connector B
2	(no Pos. #)	888 by 835 mm glazing panel
	Pos. 126	T-seal, approximately 4.4 meters
	REK	Silicone glazing sealant

The drawing view is from inside the greenhouse, so left and right callouts are reversed.

- Install one glazing block in each top and bottom profile diagonally as shown.
- Fasten the side profiles to bottom profile.
- Insert 888 x 835 mm glazing with UV protected side facing outside (away from you).
- Press the corner connectors into the top ends of the side profiles, and install the top profile.
- Apply sealant to the outer interfaces of the profiles and glazing.
- After the sealant has cured, press T-seal into edge slots of all four profiles.

More

Step 2b Lower Doors



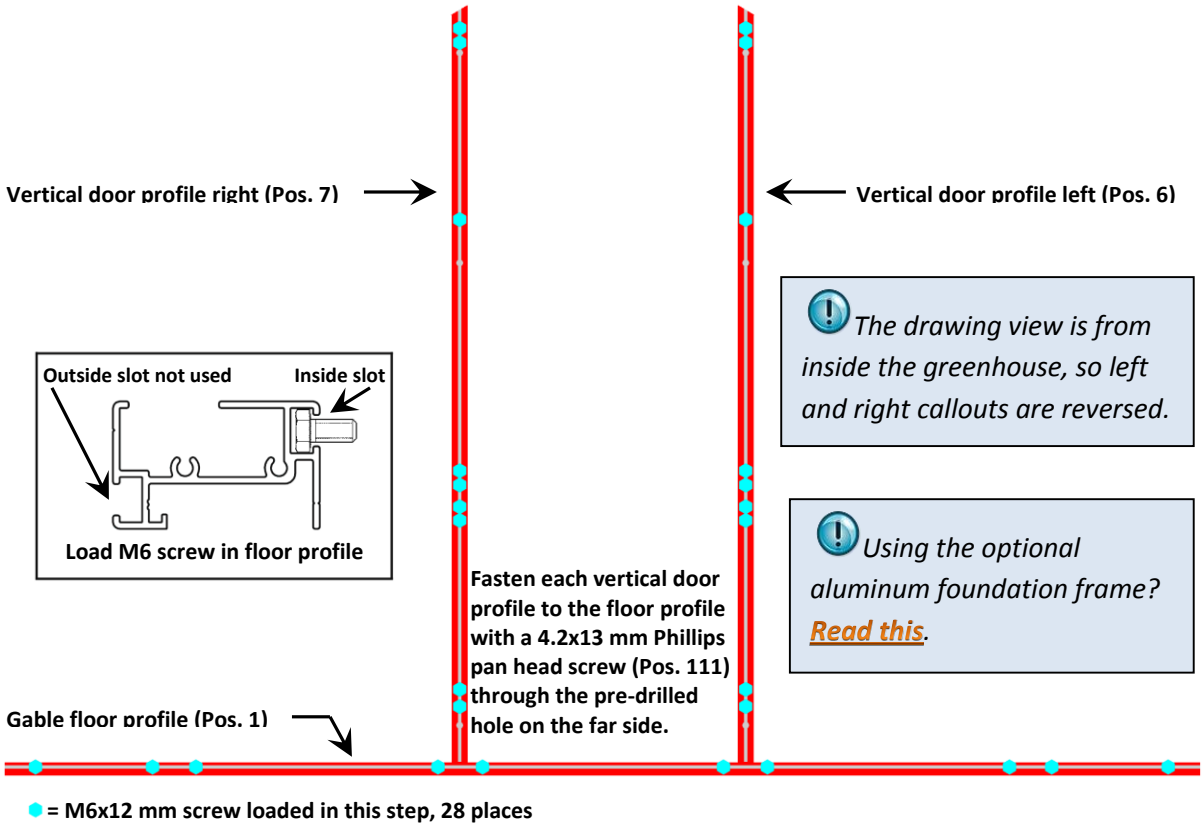
Parts required for two lower doors

2	Pos. 44	Lower door profile, latch side
2	Pos. 45	Lower door profile, hinge side
2	Pos. 48	Lower door profile, bottom
2	Pos. 46	Lower door profile, top
4	Pos. 127A	Plastic corner connector A
4	Pos. 127B	Plastic corner connector B
4	Pos. 143	Glazing block
2	Pos. 47	Rectangular tube
4	Pos. 137	End cap for rectangular tube
2	(No Pos. #)	888 by 835 mm glazing panel
	Pos. 126	T-seal, approximately 4.4 meters

The drawing view is from inside the greenhouse, so left and right callouts are reversed.

- Install one glazing block in each top and bottom profile diagonally as shown.
- Press corner connectors into the bottom ends of the side profiles and fasten to the bottom profile.
- Insert 888 x 835 mm glazing with UV protected side facing outside (away from you).
- Prepare the top profile assembly per detail and fasten with 2 screws through the pre-drilled holes.
- Press corner connectors into the top ends of the side profiles and install the top profile assembly.
- Apply sealant to the outer interfaces of profiles and glazing.
- After the sealant has cured press T-seal into the edge slots of all four profiles.

Step 3 Gable Floor Profile and Vertical Door Profiles



Assembling your gable horizontally? Read this.

Parts required

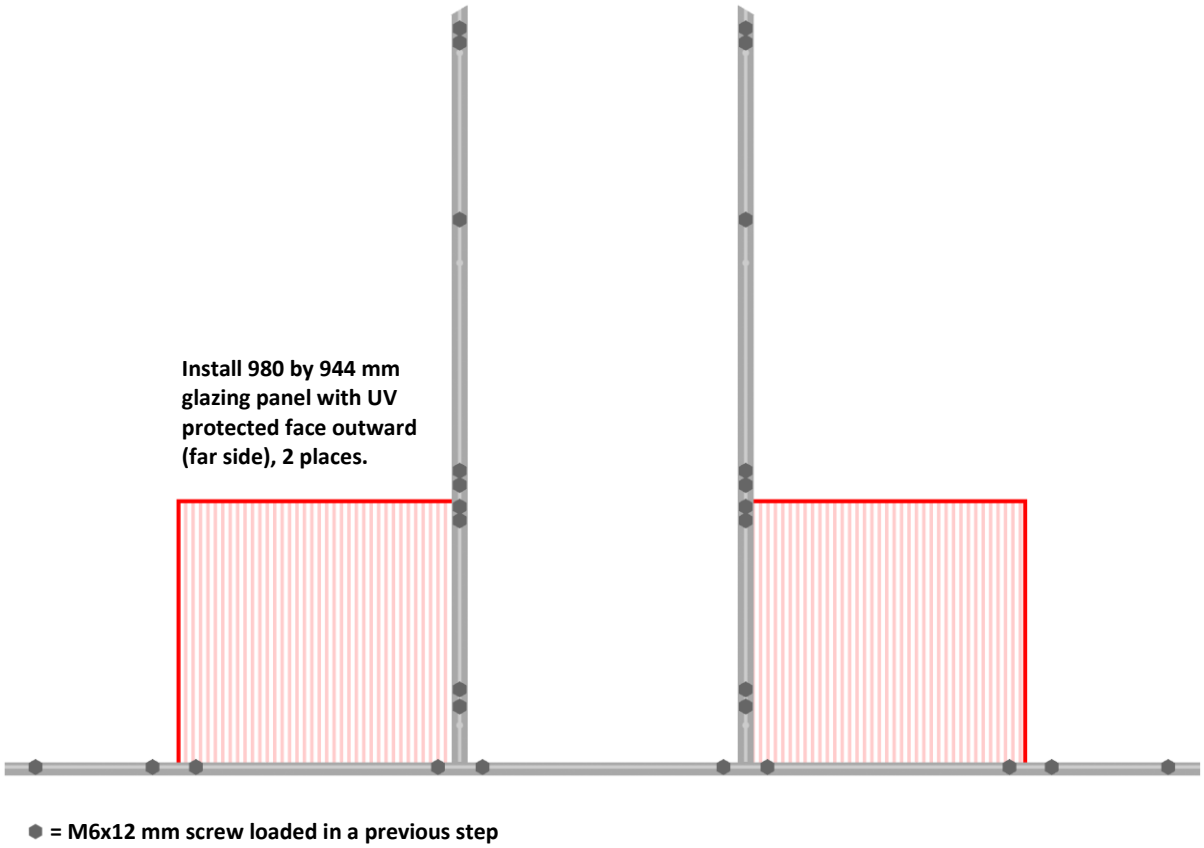
1	Pos. 1	Gable floor profile
1	Pos. 6	Vertical door profile, left
1	Pos. 7	Vertical door profile, right
28	Pos. 107.12	M6x12 mm hex head cap screw with nut
2	Pos. 111	Phillips pan head screw, 4.2x13 mm

- Load the floor profile and vertical door profiles with M6x12 mm screws as shown.
- Engage the left and right vertical door profiles into the floor profile and slide into position, aligning the pre-drilled holes in the profiles.
- Secure each vertical door profile to the floor profile with a 4.2x13mm Phillips pan head screw driven through the pre-drilled holes.

***IMPORTANT**: If your Riga will be anchored to the substrate with wedge anchors or other non-removable fasteners consider an alternative for the innermost 8 of the 10 M6x12 screws that are loaded into the floor profile. This concerns only the mounting bracket screws near the vertical profiles, not the floor profile connector screws near the ends.*

More

Step 4 Lower 980 x 944 mm Glazing Panels (1 & 2 of 4)

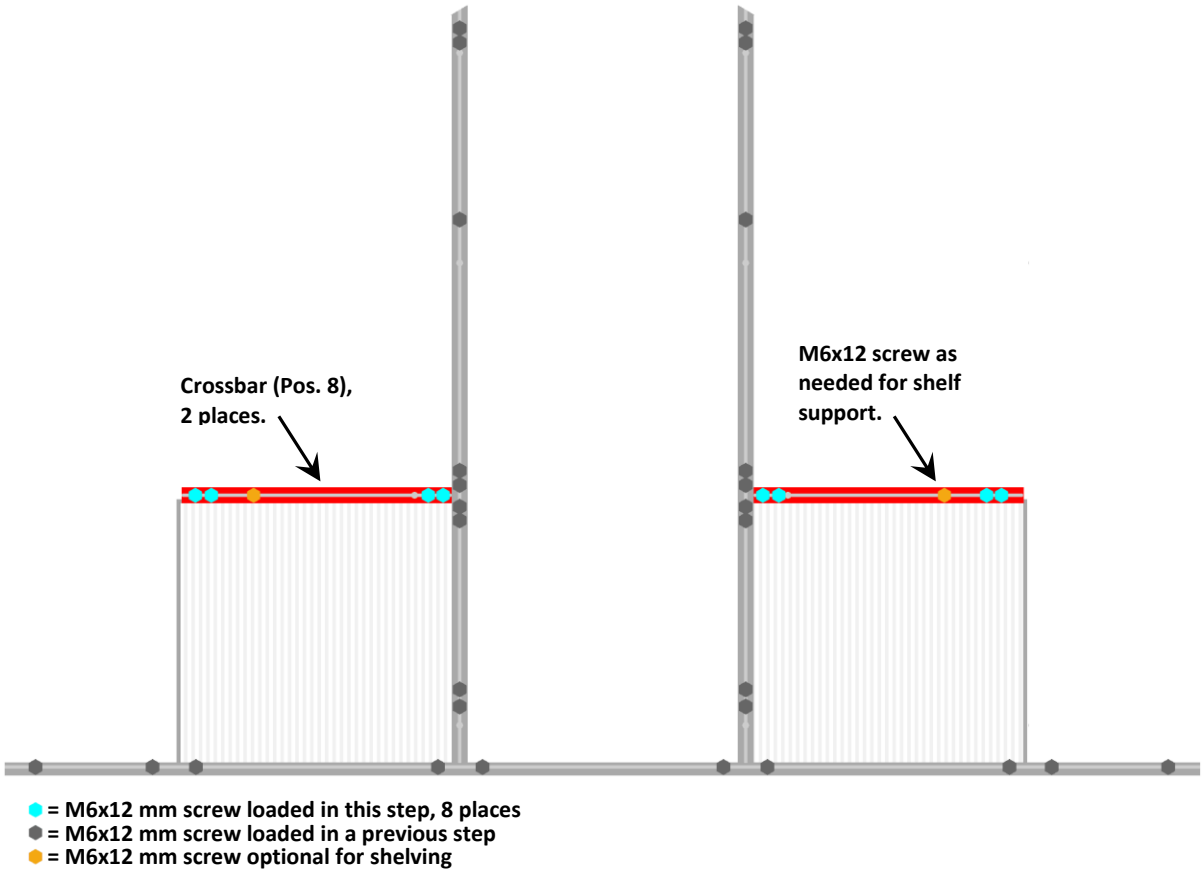


Parts required

2 (No Pos. #) 980 by 944 mm square glazing panel

- Place the glazing panels in position with the edges inside the vertical and floor profile slots. The UV protected faces must face outward, which in this inside view is away from you.

Step 5 Lower Crossbars (1 & 2 of 5m)



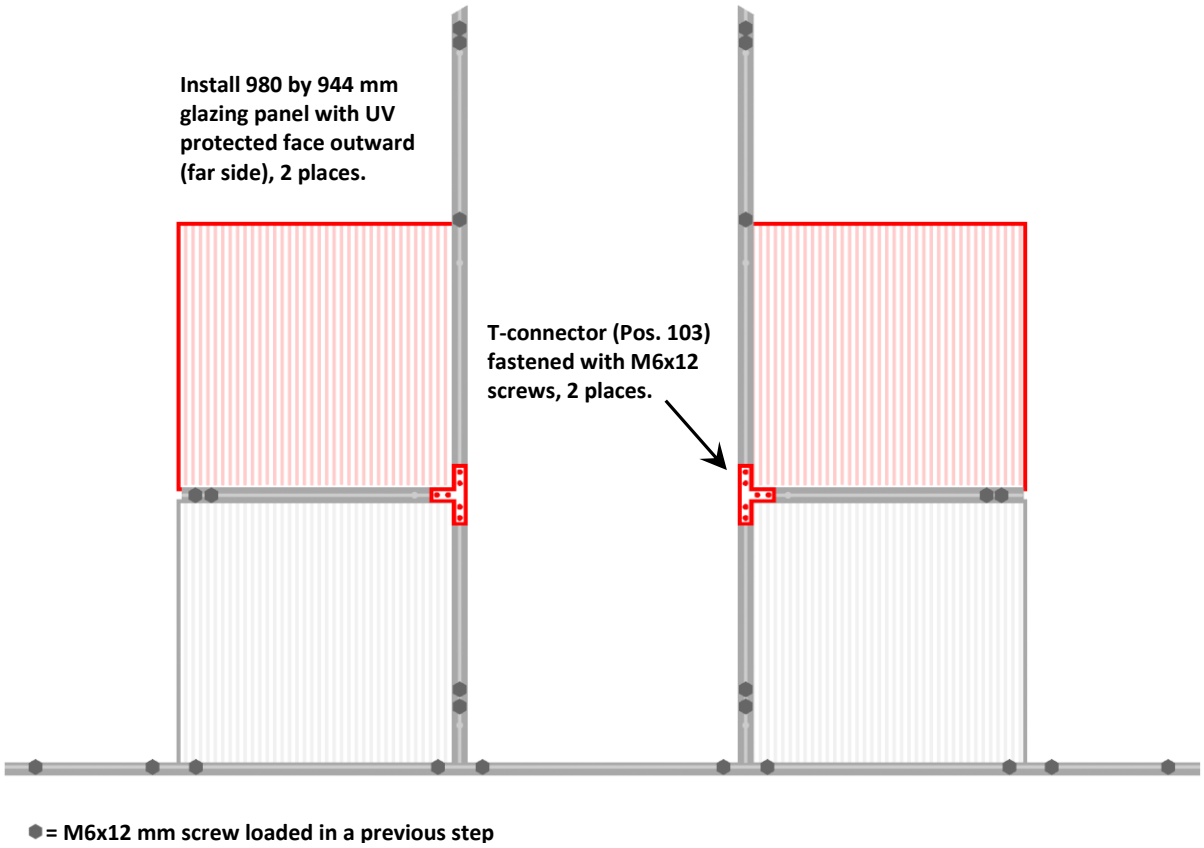
Parts required

2	Pos. 8	Crossbar
8	Pos. 107.12	M6x12 hex head cap screw with nut
2 or 4	Pos. 107.12	Optional M6x12 hex head cap screw with nut for shelf support

- Load each crossbar with M6x12 mm screws as shown, and with optional screws as required.
- Place a crossbar on each glazing panel.

If your Riga XL includes an optional shelving kit, load an extra M6x12 screw in each crossbar to fasten the ends of the shelf. A shelving kit supplies materials for one side of the greenhouse. Two kits are needed for shelves on both sides.

Step 6 T-connectors and Upper 980 by 944 mm Glazing Panels (3 & 4 of 4)



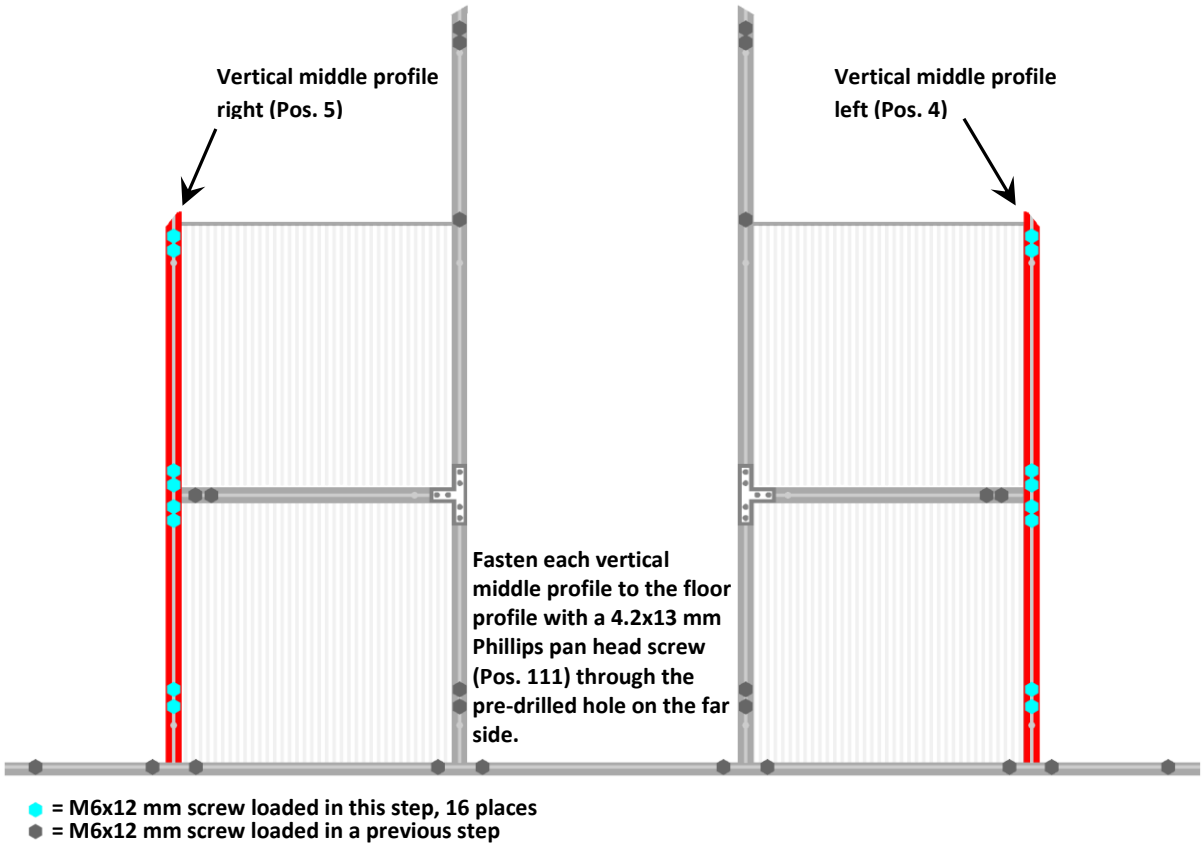
Parts required

2	Pos. 103	T-connector plate
2	(No Pos. #)	980 by 944 mm square glazing panel

- Install a T connector at each vertical-to-crossbar joint. Fasten in place with the M6 screws previously loaded into the profiles. Tighten the nuts finger tight at this time; they will be fully tightened in a later step.

- Place the glazing panels in position with edges in the retaining slots of the crossbars and vertical profiles. Orient the UV protected faces outward, which for this inside view is away from you.

Step 7 Vertical Middle Profiles



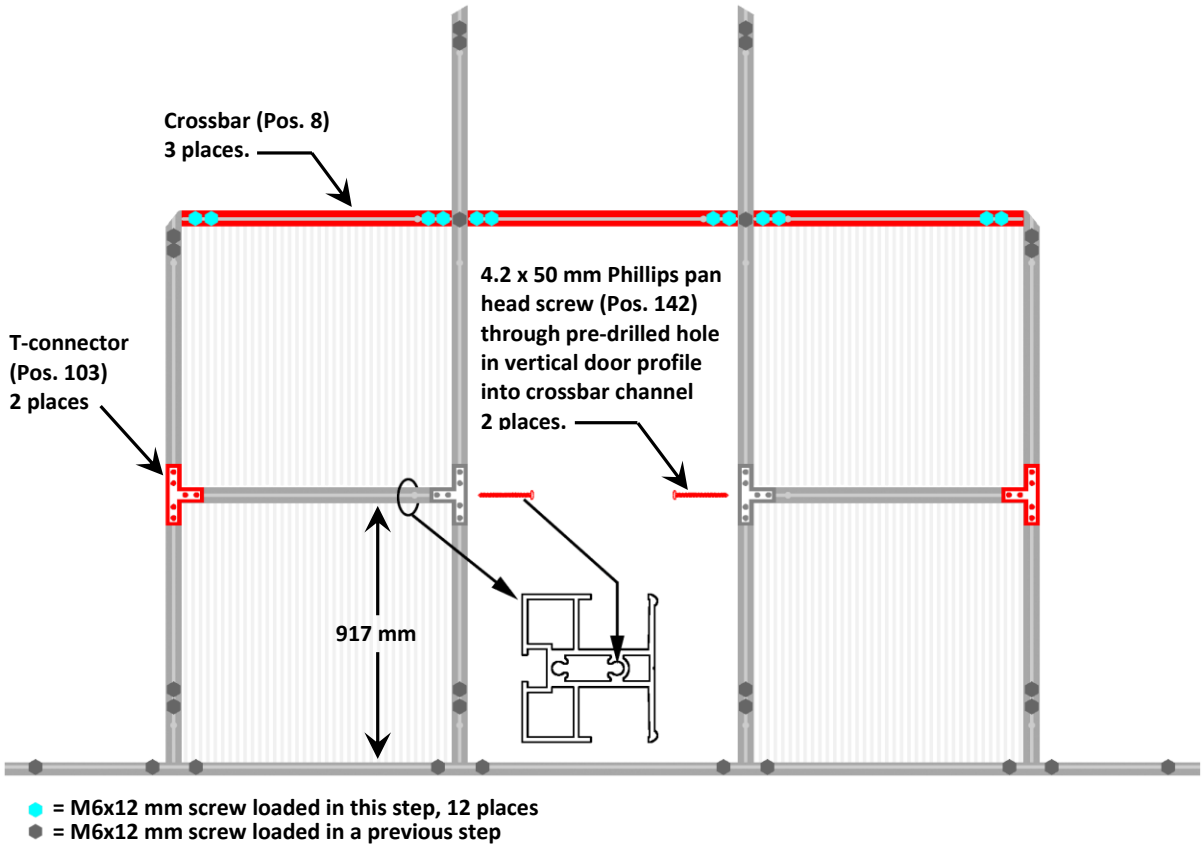
Parts required

1	Pos. 4	Vertical middle profile, left
1	Pos. 5	Vertical middle profile, right
16	Pos. 107.12	M6x12 mm hex head cap screw with nut
2	Pos. 111	Phillips pan head screw, 4.2x13 mm

- Load the vertical middle profiles with M6x12 mm screws as shown.
- Engage the left and right vertical middle profiles into the floor profile and slide into position, aligning the pre-drilled holes in the profiles.
- Secure each vertical middle profile to the floor profile with a 4.2x13mm Phillips pan head screw driven through the pre-drilled holes.

IMPORTANT: *A vertical profile engaged with a floor profile must be braced against tipping to prevent deforming both profiles.*

Step 8 T-connectors and Upper Crossbars (3, 4, & 5 of 5)



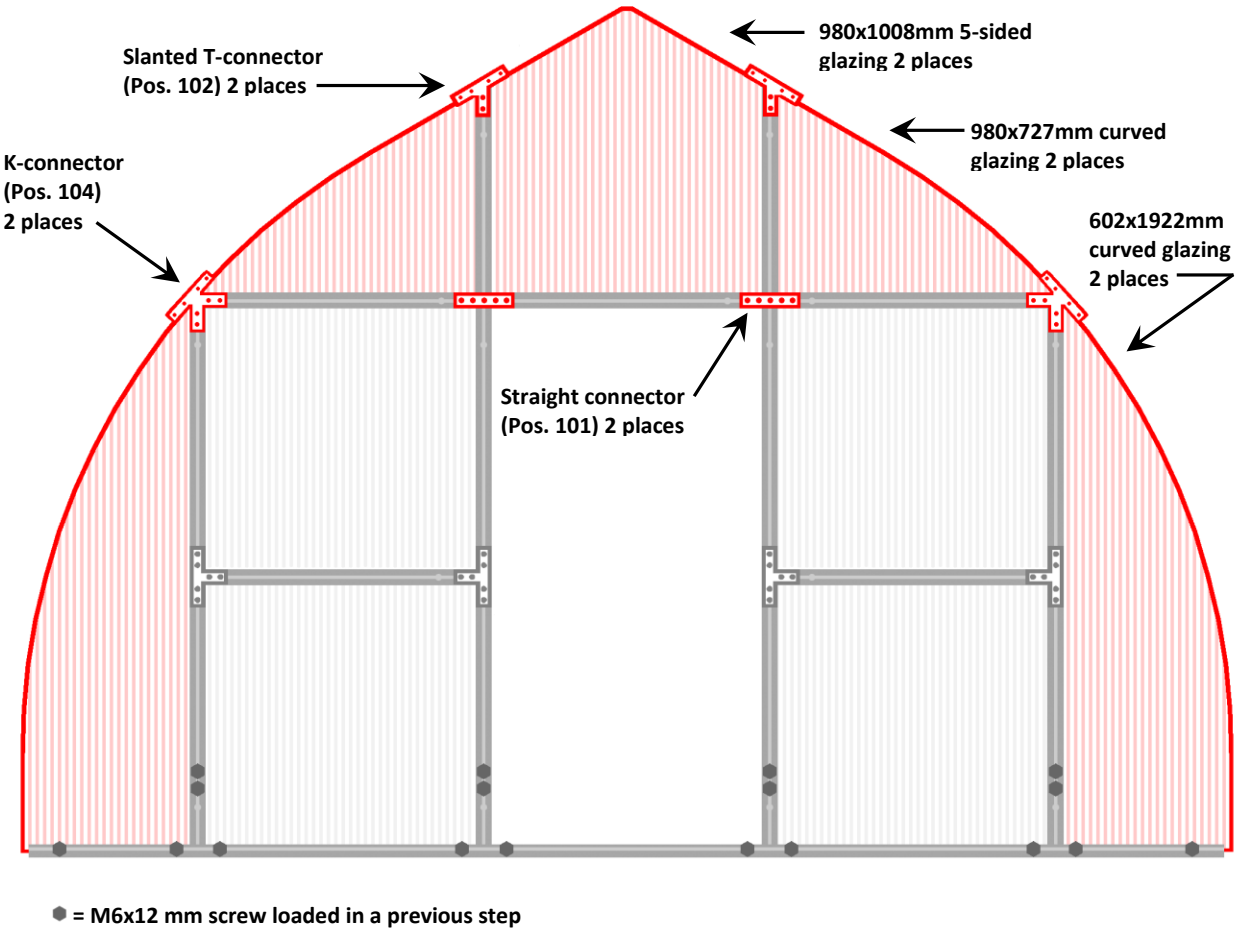
Parts required

12	Pos. 107.12	M6x12 mm hex head cap screw with nut
2	Pos. 142	Phillips pan head screw, 4.2 by 50 mm
3	Pos. 8	Crossbar
2	Pos. 103	T-connector plate

- Drive a 4.2 by 50 mm Phillips pan head screw through each vertical door profile into the crossbar.
- Install a T connector at the junction of each vertical middle profile and its lower crossbar.
- Load three upper crossbars with screws as shown and set in place.

More

Step 9 Curved & 5-sided Glazing, Straight, K, and Slanted T-connectors



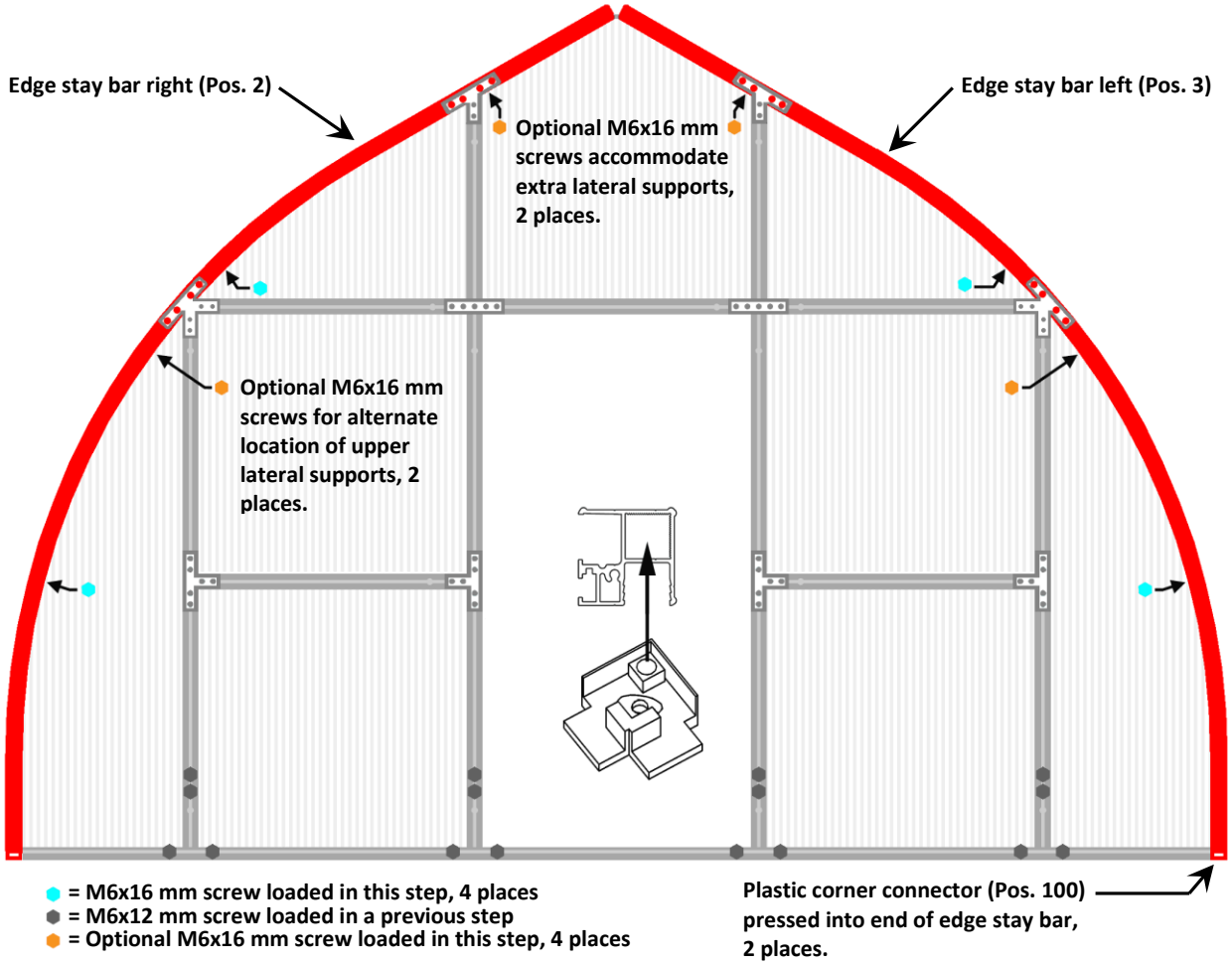
Parts required

2	Pos. 101	Straight connector plate
2	Pos. 102	Slanted T-connector plate
2	Pos. 104	K-connector plate
1	(No Pos. #)	602 by 1922 mm curved glazing panel, left
1	(No Pos. #)	602 by 1922 mm curved glazing panel, right
1	(No Pos. #)	980 by 727 mm curved glazing panel, left
1	(No Pos. #)	980 by 727 mm curved glazing panel, right
1	(No Pos. #)	980 by 1008 mm 5-sided glazing panel

- Install the straight connector plates, then the K connector plates, and finish with the slanted T connector plates. Confirm that the crossbar ends are in intimate contact with their corresponding vertical profiles, and then fasten with the previously loaded M6x12 screws.

- There is a left and a right version of each curved glazing panel so that all can be installed with the UV-protected side outward. Place the curved panels and the 5-sided panel in their cells with the UV protected side outward, which as viewed in the drawing is away from you.

Step 10 Edge Stay Bars with Pressed-on Plastic Corner Connectors



Parts required

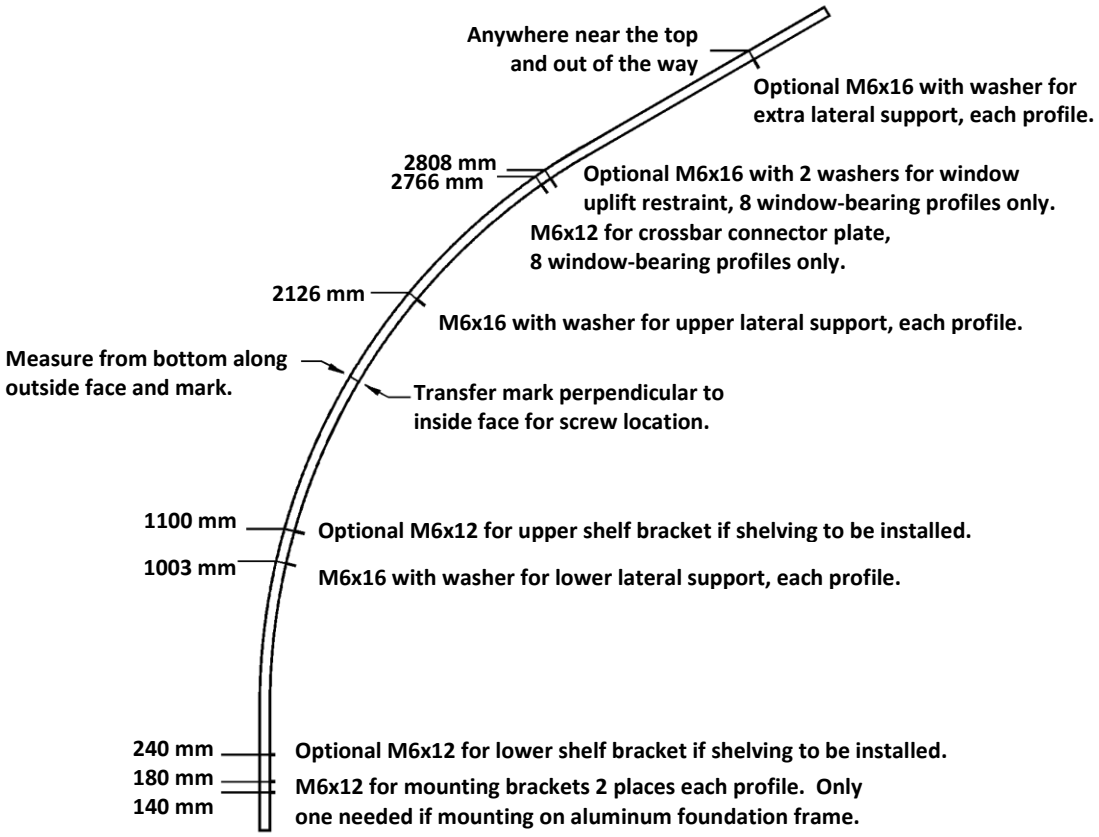
1	Pos. 2	Edge stay bar, curved, right side
1	Pos. 3	Edge stay bar, curved, left side
2	Pos. 100	Plastic corner connector
2	Pos. 105	Floor profile connector
16	Pos. 118	3.5 x 13 mm self-drilling Phillips pan head screws
4	Pos. 107.16	M6x16 hex head cap screw with nut
4	Pos. 107.16	Optional M6x16 hex head cap screw with nut

WARNING! *You must engage the roof beam or a* ***Roof Beam Fitment Tool*** *before driving the self-drilling screws.*

- Attach a floor profile connector at each end of the floor profile using pre-loaded M6x12 screws.
- Load M6x16 screws into each edge stay bar as shown and optional screws as needed.
- Install a plastic corner connector on the lower end of each edge stay bar (see detail in drawing).
- Place the edge stay bars into position with plastic corner connector engaged in the floor profile.
- Fasten edge stay bars to K and slanted T connectors with 3.5 x 13 mm self-drilling screws.

More

Step 11 Load Screws in the Curved Center Profiles



Parts required

10	Pos. 19	Curved center profiles
20	Pos. 107.16	M6x16 hex head cap screw with nut
28	Pos. 107.12	M6x12 hex head cap screw with nut
20	Pos. 108	M6 flat fender washer for lateral supports
10 max	Pos. 108	Optional M6 flat fender washer for extra lateral supports
16 max	Pos. 108	Optional M6 flat fender washer for uplift restraint
8 max	Pos. 107.16	Optional M6x16 hex head cap screw with nut for uplift restraint
10 max	Pos. 107.16	Optional M6x16 hex head cap screw with nut for extra lateral supports
20 max	Pos. 107.12	Optional M6x12 hex head cap screw with nut for shelf brackets

Eight of the ten profiles will support one side of a roof window and must be loaded with all of the screws shown. Omit the screws at 2766 and 2808 mm for the remaining two profiles.

The screws at 240 mm, 1100 mm, 2808 mm, and near the top are optional fastening points. You may omit these screws for any options you don't intend to install.

- Measure along convex face and mark the locations.
- Transfer marks to concave face.
- Load each screw at its approximate location, including washers if specified.
- Lightly tighten nut to hold in place.

Step 12 Prepare the Floor Profiles, Crossbars, and Roof Beam

Parts required

2	Pos. 18	Side floor profiles
1	Pos. 1	Gable floor profile
4	Pos. 25	Crossbar
1	Pos. 28	Roof beam
1	Pos. 31	Roof beam reinforcement bar
32	Pos. 107.12	M6x12 hex head cap screw with nut
8	Pos. 107.16	M6x16 hex head cap screw with nut

*If your Riga will be anchored to the substrate with wedge anchor bolts or other non-removable fasteners **consider an alternative** for most of the M6x12 screws loaded into the floor profiles. This applies to the mounting bracket fasteners only, not to the floor profile connector fasteners.*

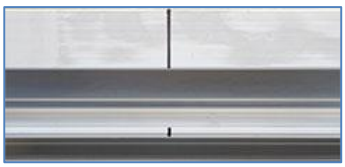
Measure and mark the floor profiles and roof beam reinforcement bar

Installing the curved center profiles (arches) is easier if you know exactly where to place them. Precise index marks on the side floor profiles and roof beam reinforcement bar make this possible. The floor profiles and the reinforcement bar differ slightly in length so the measurement values are slightly different.

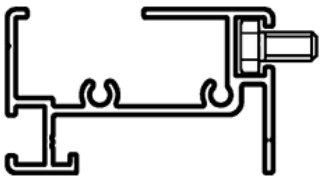
Measuring from one end, place marks at the distances shown in the instructions below. Then measure from the other end and mark again. Use the midpoint between marked pairs if they differ by 2 mm or less. If the marks are farther apart than 2 millimeters, there may be a problem with the profile or with your measuring tape.

Use a framing square to extend each mark to all visible faces of the profiles so they can be seen from all directions. The curved center profiles will be centered on the marks.

Prepare the side floor profiles



- Measure and mark the side floor profiles (Pos. 18) at 960, 1955, 2950, 3945, and 4940 millimeters.

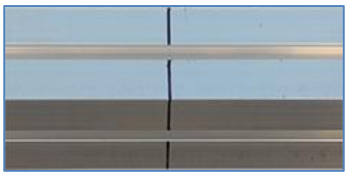


- Load twelve M6x12 cap screws into the inside capture slots of each side floor profile. Position a screw 55 millimeters to either side of each mark to fasten a mounting bracket, and one at each end to fasten a floor profile connector. Put a nut on each screw and tighten it to keep it in place.

Temporarily prepare the south gable floor profile

- You will fully load the south gable floor profile (Pos. 1) when you return to Step 3 to build the second gable. For now, just load a single M6x12 cap screw near each end so you can later attach floor profile connectors (Pos. 105) to help position the side floor profiles.

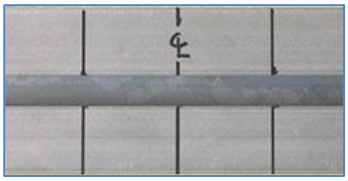
Prepare the roof beam reinforcement bar



- The reinforcement bar (Pos. 31) is bound to the roof beam (Pos. 28). Measure and mark the reinforcement bar at 990, 1985, 2980, 3975, and 4970 millimeters.

*No screws need to be loaded into the reinforcement bar unless you expect to install equipment on it for **plant support** or other purposes.*

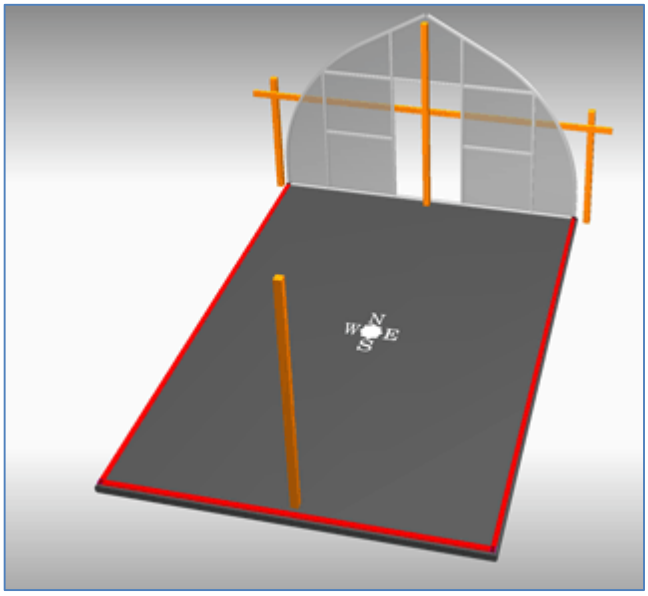
Prepare the window opening crossbars

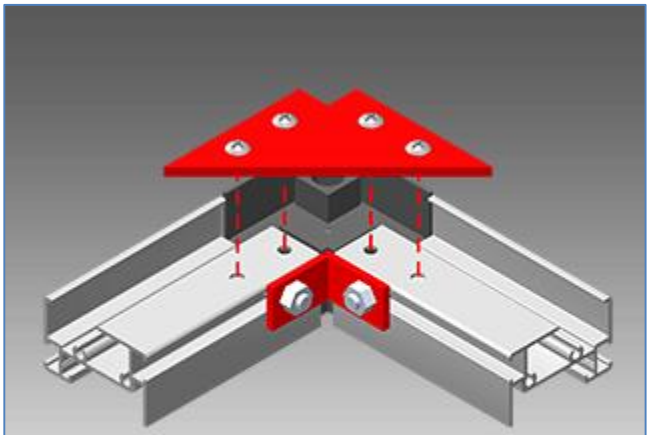


Measure and mark the center of each crossbar (Pos. 25). Place additional marks 24 millimeters each side of the center mark. These show the position for the lower mounting foot of the automatic window opener.

- Load two M6x16 screws into each Pos. 25 crossbar, placing them near the marks. These will fasten a window opener. Stow a nut on each screw and tighten to retain its position.
- Load two M6x12 screws into each Pos. 25 crossbar, placing them near the ends. These will fasten the connector plates. Stow a nut on each screw and tighten to retain its position.

Step 13 Set the Floor Profiles





Step 13 detail
Floor profile corner connection

Legends for steps 13 through 19

For reference, consider the greenhouse to be oriented as shown by the compass rose. The work of each step is highlighted red and reverts to gray tones in subsequent steps.

Parts required

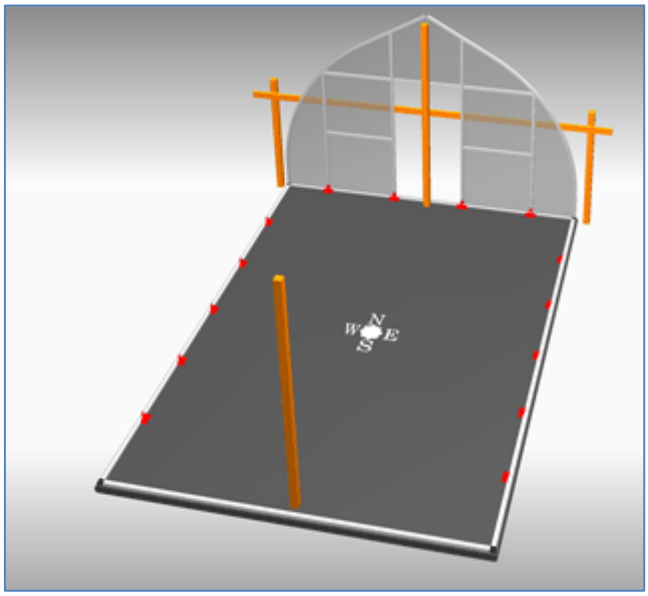
2	Pos. 18	Side floor profile
1	Pos. 1	Gable floor profile (for south end)
2	Pos. 100	Plastic corner connector (for south end)
2	Pos. 105	Floor profile connector (for south end)
2	Pos. 116	Floor profile corner connector cover (for north end only)
8	Pos. 113	4.8 x 16 mm Phillips pan head screw

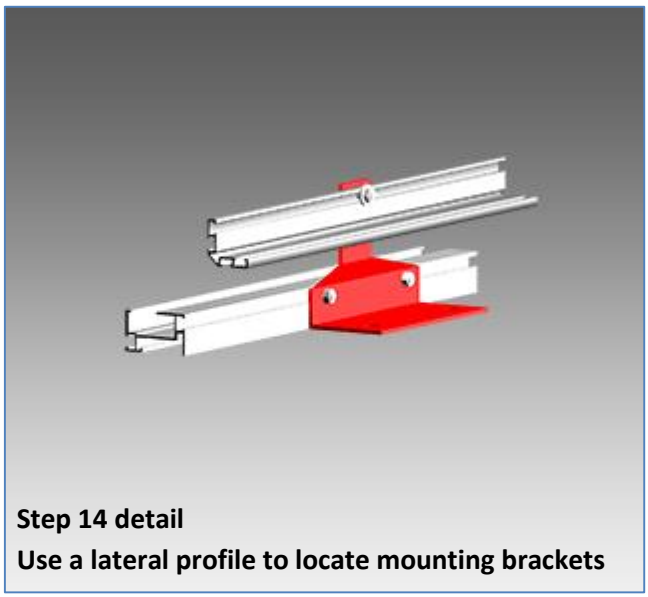
The need for the south gable floor profile is temporary. *If you decide to defer Step 14 (coming up next), you can omit the south gable floor profile and its corner connector parts from Step 13.*

- Connect the side floor profiles to the north gable floor profile.
- Fasten the connection with the floor profile connectors and M6 screws and nuts but do not fully tighten the nuts. Some adjustment may be necessary.
- Install the corner connector covers and adjust so the cover holes align with the holes in the floor profiles, then fasten the cover with 4.8 x 16 mm Phillips pan head screws.
- Tighten the M6 nuts to secure the floor profile connector
- Using two additional plastic corner connectors, connect the south gable floor profile to the side floor profiles. Secure the connections with floor profile connectors. Corner connector covers are not needed for the south corners at this time.

More

Step 14 Install the North, East, and West Mounting Brackets





Step 14 detail
Use a lateral profile to locate mounting brackets

Proceed with this step only if your substrate is square, flat, and true.
You must maintain the floor profiles square and straight throughout anchoring process.
Your anchoring method must allow the bracket to be loosened or removed.
Please read All About Anchoring and Anchoring to Concrete before you begin Step 14.

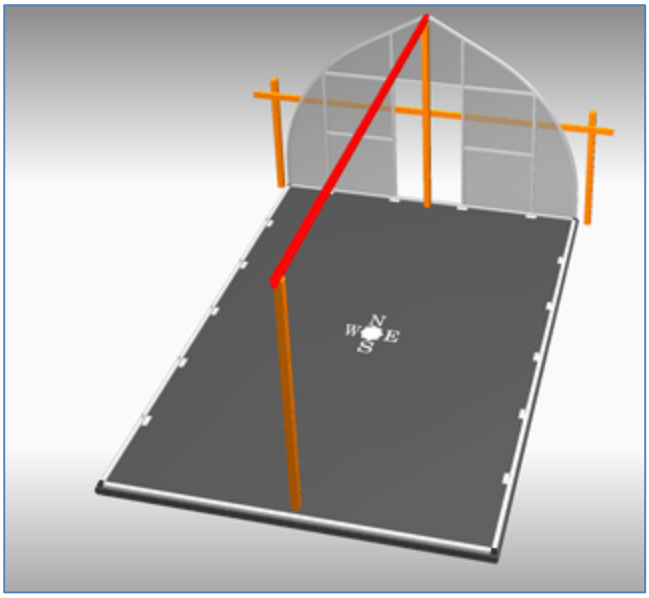
Parts required

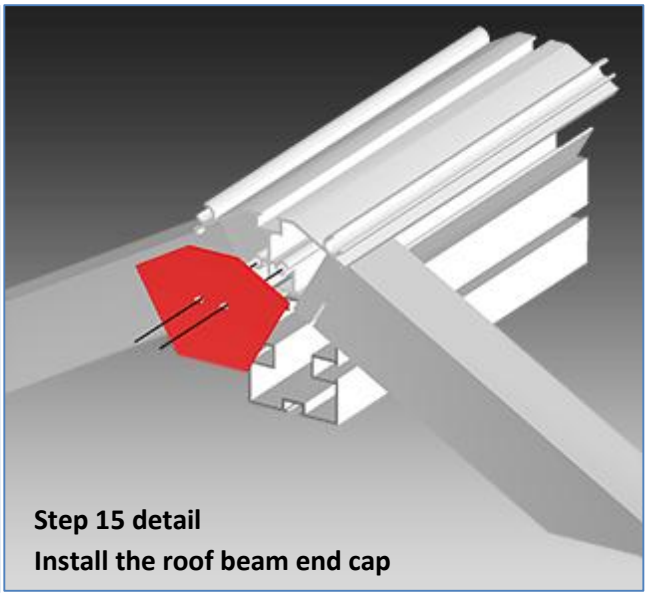
14	Pos. 6.7	Mounting bracket
1	Pos. 22	Lateral support
28		Anchor

- Align the four floor profiles perfectly square on the substrate. The profiles must not be bowed.
- Install the four north gable mounting brackets first. Fasten a bracket to each vertical profile and to the floor profile with the M6x12 screws that were loaded in Step 12.
- At each position, restrain the bracket and drill perfectly plumb holes through the bracket holes into the substrate. Install the anchors, and then proceed to the next bracket.
- For the east and west sides, temporarily fasten lateral supports to the gable edge stay bars. Then fasten a bracket to each of the pre-drilled holes in the lateral supports, and to the floor profile with the M6x12 screws that were loaded in Step 12.
- Start with the bracket most distant from the gable. Restrain the bracket to prevent movement and drill through the bracket holes. Install the anchors, and then proceed to the next bracket
- Remove the lateral supports, the south gable floor profile, and the south plastic corner connectors after all brackets are anchored. The south gable mounting brackets will be installed in Step 18 after the gable has been joined to the side walls.

More

Step 15 Set the Roof Beam





Step 15 detail
Install the roof beam end cap

Parts required

1	Pos. 28	Roof beam
1	Pos. 31	Reinforcement bar engaged with roof beam and previously marked in Step 12
1	Pos. 114	Roof beam end cap cover (plate)
2	Pos. 111	4.2 x 13 mm self-tapping Phillips head screws

If in Step 10 the edge stay bars were not fastened to the K and slanted T connectors, fasten them in this step after the roof beam is engaged. *Confirm that all profiles are plumb, square, and properly aligned. Clamp the edge stay bars to keep them in intimate contact with the vertical profiles, and then drive the self-drilling screws.*

- Hoist the roof beam and reinforcement bar assembly into place on the supports and confirm that the two pieces are evenly aligned.
- Engage the roof beam into the gable edge stay bars (curved profiles). The north end of the beam must be flush with the outer face of the edge stay bars.
- Secure the roof beam end cap cover to the end of the beam with the 4.2 x 13 mm screws.

STOP

If a Roof Beam Fitment Tool is not available you must build the second gable before proceeding to Step 16. You will need to ***use the unencumbered roof beam itself as a fitment tool*** *before any side wall arches or glazing are in place.*

More

Step 16 Assemble the Side Walls

Introduction to Step 16

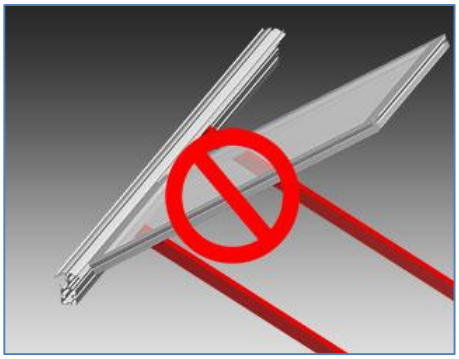
Step 16 is implemented in 26 individual operations numbered Step 16.01 through Step 16.26. Each operation is illustrated with a drawing. It is important that you perform these operations in order.

The following terms are used to describe the operations of Step 16:

1. ***Arch*** is a short name for a curved vertical profile. The arches occur in east-west pairs numbered 1 through 7 counting from north to south. The arches of the north gable are named 1E and 1W, and the arches of the south gable are named Arch 7E and Arch 7W.
2. ***Bay*** is the space between two consecutive arches. Every bay is occupied by a glazing panel, and in four instances by a roof window above the panel. Bays occur in east-west pairs numbered 1 through 6 from north to south and are named for their count position. For example the first bay against the north gable on the east side is named Bay 1E.
3. ***Glazing*** is a 980-millimeter wide triple-wall polycarbonate panel that occupies a bay. Glazing is held in place by arches on each side, a floor profile at the bottom, and either a crossbar or the roof beam at the top. Eight of the glazing panels are 3893 millimeters long and extend from the floor profile to the roof beam. Glazing panels in bays 2W, 3E, 4W, and 5E are only 2830 millimeters long and do not reach the roof beam, so they are installed with a crossbar between the arches to retain the top edge. The bay space from the crossbar to the roof beam is occupied by a roof window. Glazing is named after the bay it occupies; for example the panel that occupies the space in Bay 1E is named Glazing 1E.
4. ***Crossbar*** is a straight aluminum profile with a slot into which fits the top edge of a 2830 millimeter glazing panel. A crossbar fits perfectly between two arches and each end is fastened to an arch by a connector plate and two captive M6x12 screws. A crossbar is named after the bay it occupies, so Crossbar 2W will be found in Bay 2W.
5. ***Window*** is a roof window joined to the roof beam by an integral hinge. Windows are normally installed in bays 2W, 3E, 4W, and 5E and are named after the bay they occupy. A window is installed by engaging it at one end of the roof beam and sliding it into position.

The Window Installation Rule

It is difficult to pass a window over arches but almost impossible if glazing is present. When sliding a window into position there must be no curved profiles or glazing in its path. Install a window in its bay before the bay is completed with a second arch. **Why?**



Watch a time-lapse video to see how the Window Installation Rule was discovered.

http://www.youtube.com/watch?v=KgCiE8ZWdow

General instructions for Step 16

Parts required for Step 16

10	Pos. 19	Curved center profile, previously loaded with screws in Step 11
4	Pos. 25	Crossbar, previously marked and loaded with screws in Step 12
8	Pos. 115	Connector plate for crossbar
4		Roof window, previously assembled and sealed in Step 1
4		Glazing panel for windowed bays, 980 x 2830 mm
8		Glazing panel for non-windowed bays, 980 x 3893 mm

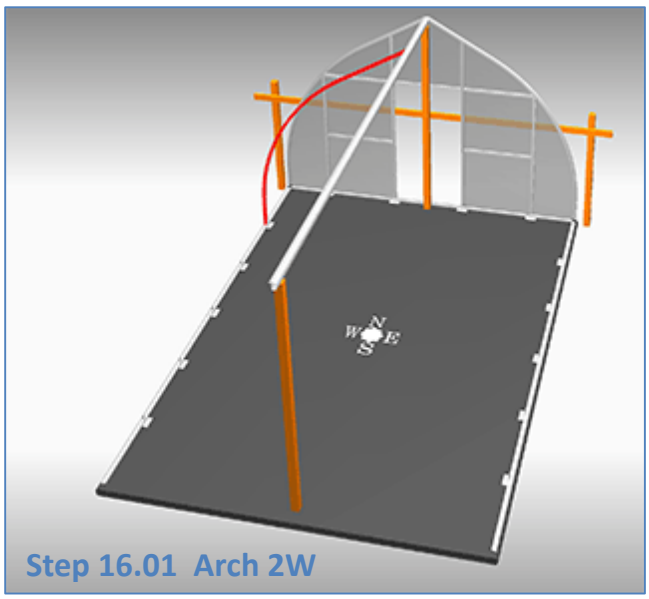
Apply the instructions below as you follow the pictorial guide for Steps 16.01 through 16.26.

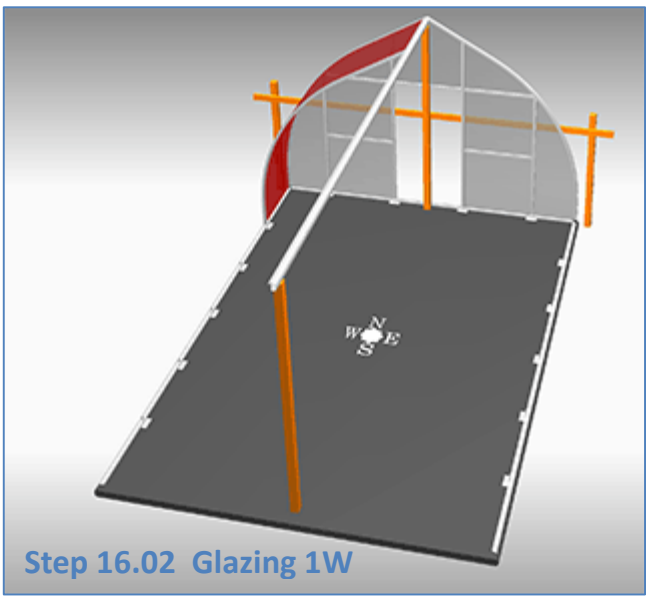
Force should not be needed to move components! *Gentle taps with a rubber mallet are acceptable but heavy blows will disrupt the alignment of other components. If you perceive a need for high force you have done something wrong. Stop immediately and solve the problem.*

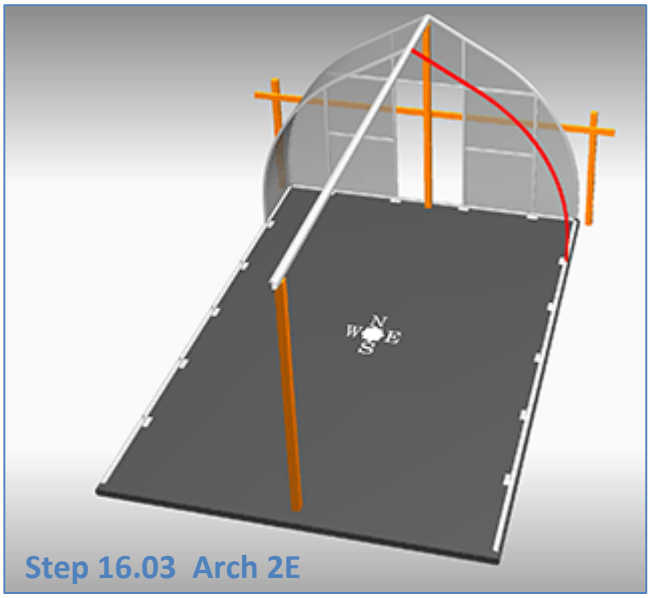
- **To install an arch:** Engage the lower end of the arch with the floor profile and the upper end with the roof beam. Gently slide the arch in small increments toward its position, keeping the positions of upper and lower ends synchronized. You may need to loosen mounting brackets to make them easier to pass. Stop the arch 2 to 3 inches before its marked position to leave working space for glazing installation.
- **Install all glazing panels with the UV-protected face outward.**
- **If mounting brackets are present:** Remove them on both sides of a bay before installing glazing in that bay. While this is not technically necessary, it is a safety precaution. The brackets may damage the glazing if you should lose control of the panel and allow it to fall forward against them. After the glazing is in place, replace the brackets and fasten them to the floor profile and arches.
- **To install a 3893 mm full-length glazing panel:** Wear rubber-coated gloves to securely grip the glazing. Maneuver the upper glazing edge into the roof beam slot. Then lift up the lower end of the panel, bending the panel, and set the edge into the floor profile slot. Move the glazing and its south arch northward while threading the edges into the arch retention slots.
- **To install a 2830 mm reduced-length glazing panel:** Place the lower edge into the floor profile slot and place a crossbar on the top edge. Bend the panel to match the curvature of the adjacent arches and work the panel and arches northward, threading the glazing sides into the arch slots. Fasten the crossbar to the arches using connector plates and the M6 screws previously loaded in Step 12.
- **To install a window:** Be prepared to prop the window in a raised position before you release it to step down from the ladder. Engage the window hinge in the roof beam's receiving channel at the south end and slide it northward. Then slide the window into position using the prop to maneuver it. Leave the window propped while the glazing panel and crossbar is being installed beneath it.
- **Remove the gable bracing and roof beam supports at the completion of Step 16.**

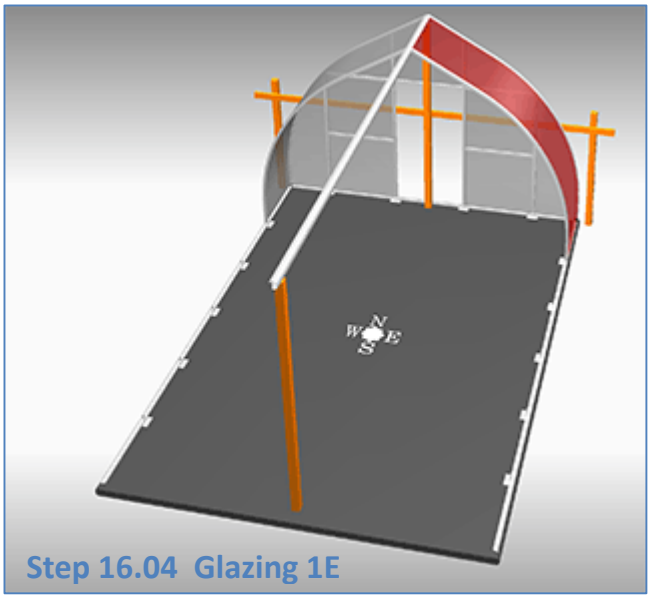
The 2830 millimeter glazing panels are very difficult to bend. *You will need some form of assistance.*

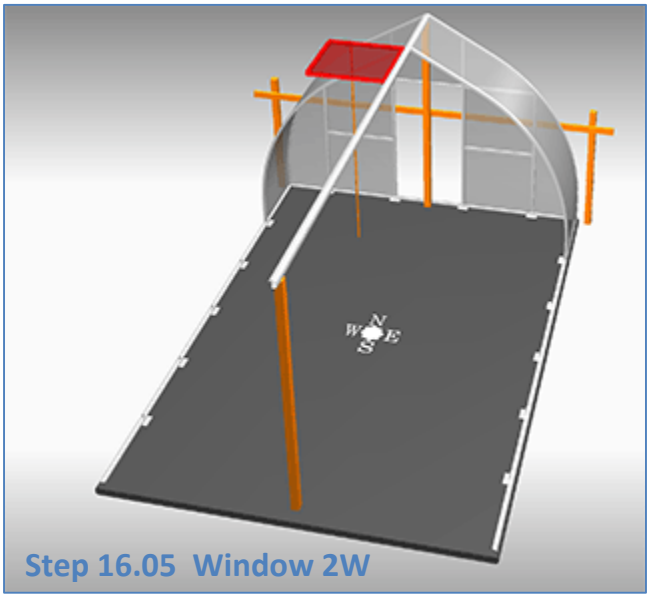
More

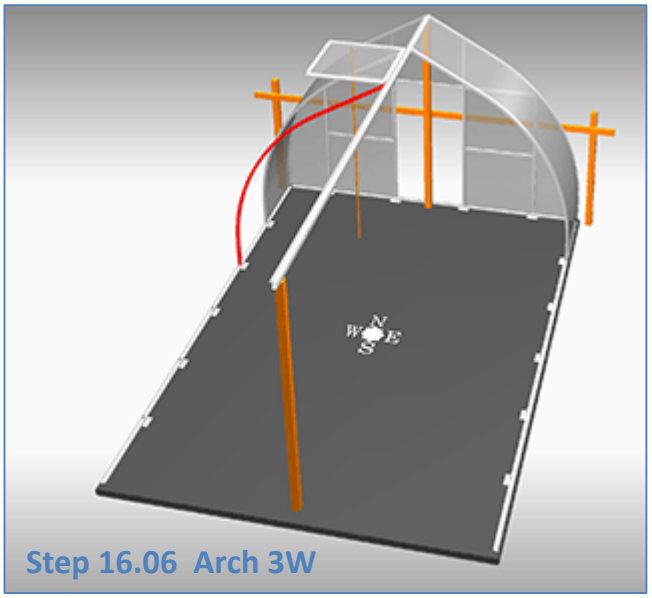

Step 16.01 Arch 2W

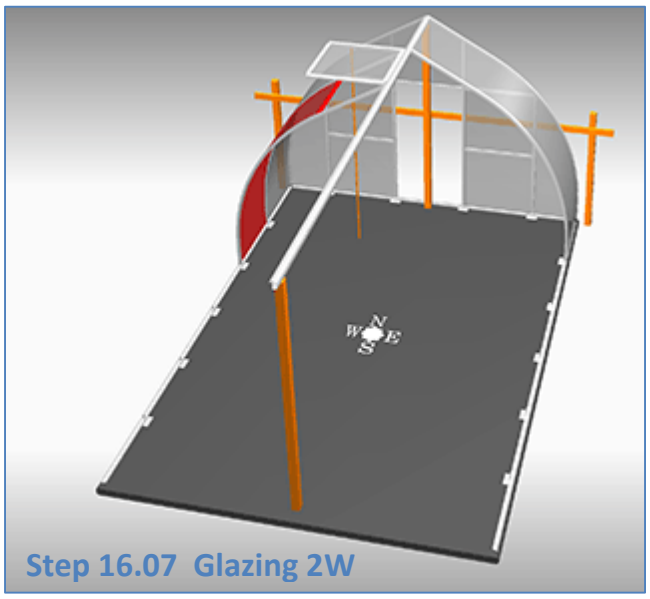

Step 16.02 Glazing 1W


Step 16.03 Arch 2E

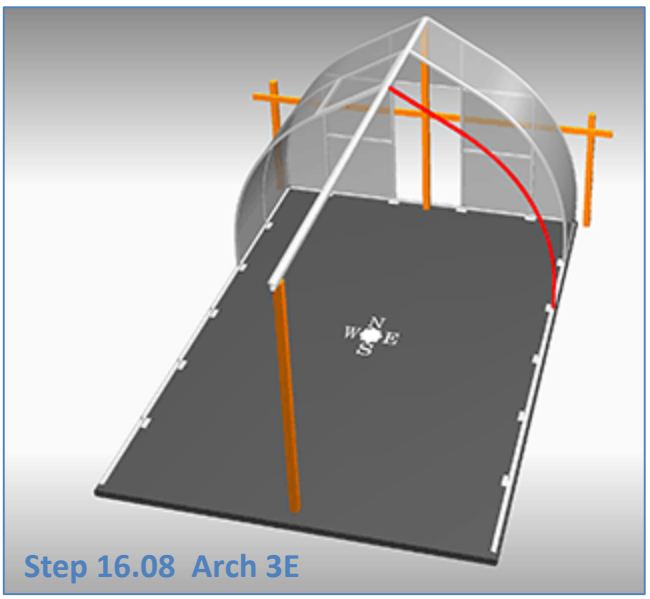

Step 16.04 Glazing 1E


Step 16.05 Window 2W

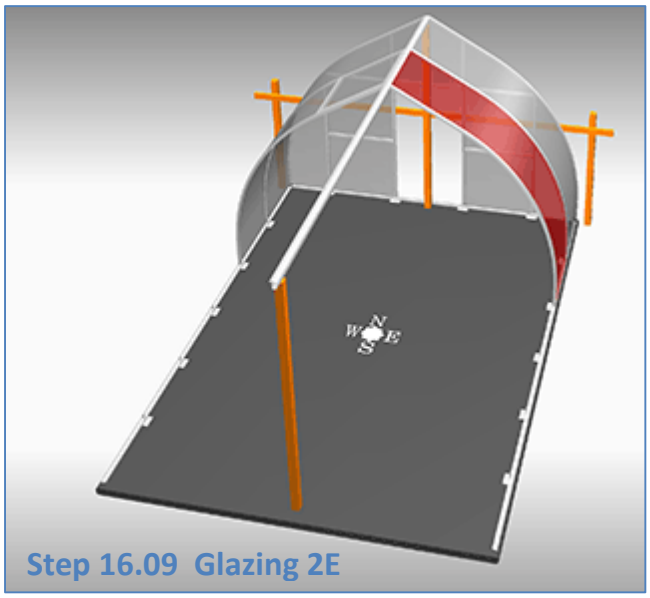

Step 16.06 Arch 3W



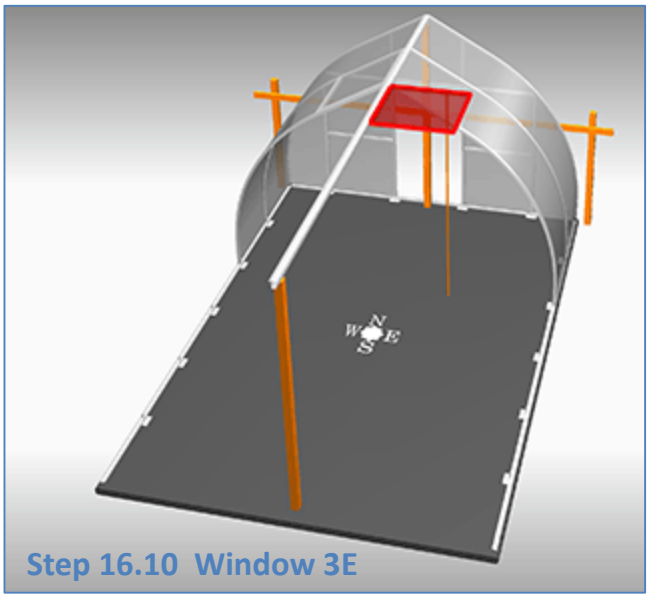
Step 16.07 Glazing 2W



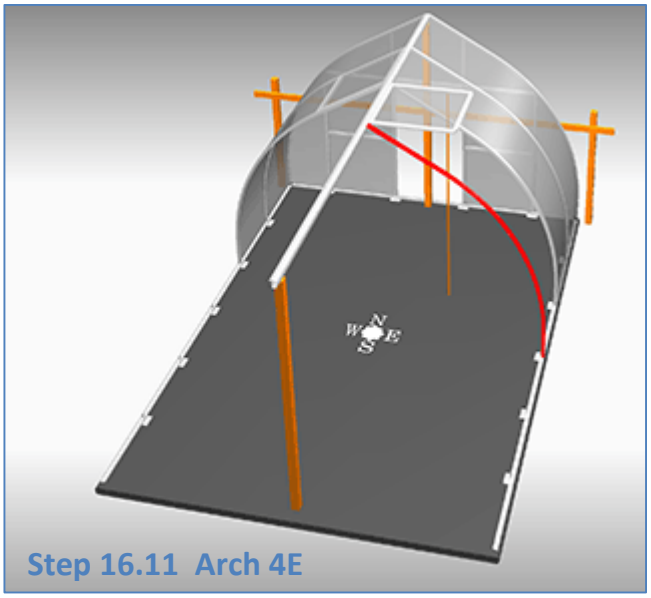
Step 16.08 Arch 3E



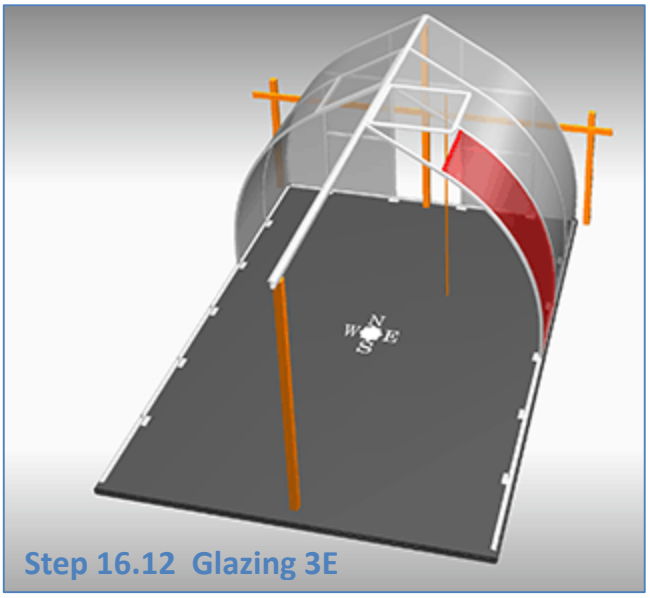
Step 16.09 Glazing 2E



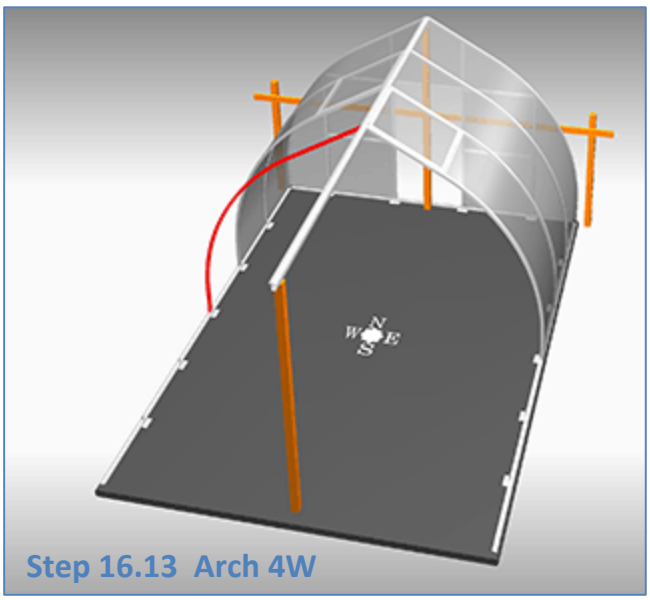
Step 16.10 Window 3E



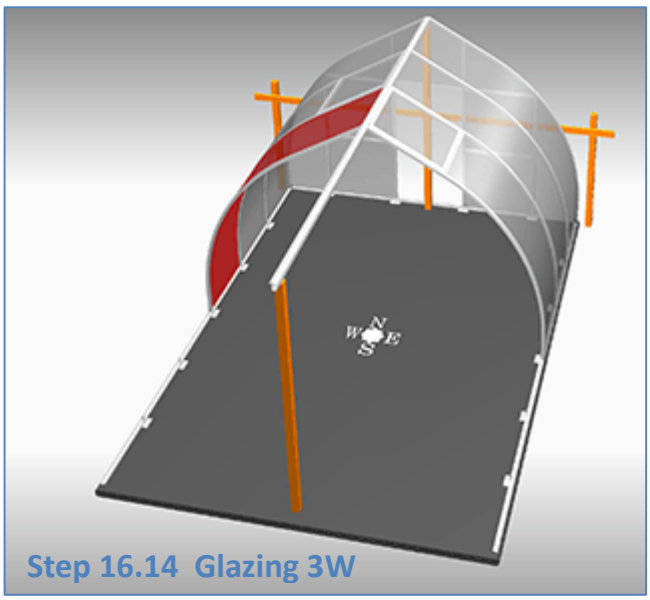
Step 16.11 Arch 4E



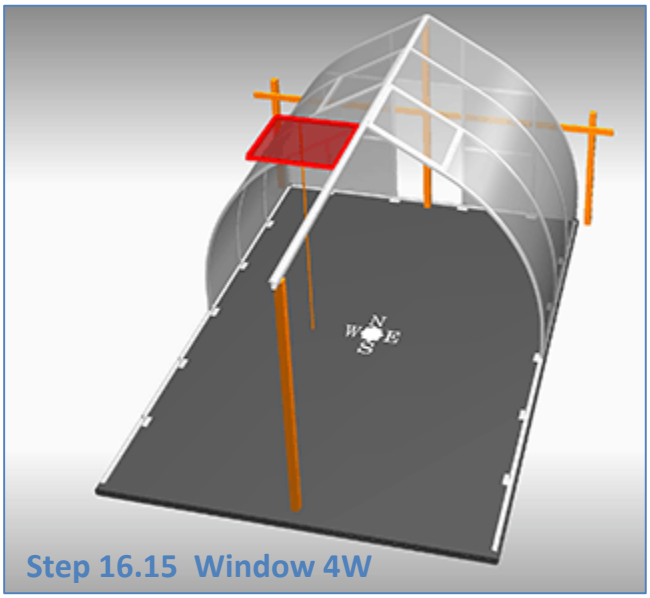
Step 16.12 Glazing 3E



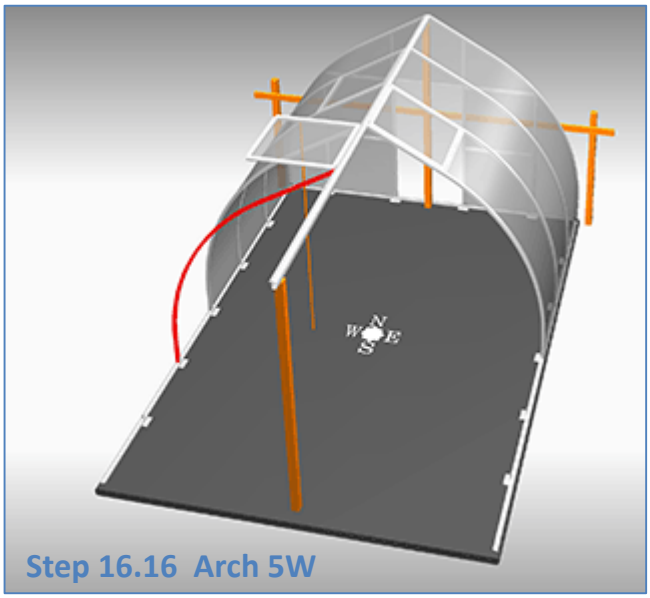
Step 16.13 Arch 4W



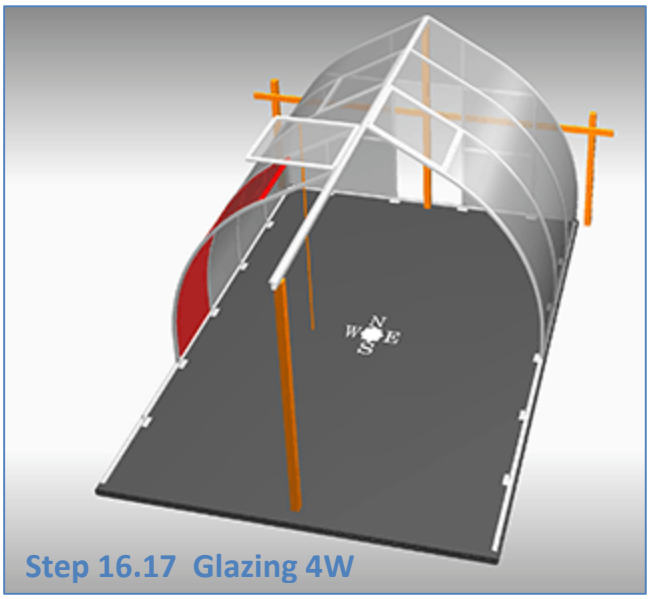
Step 16.14 Glazing 3W



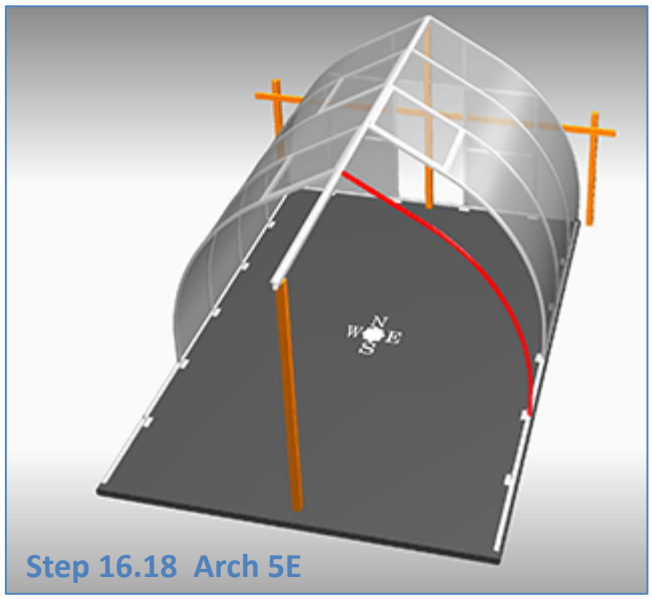
Step 16.15 Window 4W



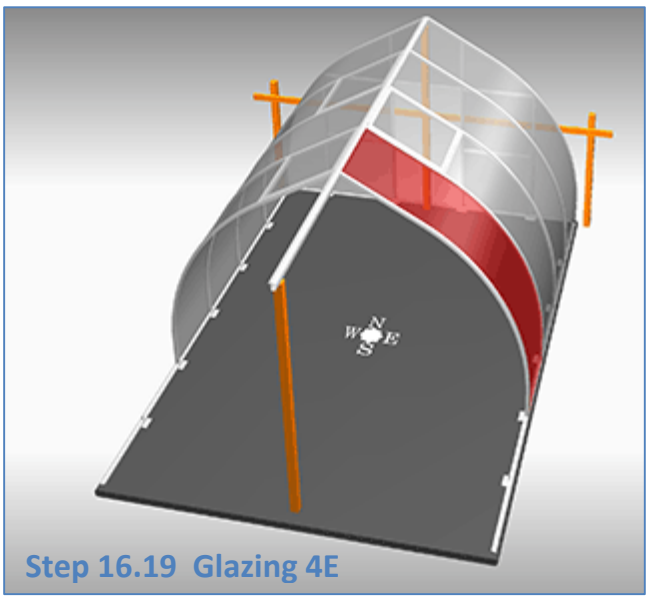
Step 16.16 Arch 5W



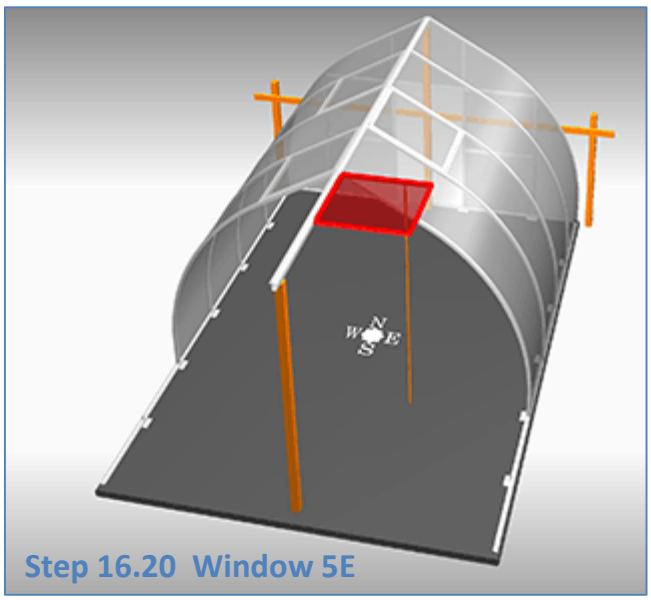
Step 16.17 Glazing 4W



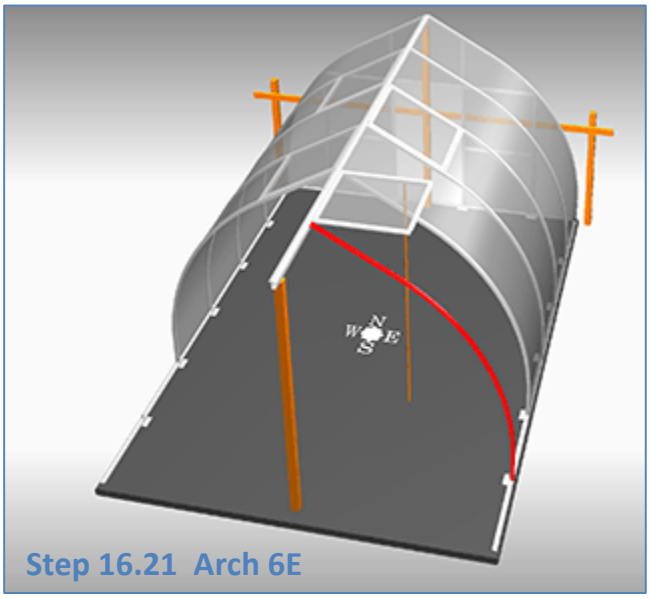
Step 16.18 Arch 5E



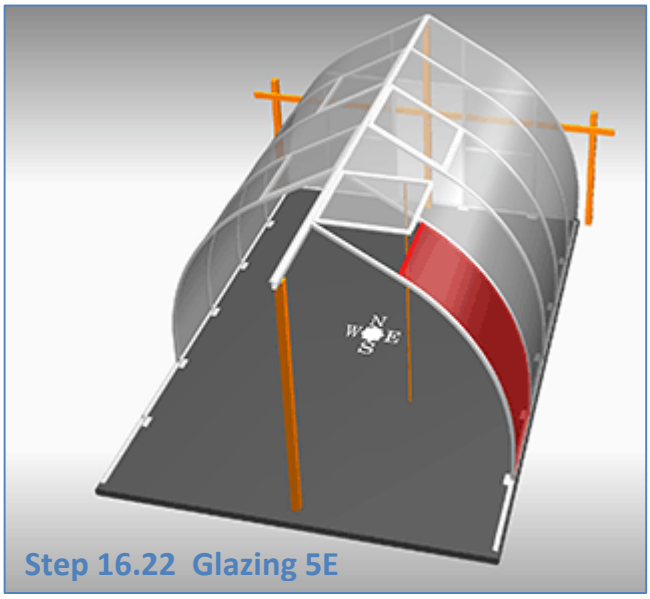
Step 16.19 Glazing 4E



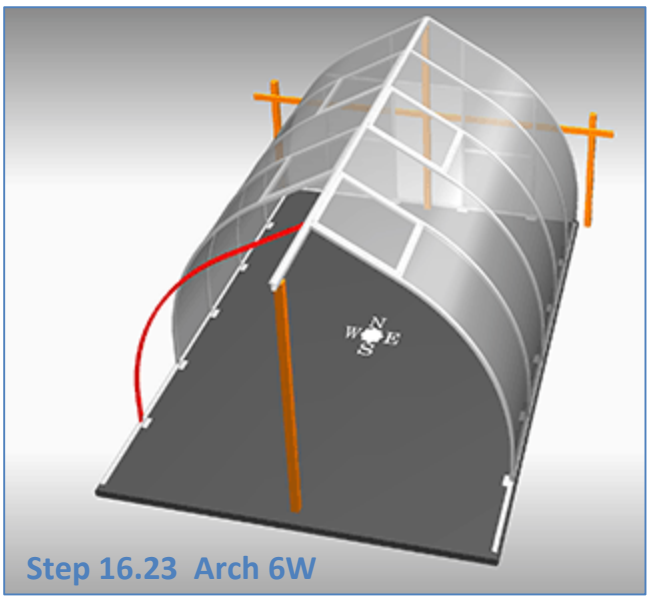
Step 16.20 Window 5E



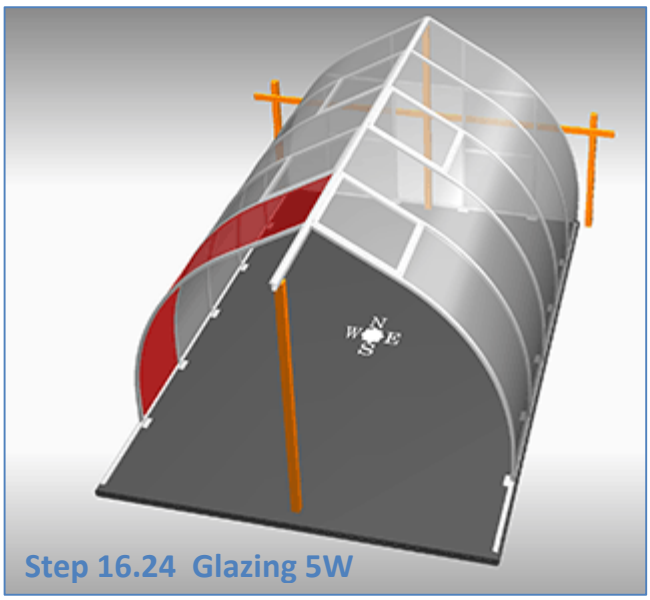
Step 16.21 Arch 6E



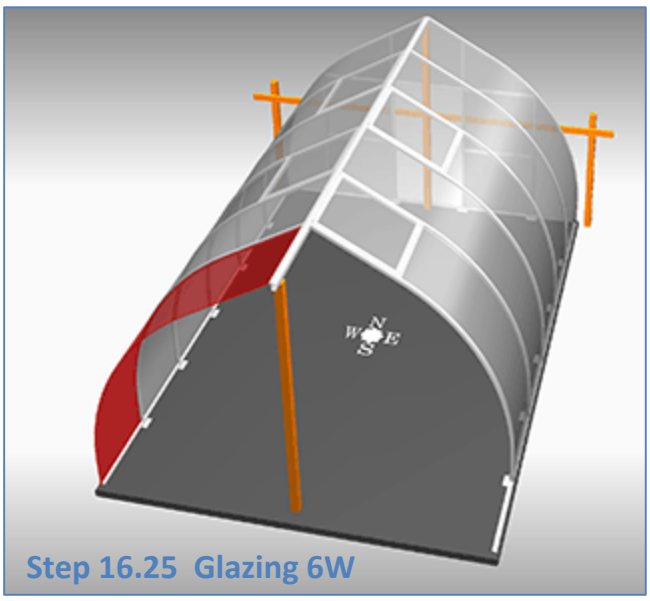
Step 16.22 Glazing 5E



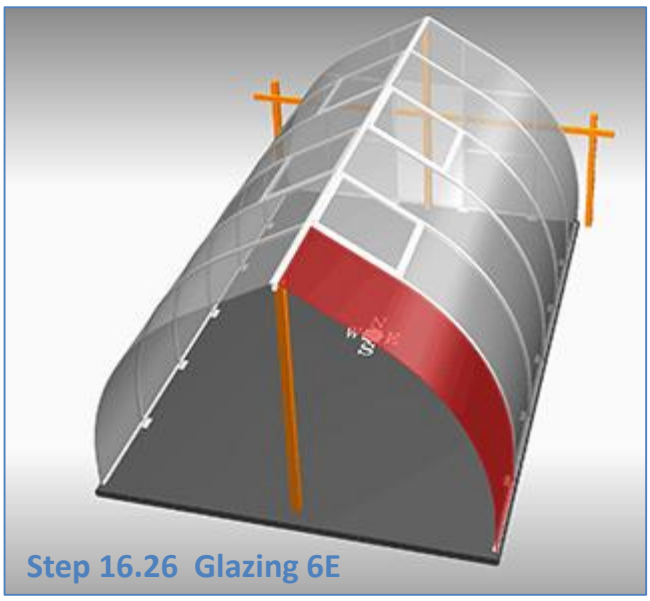
Step 16.23 Arch 6W



Step 16.24 Glazing 5W



Step 16.25 Glazing 6W



Step 16.26 Glazing 6E

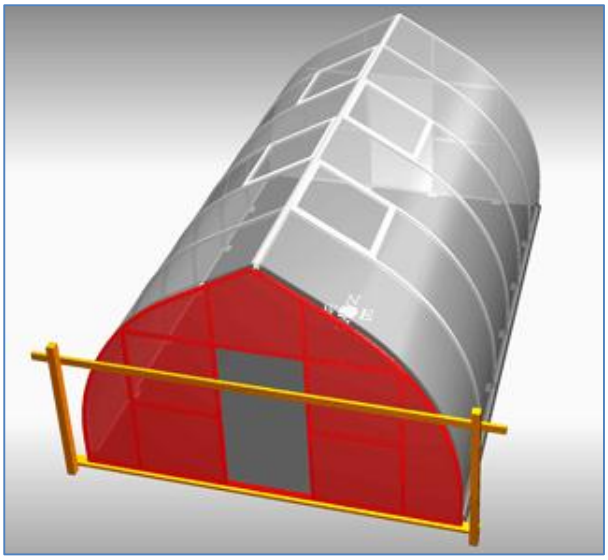
If your greenhouse is built on the optional aluminum foundation frame you must defer installing Glazing 6W and 6E until after the second gable is built (Step 17). If you are building on a wood or concrete substrate you may still find it more convenient to defer these. There will be more room to work around the gable.

Step 17 Assemble and Set the Second Gable

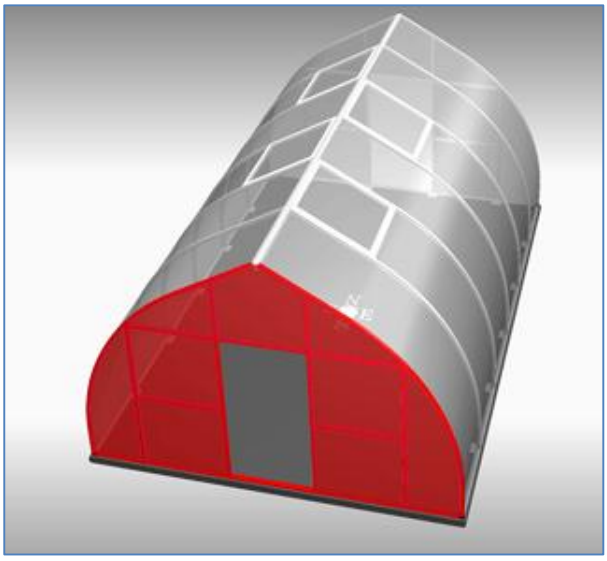
Parts required

Completed gable per Steps 3 through 10
1 Pos. 114 Roof beam end cap cover
2 Pos. 111 4.2 x 13mm Phillips head screw
2 Pos. 116 floor profile corner connector cover
8 Pos. 113 4.8 x 16 mm Phillips pan head screw

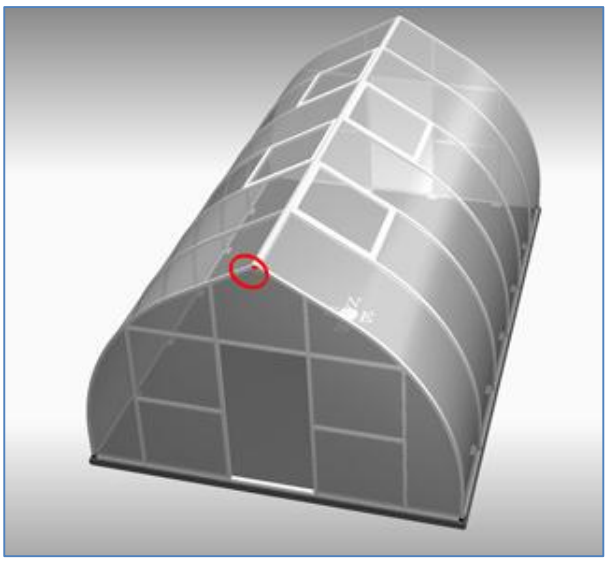
Build the gable about 3 inches south of its final position to allow working space. If your substrate is not long enough to support the displaced gable you must build temporary support into the bracing.



As you move the completed gable into position, join its plastic corner connectors to the side floor profiles and work upward as you thread the edges of Glazing 6W and 6E into the gable arch slots. Engage the arches with the roof beam when they have approached close enough. You can remove the bracing when the gable is securely in place.



Secure the roof beam end cap cover to the end of the beam with the 4.2 x 13 mm screws. Fasten the floor profile connectors (Pos. 105) and install the floor profile corner connector covers (Pos. 116), securing each with 4.8 x 16 mm Phillips pan head screw (Pos. 113).



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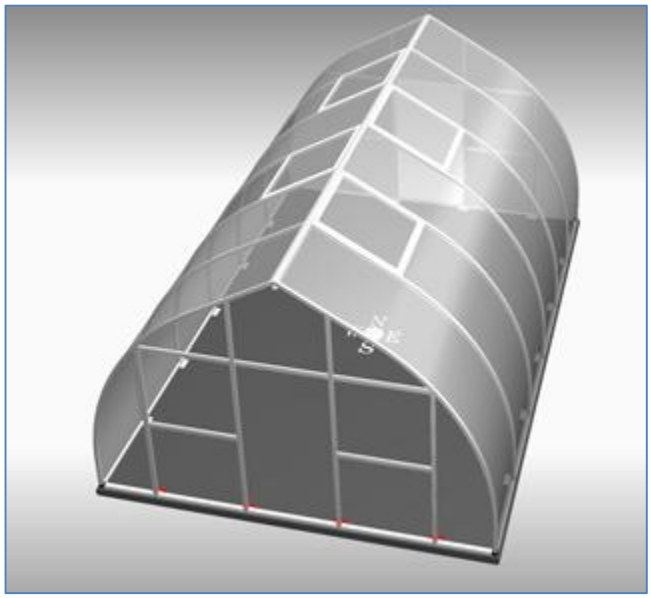
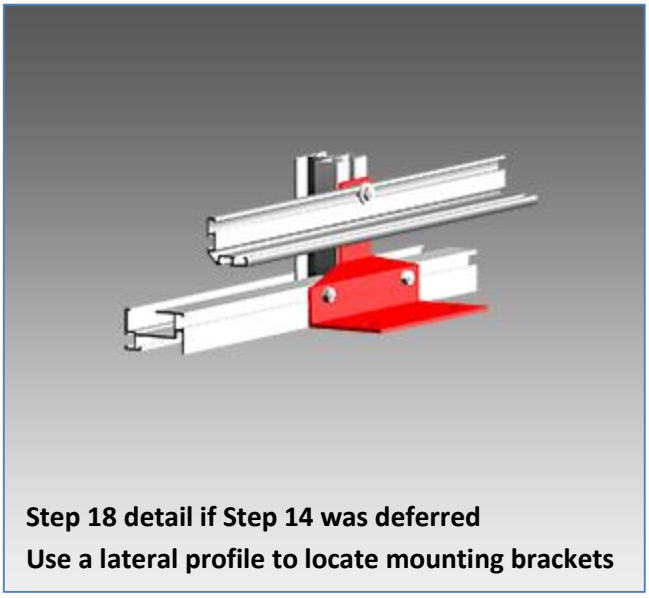
Step 18 Install the South Gable Mounting Brackets





Step 18 detail if Step 14 was deferred
Use a lateral profile to locate mounting brackets

For the aluminum foundation frame use Pos. 6.4 hold-down plates instead of mounting brackets.

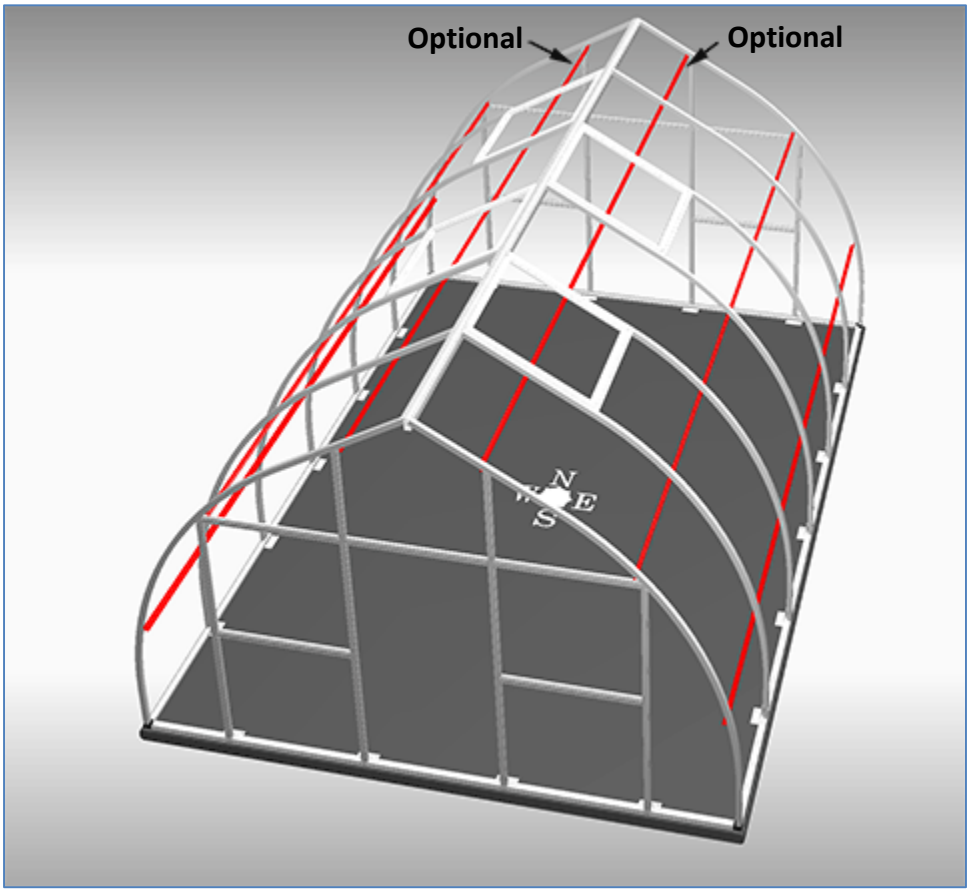
Parts required

4	Pos. 6.7	Mounting bracket
8		Anchor, 3/8 inch

If you deferred Step 14 *(installing the north, east, and west mounting brackets) perform that step now. You will have to contend with the arches when you use the lateral profile to locate the bracket positions (see detail drawing above). Return here when finished and install the south gable mounting brackets.*

- Precisely locate each mounting bracket and fasten it to the floor profile and to the vertical profile.
- Restrain the bracket; it must not move during drilling.
- Use the holes in the bracket to transfer-drill perfectly plumb holes in the substrate.
- Install the anchors and fasten down each bracket before moving to the next.

Step 19 Install the Lateral Supports



Parts required

4	Pos. 22	Lateral supports
2	Pos. 22	Optional extra lateral supports for lighting and plant support

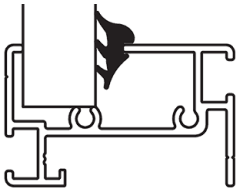
If an optional shelving kit will be installed the shelf height is fixed by the lateral support elevations. You may wish to adjust these elevations.

- Lower laterals should be at the approximate height of the lower gable crossbars and upper laterals at the approximate height of the upper crossbars. Optional extra laterals can be anywhere you wish, but are convenient just above the slanted T connectors. **Why extra lateral supports?**
- Stretch a gable-to-gable string between preloaded screws in the arches to mark elevations along all of the arches.
- M6x16 screws with nuts and washers have been preloaded into the arches.
- It may be necessary to adjust the position of some side wall arches to align with the pre-drilled holes in the lateral supports.

More

Step 20 Install Interior Seals

The interior insulation seal (Pos. 110) is delivered as two joined strands in a single coil. Its purpose is to seal the openings at the base of each glazing panel against debris and condensate that runs down the glazing surface. Segments are pressed into the floor profile slot between vertical profiles, fitting tightly against the inside face of the glazing. Separate the strands before starting.



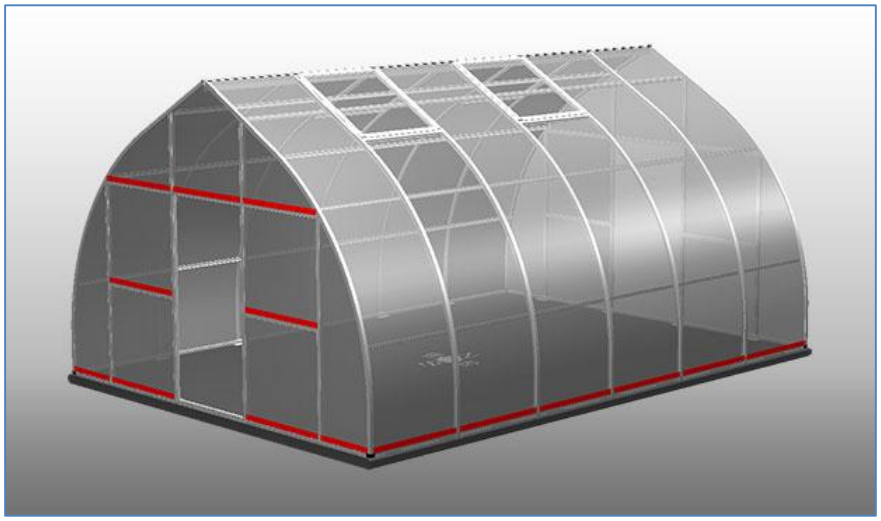
- You may precut the seal if you wish, or cut as you finish each bay. You will need two different lengths if you precut. The wide bays of the side walls and gables are 952 mm and the smaller bays at the curved gable profiles are 571 mm. You should cut a little extra; 972 mm and 580 mm are recommended so you can compress the seal lengthwise as you press it into place. This will prevent the ends from pulling away from the vertical profiles during cold weather shrinkage.

- Press the seal into the slot until the inside lip of the floor profile engages with the slot in the side of the seal. Pressing in over 60 feet of seal takes a toll on your fingers. Fashion a simple roll-in tool to provide some relief.

- Cut the seal about 12 mm long when you near the end of the bay if you have not already precut it. The extra material will provide some longitudinal compression. Each end of the seal should fit tightly against the vertical profile.

- It is more difficult to press seal behind the corner connector cover plates but it can be done. Try sliding the seal into place endwise instead of pressing down.

Step 21 Apply Exterior Sealant



Seal the bottom edge of every glazing panel. Mask with Scotch Blue painter's tape to form a bead on the glazing surface 3 to 5 millimeters wide from the profile edges. Apply the sealant and tool it to slope from glazing surface to profile edge. Allow it to cure for 24 hours before removing the tape.

Windows are sealed individually when they are assembled in Steps 1. Doors should be sealed after they have been hung and adjusted for proper fit in the doorway.

*Sealant should have been applied to the **ends of the window crossbars** as they were installed. Minor leakage will occur if this was not done.*

If you would like to defer sealing the exterior until better weather, apply 1-inch Scotch Blue painter's tape over the glazing interface to act as a flashing. It will last for months. For even longer life flash with aluminum foil tape.

Step 22 Hang the Doors

Parts required

8	Pos. 135	Hinge set
16	Pos. 140	Stainless 4.8 x 16 mm self-tapping Phillips flat head screw
16	Pos. 139	Stainless 4.8 x 25 mm self-tapping Phillips flat head screw
4	Pos. 136	Sash lock
8	Pos. 141	Stainless 3.5 x 22 mm self-tapping Phillips flat head screw
2	Pos. 150	Door lever set
2	Pos. 158	Two-part door holder set
4	REK	Double sided mounting tape, ¾ by 2 inch
4	REK	Stainless #8 x ¾ inch self-tapping Phillips flat head screw
4	REK	Stainless #10 x ¾ inch self-tapping Phillips pan head screw

When viewing the doors from outside the greenhouse, the latch side is left and the hinge side is right.

- Disassemble the hinge pairs by removing the pins.
- Fasten four hinge fixed parts to each right vertical door profile with 4.8 x 25 mm Phillips flat head screws driven into the pre-drilled holes. Tighten the screws.
- Fasten two hinge swinging parts to each door with 4.8 x 16 mm Phillips flat head screws driven into the pre-drilled holes. Leave the screws slightly loose.
- Engage each door to its respect hinge fixed parts and install the hinge pin to secure it. Then install the circlips to retain the pin.
- Tighten the screws that fasten the hinge swinging parts to the doors.
- Install one part of a door holder set on each door and its mate on the corresponding gable crossbar. Use #8 x ¾ inch Phillips flat head screws for the female part and #10 x ¾ inch screws for the male part.
- Install a door lever set in each upper door following the pictorial instructions included with the lever set.
- Fasten a sash lock to each door with 3.5 x 22 mm Phillips flat head screws.

More

Step 23 Install the Window Openers

Parts required

4 (No Pos.) Automatic window opener assembly

The window openers are easier to install if you temporarily remove the springs and leave the actuator detached. Washers are not called for, but ¼ inch stainless flat washers over the slots of the upper foot will make it easier to keep the foot in position while tightening the nuts.

Install each window opener by fastening one foot to the window's lower profile and the other foot to the crossbar immediately below. The mounting screws have been preloaded in Step 1 and the positions have been marked in Step 12.

Chill the actuator in a refrigerator for about 10 minutes to assure that it is fully retracted. Manually press the shaft as far is it will go into the cylinder, and then fully thread the actuator into the yoke on the mechanism. Raise the window as needed to align the hole in the shaft with that of the bushing and install the locking pin. Finish by replacing the springs.

The opening temperature is controlled by the distance you thread the cylinder into the yoke. Fully threaded, the window will open at the minimum temperature. Thread the cylinder farther out (anti clockwise) to raise the opening temperature.

More

SUPPLEMENTAL ASSEMBLY INSTRUCTIONS

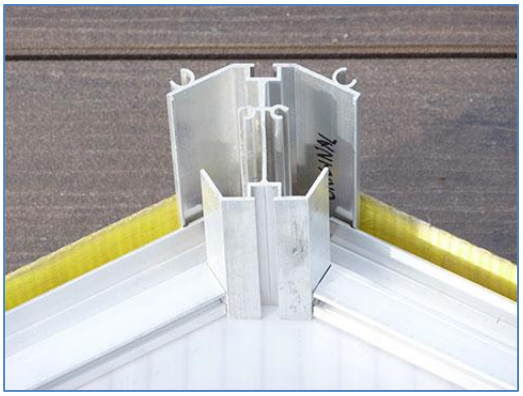
Assemble the Gables Horizontally

If you have the space you might find it easier to assemble the gables in a horizontal position. Assemble with the inside gable face upward as you follow the instructions for Steps 3 through 10. Here are a few hints to make the job easier.

Confirm that the gable is square, and then use clamps and cargo straps to secure it before fully tightening the screws.

Pre-drill a clearance hole in each end of the floor profile for a #6 stainless self-tapping screw, ½ inch long. Drive the screws into the plastic corner connector to temporarily secure these parts against separation while moving the gable or tilting it into position. You might need to remove these screws later when you connect the side wall floor profiles.

You must use the roof beam fitment tool to assure proper alignment of the arches before driving self-drilling screws.



Clamp the corner junctions and confirm that they are square and properly positioned before driving self-drilling screws through the connector plates into the arches.

More 1 Roof Windows

The windows are best assembled on a small table so you can walk around and work on any side of the window without a long reach. This is particularly helpful when glazing sealant is applied. Assembling the window with the inside facing upward is most convenient.

Mark the center of the profile that will be the lower window side (Pos. 25). Add additional marks 20 mm each side of the center to designate the area for the window opener's mounting foot.

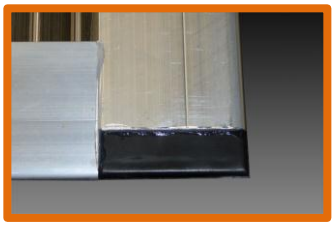
The screw capture slots in the window and door profiles are too large to bind the heads of the provided M6 cap screws. The heads will turn in the slots, thus tightening is inconvenient. It is recommended to substitute UNC ¼-20 x ¾ inch stainless hex head cap screws. Each window requires two screws for the window opener and two more for uplift restraints.

Load screws into the bottom profile and optionally into the side profiles. If you expect to install uplift restraints you must load the additional screws near the bottom ends of the side profiles. Corresponding screws must also be loaded in the supporting curved center profiles.

Install glazing blocks in the bottom profile. Press the blocks into position about 30 mm (1 $^{1}/_{8}$") inward from the profile ends to avoid interference with the 4.2 x 60 mm screws. The bifurcated fastener on the bottom of the block will snap into the open-faced screw channel in the profile.

Install a plastic corner connector at the bottom ends of each side profile. Two configurations of corner connectors are provided to properly match two ends of a profile. The proper connector will extend the lip of the profile that receives the pressed-in T-seal and wrap it around the corner to match the joining bottom or top profile.

Apply a thin bead of sealant on the mating edges of joining parts before fastening. This will help defend against water intrusion.



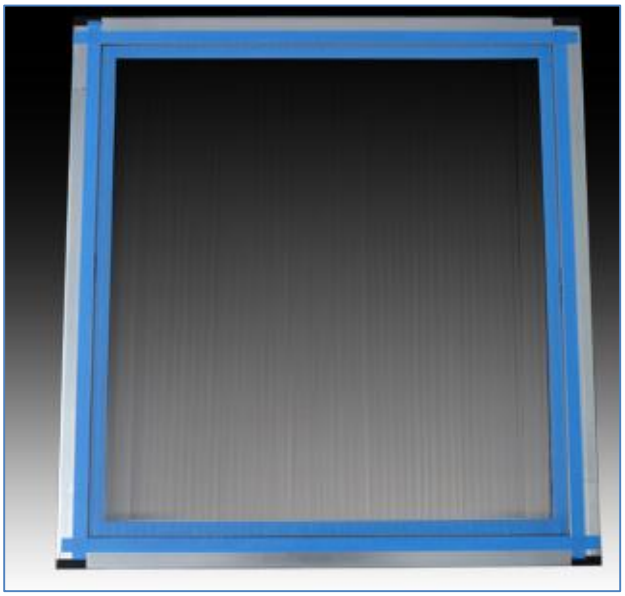
Fasten the two side profiles to the bottom profile. Use the provided 4.2 x 60 mm Phillips head screws. **Always drive the inner screw first** (marked 1 on the drawing) to pull and hold the profiles tightly together, then drive the outer screw (marked 2 on the drawing). The outer screw engages threads in the plastic corner connector before reaching the profile's screw channel and tends to jack the two profiles apart if not held tightly together by the first screw.

Insert an 888 x 943 mm glazing panel. Mark the exterior side of the panel before removing the protective film, then insert the panel into the 3-sided profile frame with the exterior side facing away from the side with the screw capture slots.

Install a plastic corner at the top ends of each side profile. Then install and fasten the top profile, remembering to always drive the inner screw first.

Position the glazing. Slide the glazing around so that all of its edges inside the profile slots have at least a small clearance from the floor of the slot. You must do this by feel. It is not necessary to center the panel, just arrange some clearance for each side. This will allow thermal expansion and contraction movements to be evenly distributed over all of the sealant beads. ***Be aware that the glazing might move if you handle the window, so once you have the glazing properly positioned try to avoid any significant movements until the sealant has partially cured.***

Mask and apply the glazing sealant to the outside window face. Mask with Scotch Blue painter's tape to form a bead on the glazing surface 3 to 5 millimeters wide from the profile edges. Apply the sealant and tool it to slope from profile edge to glazing surface. Allow it to cure for 24 hours before removing the masking or installing the T-seal.



Press the T-seal into the profile retaining slots on the bottom and both sides of the window. Do not install T-seal on the top profile. The lip of this profile is part of the hinge that fastens the window to the roof beam.

Press the seal into place in a way that does not introduce tension in it. Try to slightly compress the seal material along its length as it goes into the slot. This will prevent cold-weather shrinkage from compromising the seal. If the seal fins appear wavy you are compressing too much.

It is possible to install the seal around corners, sealing all three sides with a single length of material, but there is no advantage in doing so.

The T-seal is somewhat difficult to install. Assure that the stem of the seal is pressed fully into the profile slot and the seal is flat without hills and valleys. A screen bead roller, used for household window screens, can be helpful.

Return to Step 1

More 2 Upper and Lower Doors

Assembling doors is much like assembling windows but there are no cap screws to load, the T-seal is applied to all four sides, and you must attach hinges to the outside face. You can apply to doors everything you learned assembling the windows.

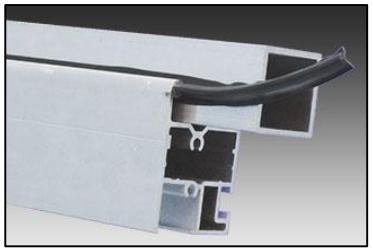
Those mysterious glazing blocks

No one seems to know what the glazing blocks are for, or why they are installed differently in doors than in windows. One thing is certain; the blocks must be kept at least 30 millimeters away from the ends of the profiles in which they are installed, otherwise the 60 millimeter screws that fasten the corners will wedge beneath the block displacing the glazing from its proper position and possibly deforming the frame.

Special instructions for the lower door

The lower door has a 2-piece assembly at the top composed of the door's top profile with a rectangular tube fastened to it. The tube is sealed against the lip of the door profile on which it mounts and provides a seat for the seal of the upper door. This double seal arrangement prevents rainwater from intruding between the doors.

Install the seal in the door's top profile before you attach the rectangular tube. The seal material should extend over the full width of the door, not just the width of the rectangular tube. You can trim it after the door is fully assembled. The pre-drilled holes in the rectangular tube are offset, so it will fit only one way on the top profile.



As you did with the windows, be sure to drive the corner fastener screws in the recommended order so the profiles will be pulled tightly together. You can ignore this order for the bottom corners of the upper door; there are no plastic corner connectors there to jack the profiles apart.

Applying the glazing sealant

The glazing sealant you applied to the roof windows prevents leakage. The doors are less susceptible to leakage because much less rain falls on their glazing surface, but sealing the doors unitizes the frame and the glazing panel into a rigid diaphragm that will remain square and true despite gravitational forces that try to make it sag. Check the doors with a carpenter's square before applying sealant.

Experienced Riga builders defer sealing the doors until they have been hung and checked for proper clearance. It is helpful to shim the door as needed to keep it square and true until the sealant cures.

Return to Step 2

More 3 Gable Floor Profile and Vertical Door Profiles

Load the inside capture slot of the floor profile with M6x12 screws.

Position a screw 55 millimeters each side of each pre-drilled 3.5 mm hole to fasten a mounting bracket, and one near each end to fasten a floor profile connector. Stow a nut on each screw and tighten to retain its position. NOTE: the pre-drilled holes are on the outside face of the floor profile.

Load each vertical door profile with screws as shown in the drawing.

Load the screws into either end of the profile in the order and approximate placement shown in the drawing. All of the M6x12 screws are mandatory, and you can load any optional screws that may be useful for your specific applications. Stow the nuts finger-tight on the screws to hold them in position.

Engage the left and right vertical door profiles into the floor profile and slide into position.

Install the left profile from the left end of the floor profile and the right profile from the right end of the floor profile. The vertical profiles have 3.5mm holes near the bottom ends, and are properly positioned when these holes are aligned with the innermost two holes in the floor profile.

IMPORTANT: *A vertical profile engaged with a floor profile must be braced against tipping to avoid deforming both profiles.*

Secure each of the vertical door profiles to the floor profile

Drive a 4.2x13mm Phillips head screw through the aligned pre-drilled holes. Assure that your Phillips bit fits the screw tightly with no wobble, and apply thread lubricant to the screws and the holes before driving.

Please drive these screws with care to avoid cam-out and consequent damage to the screw. If cam-out does occur you might be able to extract the damaged screw with a pair of VISE-GRIP® pliers.

Return to Step 3

More 8 T-connectors and Upper Crossbars

Fasten the crossbars to the vertical door profiles.

Drive the 4.2 x 50 mm Phillips head screw through the vertical door profile into the crossbar. Each screw passes through a pre-drilled hole in the vertical door profile, and into the circular channel in the crossbar extrusion as shown in the drawing. The space between the crossbar and the floor profile is 917 mm when the pre-drilled hole and the circular channel are properly aligned. When the screw has pulled the crossbar into intimate contact with the vertical door profile you may tighten the M6 nuts that fasten the previously installed T connector.

Install a T connector at the junction of each vertical middle profile and its lower crossbar.

Fasten the connector with the M6 screws that are already in place. Use clamps or straps to assure that the crossbar is in intimate contact with the vertical middle profile, and then tighten the M6 nuts.

Load three upper crossbars with M6x12 screws and set in place.

Load two screws near each end of each crossbar. Place the two outer crossbars atop the glazing and place the center crossbar in position between the vertical door profiles. Retain it with clamps, tape, or a strap until it is fastened in a later step.

Return to Step 8

More 10 Edge Stay Bars with Pressed-on Corner Connectors

Load screws into each edge stay bar (corner arch)

The screw locations are shown in the Step 10 drawing. These screws will fasten lateral supports. M6x12 screws are not long enough for this job so you must use M6x16 size. Position the screws as shown in the drawing. Optional screws for future use, positioned above the slanted T-connector plates, are strongly recommended to accommodate **extra lateral supports**. If you intend to install the optional shelving you should install another screw below the K connector as shown because the upper lateral support might be more convenient there for shelf support. Shelving is usually installed on one side only, but screws in both sides will keep your options open

Install corner connectors on the edge stay bars

The connectors must be pressed into the stay bar extrusion before being put in place. Use a rubber mallet to drive the connector's square stud fully into the cell of the extrusion.

Place the edge stay bars into position

Insert the plastic corner connector plugs into the sockets of the floor profile. Work the stay bars into position while threading the curved glazing edges into the slots. Use cargo straps across the base of the gable to keep the connectors engaged with the floor profile. Install a roof beam fitment tool and clamp the stay bars at the K connectors and slanted T connectors to assure intimate contact.

FASTENING THE EDGE STAY BARS: This is a point of no return. *Engage the roof beam fitment tool with the stay bars as you would a real roof beam and perform the next instruction to secure the bars.* ***If you do not have a roof beam fitment tool, read this.***

Fasten the edge stay bars

With the roof beam or the roof beam fitment tool engaged and the edge stay bars clamped into intimate contact with the vertical profiles, drive the 3.5 x 13 mm self-drilling Phillips pan head screws through holes in the K-connector plates and the slanted T-connector plates into the bars. Be sure that your Phillips bit fits the screws tightly with no wobble, and apply thread lubricant to both the screw and the target before drilling.

Attach the floor profile connectors

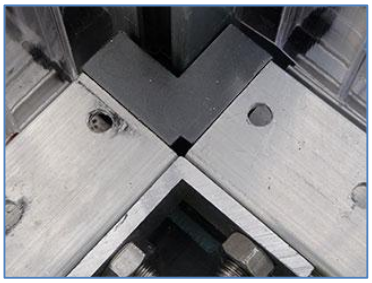
Attach one connector (Pos. 105) at each end using the M6x12 screws previously loaded. The screws can be tightened later when the side floor profiles are joined.

The holes in the floor profile connectors are offset to one edge, thus they can be installed with the wrong edge up. The connectors are correctly installed if their upper edge is flush with the top face of the floor profiles.

Return to Step 10

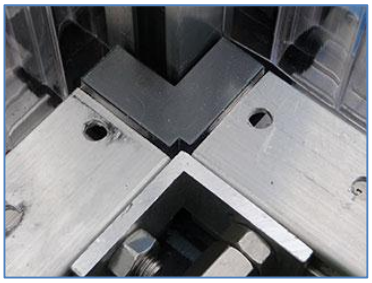
More 13 Set the Floor Profiles

The cover plate, not the plastic corner connector, governs the alignment of floor profile corner connections. *Do not attempt to drive the 4.8 x 16 mm screws until you have visually confirmed proper alignment.*

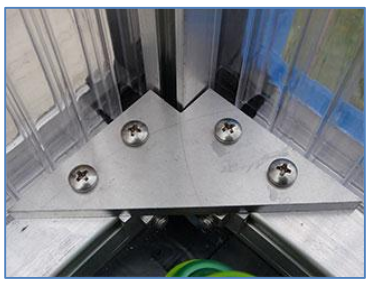


The image to the left shows the plastic corner connector tightly coupled to the floor profiles in what appears to be a perfect connection. There is no visible gap in the aluminum-to-plastic interface.

But with the cover in place a visual inspection reveals misalignment of the right-side holes. Because the floor profiles are tightly joined by the floor profile connector, an attempt to force the screws through the cover and into the floor profile on the right side would damage the screws and the profile.



To avoid this problem, leave the floor profile connector fasteners loose and adjust for perfect hole alignment. Inconsequential gaps might appear between the edges of the floor profiles and the plastic corner connector.



Fasten the cover in place when the holes are properly aligned. Then tighten the floor profile connector fasteners with a 10 mm socket. **You will not be able to tighten these fasteners if you loaded M6x16 screws in these positions.**

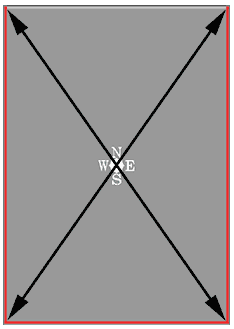
Return to Step 13

More 14 Install the North, East, and West Mounting Brackets

True up the floor profile placement

If you decide to proceed with Step 14, install string lines on the outside face of all four floor profiles. Attach the string between M6x16 cam head screws (also known as T bolts) temporarily installed in the outside capture slot. Monitor the string displacement along the profile to detect and eliminate bowing.

Make diagonal measurements as you square the floor profile rectangle. Accuracy is very important; always measure from and to identical points that are mirror images of each other. The profiles are ready to be anchored when the measurements are equal and all four string lines reveal no bowing.



Return to Step 14

More 15 Set the Roof Beam

Shortcut: An easier way to install the first two arches

You can save a little time and effort if you install arches 2E and 2W as you set the roof beam instead of later in steps 16.01 and 16.03.
Do not be tempted to add any more arches this way, and don't use this shortcut at all if you have a custom window pattern with a window in bay 1E or 1W. Doing so will cause you to later violate the window installation rule.

1. Before hoisting the beam, engage each arch with a side floor profile, slide it all the way to the north gable, and brace them there. It is much easier to slide them this long distance when engaged at only one end.

2. Engage the roof beam with arches 2E and 2W just before engaging it with the gable arches 1E and 1W.

3. Slide the arches south to their proper position after the roof beam is secured.

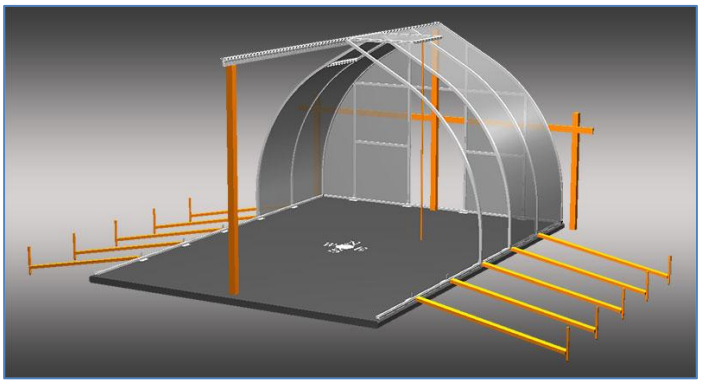
Return to Step 15

More 16 Assemble the Side Walls

The illustrations of Steps 16.01 through 16.26 show a succession of components being installed in optimum order, but you may revise this to improve convenience or make the job easier for your specific situation. The variations must never violate the **rule** that forbids sliding a window over an arch.

If mounting brackets have not been installed

Without mounting brackets the floor profiles will wander and bow as forces from the bent glazing are applied to them. You must restrain them in some way to avoid damage. One solution is kickers.



How to install an arch

It is possible to install an arch upside down. *Arches are not symmetrical but their ends are machined alike to engage with a floor profile or roof beam. Please review* ***this drawing*** *to avoid a mistake.*

Engage the arch with the floor profile as illustrated in the views below, and with the roof beam. Slide it toward its marked destination in small increments of about 2 inches keeping both ends synchronized to prevent binding. Stop the movement when the arch is within 2 to 3 inches of its destination.

When you reach Step 19 (lateral supports) your work will be much easier if you have already adjusted each arch position. This is best done after each glazing panel is installed, before moving on to the next step. Please read the next page.

How to adjust the position of an arch

The lower end of an arch is fixed by the mounting bracket and the upper end is manually adjusted to align with the **mark** on the roof beam reinforcement bar. The central portion must be manually adjusted by measuring from the north gable. Hook a metric tape into the capture slot of arch 1 (north gable) and measure to the **north edge** of the arch being adjusted. Adjust the arch to the distance in millimeters shown below.

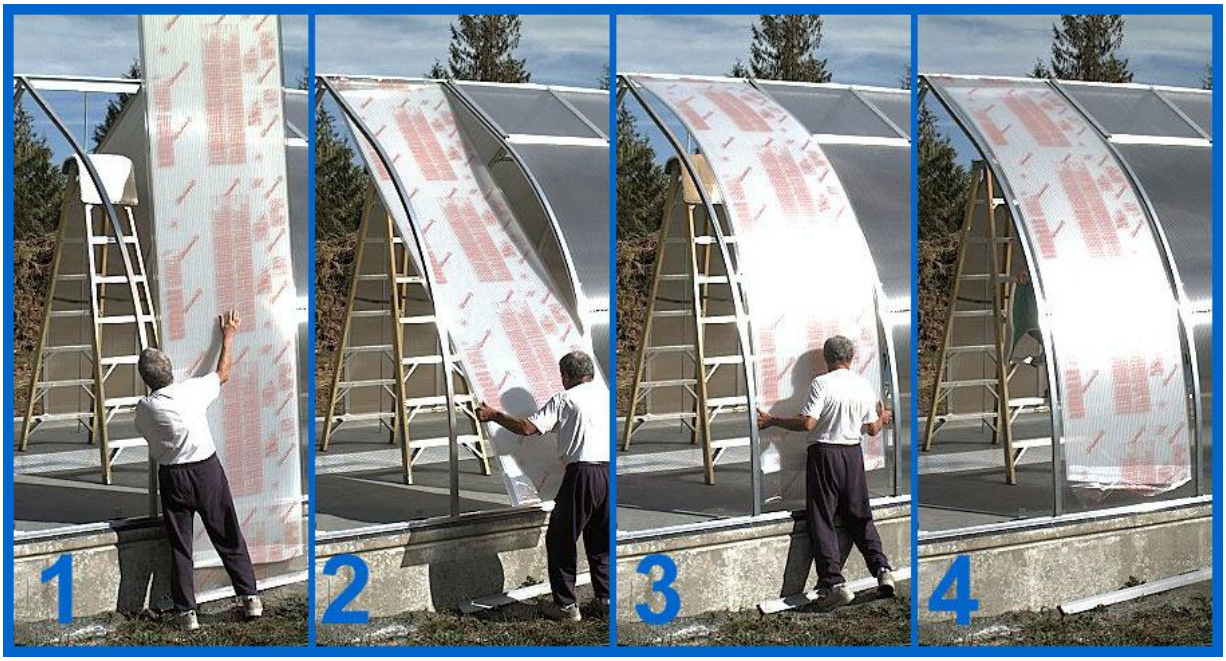
Arch 2	Arch 3	Arch 4	Arch 5	Arch 6
954	1949	2943	3937	4931

How to install a 3982 millimeter glazing panel in a non-windowed bay

Considerable forces accumulate as the panel edges are threaded into the arch slots. *Keep your fingers away from the slots; the edges may snap into place unexpectedly and take your fingertips with them.*

Prepare the bay by setting a cushioned back stop, such as a step ladder, in case you lose control of the panel. As a safety precaution, loosen or remove the mounting brackets (Pos. 6.7) in the working bay. The north side arch should be at its marked position. The south side arch should be 2 to 3 inches away from its marked position to allow finger room. Pull the protective film back several inches from the panel ends to keep it from entering the roof beam and floor profile slots.

1 Orient the UV-protected face outward.
2 Place the top edge in the roof beam slot.
3 Lift the lower edge, bending the panel.
4 Place the lower edge into the floor profile slot.



5 Install two ratcheting cargo straps from the south (movable) arch to the gable corner.

6 Working from bottom to top, press or tap the inside or outside glazing face as needed to move the edges into the slots. Re-tension the straps as more of the glazing edges enter the arch slots.

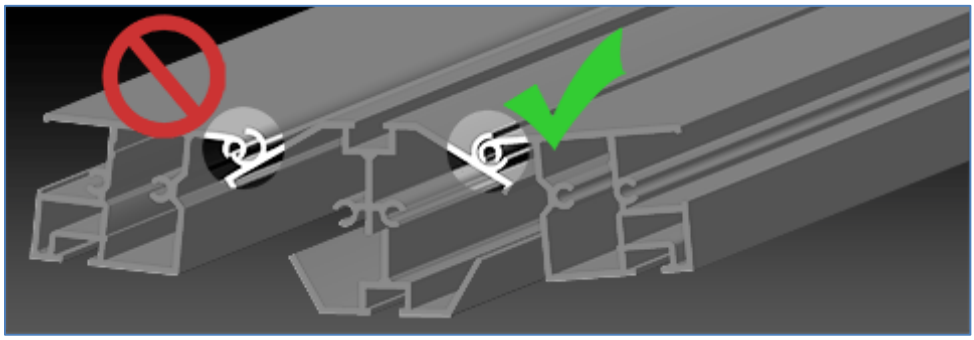
7 Remove the straps and protective film after the glazing is fully threaded.

8 Replace the mounting brackets, adjust the top end of the arches to their proper positions marked on the roof beam, and adjust the central portion of the arches by **measurement**.

How to install a window

Engage the hinge projection on the window's upper profile in the channel on the top face of the roof beam and side the window to its destination. The window profile for engagement is the one that has not been fitted with T-seal.

It is easy to engage the window incorrectly.



1 Engage the window hinge with the channel on the roof beam.
2 Prop the window before descending from the ladder.
3 Keep the window propped while sliding it to its destination.
4 Window has arrived at its destination.
5 Lower the window. It will rest on the single arch of its potential bay.

A 10 ft. length of Electrical Metallic Tubing (EMT) conduit, ½ inch trade size, makes an excellent prop. Index it by placing an end over one of the screws preloaded in the window's lower profile.

Sliding the window

There are at least three easy ways to slide the window. Keep the window propped while sliding.

1 Manually push it as far as you can from a ladder, descend to move the ladder, then re-ascend and push some more.

2 Move one of the window's optional uplift restraint screws as close as possible to the roof beam and use a second prop to push against it from the floor. This works best on the window's leading edge.

3 Use a string and pulley arrangement as was done in the pictures above. Attach the pulley to a spare M6 screw in a nearby curved profile, or to a cam head screw placed in the reinforcement bar.

How to install a 2830 millimeter glazing panel in a windowed bay

The window must be in place and propped open before the glazing is installed beneath it. Prepare the bay as you did for a 3982 mm glazing panel. Place the lower panel edge into the floor profile slot. Fasten the lower hooks of two ratcheting cargo straps to the substrate.

1 Place a crossbar atop the glazing panel and hook the upper ends of two cargo straps to it.

2 Tighten the two straps, keeping the sides equalized, until the curvature matches the arches.

3 Install two additional cargo straps outside from gable to arch as you did for 3892 millimeter glazing.

4 Tension the outside straps and thread the glazing edges into the arch slots.

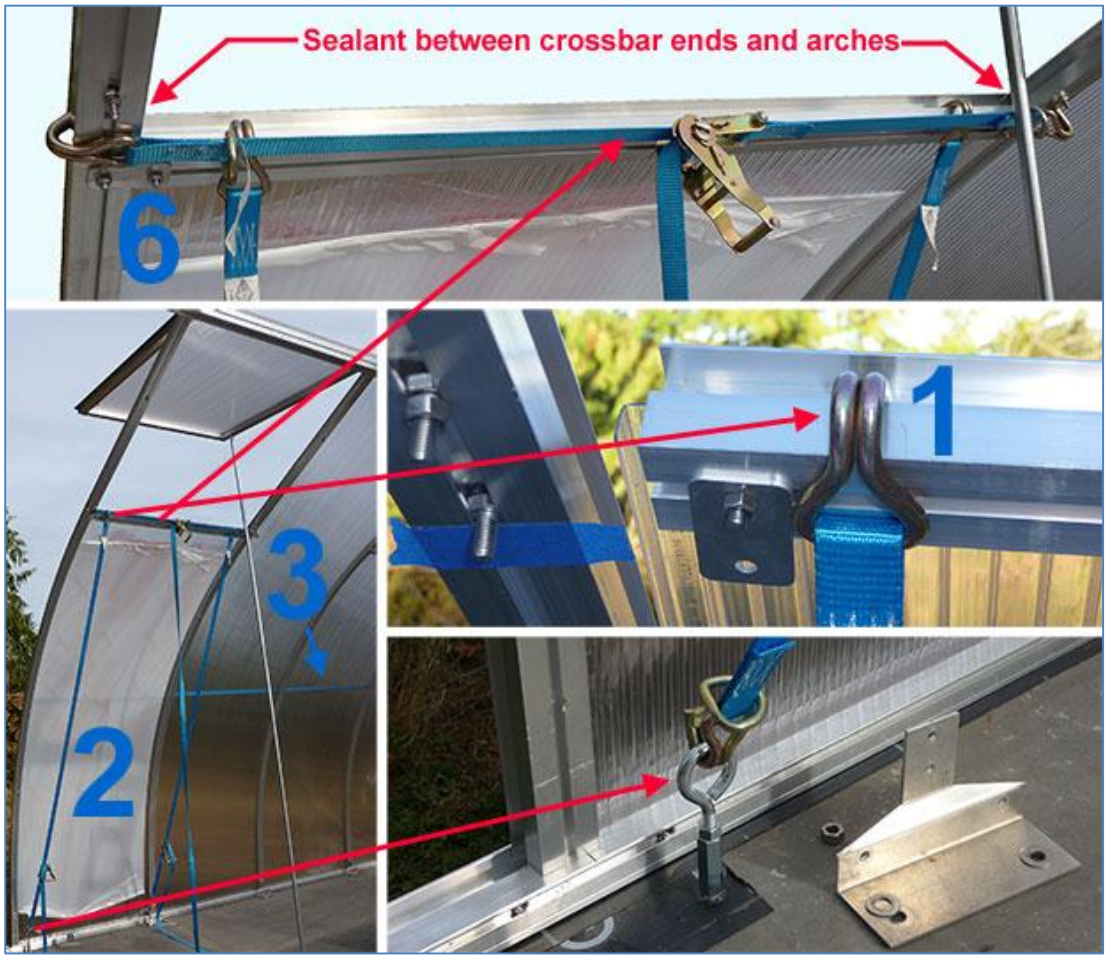
5 When fully threaded install a cargo strap parallel to the crossbar but don't tighten it yet. Secure the crossbar loosely to the arches with the connector plates.

6 Loosen the bowing straps, lower the window, and adjust the crossbar position so the T-seal rests fully on it. The gap between crossbar and window should be less than ¼ inch. Raise the window and apply sealant to the crossbar ends, then tighten the horizontal strap and the connector plate screws.

7 Wipe away sealant from the outer face of the crossbar so it will not later stick to the window T-seal. Remove all straps and protective film.

8 Replace the mounting brackets and adjust the position of the arches.

9 Lower the window but place thin spacers between it and the crossbar until the sealant fully cures.



Return to Step 16

More 17 Set the Second Gable

There are several operations to juggle as you join the gable to the side walls. Join the floor profiles and start threading the side wall glazing 6E and 6W as you work your way from bottom to top. You will reach a point when you must engage the roof beam. You will need assistance to move the gable and to keep it from falling away when you direct your attention to another area. The best assistance is a set of ratcheting cargo straps. Here are some of the helpful configurations.

1 Place two outside straps spanning the full length of the greenhouse. Strapping both sides works best, but you can share between sides if you don't have enough straps.

2 Place two inside straps pulling the upper portion of the gable inward. A third strap connected to the roof beam and anchored to the floor can adjust the beam downward. A five gallon bucket filled with water is a good alternative for a floor anchor.

3 Use a hook from the adjustable hanger kit to fasten straps to the gable and roof beam.

4 Pull down the roof beam until it is aligned to engage with the edge stay bars.

5 Outside view shows the roof beam fully engaged and ready for the cover plate.

Return to Step 17

More 19 Install the Lateral Supports

The lateral supports should be installed level, but their elevation is not critical unless they will support optional shelving. With this in mind, here's how to set the elevations.

1. For the lower laterals, make a mark on the concave face of each gable arch that is level with the top face of the nearby gable crossbar that was installed in Step 5. Use a level or laser device to help locate this spot, which will be approximately 990 millimeters above the substrate on which the floor profiles rest. This elevation is optimal for structural purposes and to support an optional lower shelf.

2. For the upper laterals, make a mark on the concave face of each gable arch at the end of the K connector's upper arm. This will be approximately 1968 millimeters above the substrate. This elevation is optimal for structural purposes but may not be best to support an optional upper shelf. If shelving is in your plan make the mark at your preferred shelving elevation. Instructions for shelf installation are here.

3. Locate the preloaded M6x16 screws at the marks and fasten the nuts tight. Stretch a gable-to-gable string between like screws and use it to make marks on each of the side wall arches. You may notice that the side wall arches are deformed inward by the force of the curved glazing; more so near the center than near the gables. Attach the string near the ends of the screws to minimize drag on the arches and provide a better straight line.

4. After making the marks remove the string and place a lateral in position, retained on each end by the screws in the gable arches. Install the remaining screws pulling the lateral away from each arch as needed to get it over the screw. The marks indicate the position of the lateral's bottom surface corner – if it had a corner. Since it is beveled, you must project where the corner would be as you fasten to the arches.

5. If you ordered an extra pair of lateral supports to use as hanging points, install them at any convenient height above the slanted T connectors, but be sure to keep them clear of the automatic window openers.

Return to Step 19

More 22 Hang the Doors

Install the hinges

- Remove the pins from all eight hinge sets and separate the two parts.
- Fasten a hinge **swinging** part in two places on each door's hinge side profile (upper door Pos. 42 and lower door Pos. 45) with 4.8 x 16 mm Phillips flat head screws driven into the pre-drilled holes. **Leave the screws slightly loose until the door is hung and the hinge pin is in place**.

- Fasten a hinge **fixed** part in four places on each right side vertical door profile (Pos. 7) using 4.8 x 25 mm Phillips flat head screws driven into the pre-drilled holes. These screws should be tightened.
- Hang the lower door first. Maneuver each door to engage the fixed and swinging hinge parts, and slide the pin in place when the alignment permits. If metal hinges are used, install circlips (snap rings) on the ends of the pins. Then tighten the screws that fasten the **swinging parts** to the door profiles.
- Install a sash lock on the inside face of each door, fastened with two 3.5 x 22 mm Phillips flat head screws (Pos. 141) into pre-drilled holes. The upper door sash lock is located on the bottom profile (Pos. 41) and the lower door sash lock is located on the latch side profile (Pos. 44).

Two types of hinges are used for the Riga XL; one made of structural plastic, the other of metal. If you have plastic hinges and your doors sag due to excessive slack, ask your Riga dealer for metal replacements.

Install the door lever sets

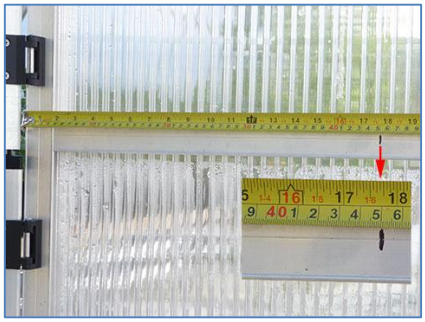
Install the lever sets in the large holes bored in the bottom profiles of the upper doors. Follow the pictorial instructions included with the boxed lever set parts. If you wish to install the locking cylinders, be aware that this must be done with the key removed from the cylinder. Once installed, there is no known way to remove the cylinders.

Install the two-part door holder sets (Pos. 158)

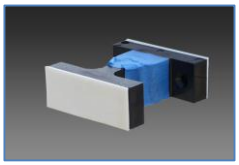
This installation will require measurement and drilling to locate the door holder parts. Some Riga owners do not install the door holders, but it is important to anchor an open door in some way to protect against wind damage.

The door holder is unusable if the door has been lowered into a stem wall opening. There will be no door and gable profiles aligned to support the holder parts.

- Locate and mark a position on the outside face of the lower right gable crossbar 450 millimeters from the hinge-side door opening.



- Connect the two door holder parts, bind them together with Scotch Blue painter's tape, and apply double-sided mounting tape to the mounting surfaces of both parts.



- Choose the part (male or female) that you want to mount on the crossbar. Remove its mounting tape release paper and affix it to the crossbar with its **left edge on the 450mm mark** and vertically centered over the decorative groove on the crossbar face.

- Remove the release paper from the other door holder part and open the upper door. Press the door against the holder, allowing its bottom profile to adhere to the mounting tape.

- Remove the Scotch Blue painter's tape and separate the holder parts. They will be held in place on the profiles by the adhesive mounting tape. Close the door to gain clear access to both parts.

The two door holder parts are fastened to the profiles with different screws, none of which are included in the Riga shipment. Use #8 x ¾ inch stainless Phillips flat head screws for the female part and #10 x ¾ inch stainless Phillips pan head screws for the male part.

- **Fasten the female part**: Drill a 0.120 inch pilot hole (#31 drill bit) through each mounting hole of the female part. **If drilling into the crossbar** try to locate the hole on the decorative groove and stop drilling immediately on penetrating the profile so you don't drill further through far side of the profile. Fasten with two #8 x ¾ inch stainless Phillips flat head screws.

- **Fasten the male part:** Drill a 0.144 inch pilot hole (#27 drill bit) through each mounting hole of the male part. Fasten with two #10 x ¾ inch stainless Phillips pan head screws.

Return to Step 22

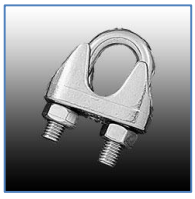
More 23 Window Uplift Restraints

Your window opener installation is not complete until you have considered uplift restraints. A restraint is a stainless steel tether with a loop at each end. Uplift restraints are aftermarket parts that can be obtained from your Riga dealer. They are not a standard part from the Riga manufacturer.

Two restraints are used for each window; one on each side. Install each loop between two flat washers on screws that were loaded in Steps 1 and 11. Position the restraint as illustrated and adjust as needed to avoid interference from the crossbar as the window is raised and lowered.

You can make your own restraints from $^{1}/_{16}$ inch stainless wire rope, preferably stranded 7x19 for maximum flexibility. The overall length should be about 16 inches which when installed near the crossbar will limit the window opening to less than the safe extents of the hinge and window opener, but greater than the maximum thermal extent of the opener. More important than the exact length of the restraint is a close length match for each window's pair.

Stainless steel materials are the best choice, and eBay is a good place to look for them. If you are not equipped to swage the binding sleeves you can use wire rope clamps.



Return to Step 23

All About Anchoring

Your Riga XL is equipped with a robust anchoring system which when properly installed will safely tolerate very high wind loads. Proper installation requires the included mounting brackets (Pos. 6.7) to be fastened to a strong and massive substrate with appropriate anchors.

About installing mounting brackets

Mounting brackets can be installed in Step 14 before the side walls are assembled, or in Step 18 after the second gable is in place. Step 14 installation is recommended and offers some advantages but Step 18 installation should be considered under some conditions.

Reasons to install mounting brackets in Step 14

Step 14	Step 18
Floor profiles anchored before installing arches and glazing will not move, fall off the substrate, or damage the isolation membrane.	Outward forces while installing glazing tend to push the floor profiles off of the substrate, damaging the isolation membrane in the process. Temporary restraints are required.
Once anchored, floor profiles remain square and true with no need for subsequent adjustment.	Side floor profiles bow considerably from glazing forces; not easily straightened to prepare for mounting bracket installation.
Access to drill the substrate for anchors is not impaired by obstacles; easier to drill accurate and plumb holes from any position.	Access to drill substrate is impaired by proximity to arches and glazing, and can only be done inside the greenhouse.

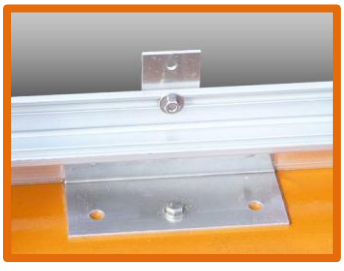
Reasons to defer mounting bracket installation until Step 18

Step 14	Step 18
High quality substrate required. Anchors cannot be conveniently moved to accommodate unexpected substrate anomalies.	More tolerant of moderate substrate anomalies and careless positioning of arches but out-of-tolerance conditions might accumulate and present problems at the second gable.
Mounting brackets must be loosened or removed during Step 16. If non-removable anchors are used, parts and method revision is required for fastening the mounting brackets to the floor profiles.	No requirement to remove mounting brackets in later steps so no parts and method revision is required for non-removable anchors. Disassembly for future repairs, however, will be difficult or impossible without the revision.

Can't decide? *If your substrate is square and level install in Step 14 using temporary anchors. Enjoy all of the benefits of early anchoring and still be able to move the bracket if it becomes necessary. Install the permanent anchors later in Step 18.*

Installing temporary anchors

Drill a $^{5}/_{16}$ inch hole in each mounting bracket, midway between the two foundation anchor holes. Choose Step 14 mounting but install only a temporary ¼ inch anchor through the new hole. Use a lag screw for wood or a Tapcon® screw for concrete.



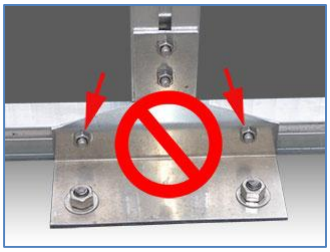
Anchoring To Concrete: A Special Case

A popular method for anchoring to concrete makes use of a threaded stud embedded into the concrete with very high pull-out resistance. One such device that is appropriate for anchoring your Riga XL is ITW RED HEAD Trubolt Wedge Anchor, part number SWW-3822 or equivalent.

A wedge anchor is permanent; it cannot be removed. There will be occasions when a Riga XL mounting bracket (Pos. 6.7) must be removed. If anchored with wedge anchors or similar non-removable anchors the bracket can only be removed by lifting it above the ends of the threaded stud.

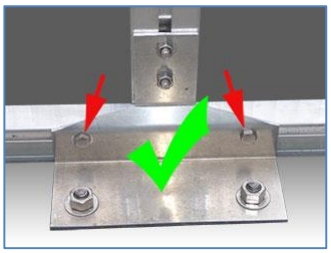
The problem

The picture shows a bracket fastened to the floor profile by two M6x12 screws in the profile's capture slots. This bracket cannot be lifted up to clear the anchor studs because the M6 screws cannot be removed. The entire floor profile must be elevated if the bracket is to be removed. This will be the situation for any stud-type non-removable anchor regardless of the substrate material.

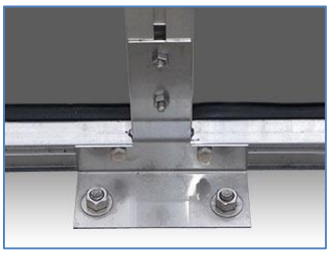


The solution

This problem can be avoided if M6 nuts are loaded into the floor profile capture slot instead of screws. The screws are then driven through the bracket holes into the nuts, and can be easily removed. For proper fit use M6x8 cap screws (8 mm long) instead of the provided M6x12 so they will not be forced against the back wall of the capture slot.



The Pos. 6.7 mounting brackets shipped prior to 2011 were made of stainless steel 1.6 millimeters thick. Brackets shipped 2011 and later are made of aluminum 3.0 millimeters thick. If your brackets are the earlier stainless models it may be necessary to include a washer beneath the head of each M6x8 screw to prevent contact with the back wall of the capture slot.



INSTALL OPTIONS

Install the Optional Shelving

This preliminary information will be completed in a future release of this manual.

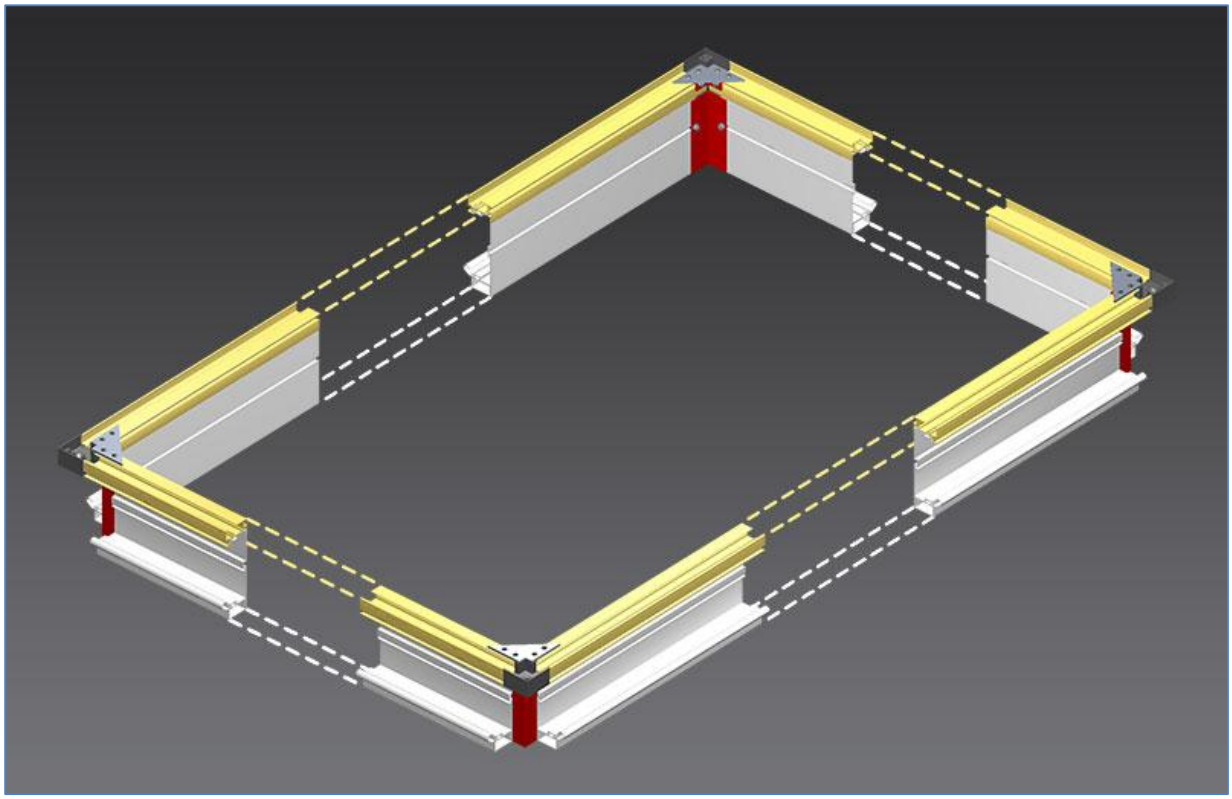
A new style shelf system for Riga greenhouses began shipping in 2012. The suspension chains of the older system have been replaced by brackets attached to the arches.

Install the 500 Millimeter Door Extension Kit

This preliminary information will be completed in a future release of this manual.

A kit is available for a Riga XL built on a stem wall. Use the door extension kit to relocate the doorway 500 millimeters downward for easy entry through the stem wall.

Assemble the Aluminum Foundation Frame



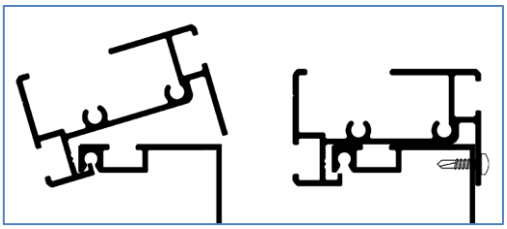
Compact view of an assembled foundation frame with floor profiles attached

The floor profiles must be installed on the foundation frame profiles before the greenhouse assembly begins. *Some deviations from the normal assembly instructions will be necessary. Place the foundation in a trench with the bottom surface of the floor profiles at grade level. Backfill and compact the trench after assembly is complete.*

Parts required

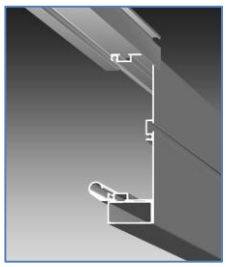
2	Pos. 6.1	Foundation frame profile for gables, 4100 mm long
2	Pos. 6.2	Foundation frame profile for sides, 5858 mm long
4	Pos. 6.3	Foundation corner connector (pictured in red)
18	Pos. 6.4	Hold-down plate
20	Pos. 117	Self-drilling screw, 3.5 x 13 mm Phillips pan head
34	Pos. 107.12	M6x12 hex head cap screw with nut
2	Pos. 1	Gable floor profile, 4145 mm long (pictured in gold)
2	Pos. 18	Side floor profile, 5903 mm long (pictured in gold)
2	Pos. 105	Floor profile connector (pictured in red)
4	Pos. 100	Plastic corner connector (pictured in dark gray)
4	Pos. 116	Floor profile corner connector cover
16	Pos. 113	Screw, 4.8 x 16 mm Phillips pan head

- Mark the floor profiles per **Step 12** but load only two M6x12 cap screws in each.
- Load 6 M6x12 cap screws in each foundation frame for gables (Pos. 6.1).
- Load 7 M6x12 cap screws in each foundation frame for sides (Pos. 6.2).
- Engage a floor profile with each foundation frame profile and align the centers. The floor profiles are 45 mm longer than their corresponding foundation frame profiles to allow socket space at the ends for the plastic corner connectors. They will extend 22.5 mm beyond each end of the foundation frame profile.



- Fasten with 3.5 x 13mm self-drilling screws (Pos. 117), six along each side profile and four along each gable profile. **Locate the screws well away from the floor profile marks so they don't interfere with the vertical profile hold down plates.**

It might be easiest to engage the floor profiles by sliding them onto the foundation frame profile from one end.



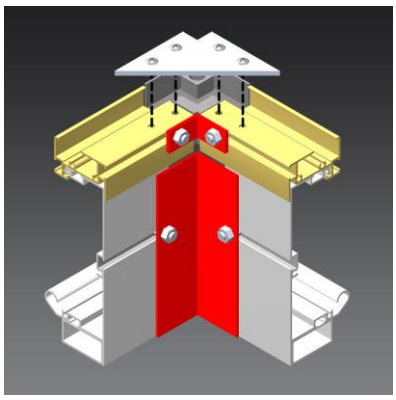
- Assemble the corners:

  Join the floor profiles with a plastic corner connector (Pos. 100).

  Install a floor profile connector (Pos. 105). Confirm **proper hole alignment** before tightening the M6 screws.

  Join the foundation frame profiles with a foundation corner connector (Pos. 6.3) fastened with the preloaded M6 screws.

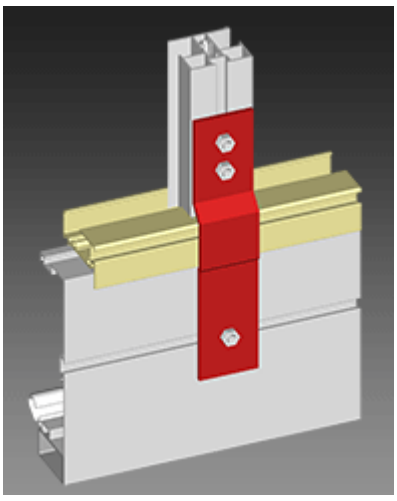
  Install a floor profile corner connector cover (Pos. 116) and fasten with four 4.8 x 16 mm Phillips pan head screws (Pos. 113).



Foundation frame hold-down plates

Pos. 6.7 mounting brackets are not used in Steps 14 and 18. Instead use a Pos. 6.4 hold-down plate to anchor each profile to the aluminum foundation frame. Fasten the plates with the M6x12 cap screws previously-loaded into the profiles.

Before building the second gable you must temporarily detach and move the gable's floor profile and associated foundation frame profile to gain access for threading side wall glazing panels into the gable.



HINTS AND OTHER INFORMATION

Plant Support

Overhead taut wires

The overhead structure of a greenhouse offers convenient opportunities for plant support implemented with a series of horizontal taut wires from which individual plant support devices are hung. The structural components to which the wires are anchored must have sufficient compressive strength to tolerate the wire tension.

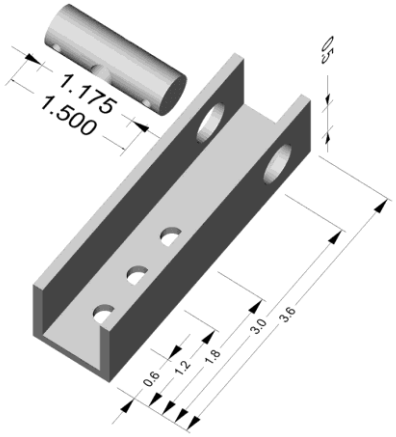
The roof beam reinforcement bar and the lateral supports in your Riga XL are good choices to accommodate taut wires. Extra lateral supports can be installed to accommodate additional taut wires at convenient locations, or a similar component can be fabricated from wood or aluminum.

Three overhead taut wires

Build the taut wire anchors

A taut wire anchor can be a simple block of hardwood or a more elegant device machined from a piece of 1-inch aluminum channel. The anchor is fastened to the structure with several M6 cap screws and provides a means for attaching the taut wire. It can feature a way to tighten the taut wire, or this can be done with a turnbuckle.

Your anchor should place the taut wire about ½ inch from the mounting surface. This will simplify the supplemental supports needed along the length of the wire.



Concept drawing of a taut wire anchor machined from 1-inch aluminum channel

Supplemental supports for the taut wire

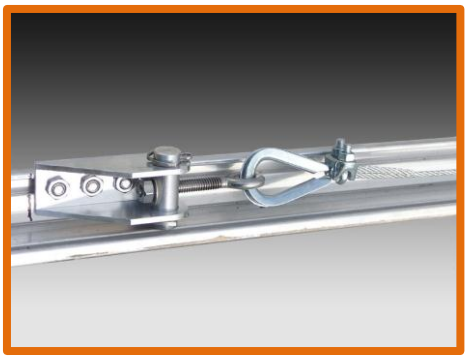
A taut wire that is the length of the greenhouse would need to be under incredibly high tension to prevent excessive sagging under load. Avoid this by placing stainless steel M6 eye nuts along the way for supplemental support near each vertical curved profile.

Eye nuts need not be fastened tightly to the structure. Thread them as snugly as possible with the best orientation for the taut wire to pass through. Use a jam nut to keep the threads tight.

M6 eye nut with jam nut on a lateral support

Install a taut wire

Use $^{1}/_{8}$ inch diameter 7x7 or 7x19 stranded wire rope (sometimes called aircraft cable) made of stainless steel or galvanized steel. Pass the wire through the eye nuts and terminate each end to an anchor using a thimble and clamp. Attach the anchors to the supporting structural component about 4 inches from each end to allow room for adjusting the wire tension. The pictured anchor is fastened with three M6x8 cap screws, each terminated with a thin M6 jam nut to avoid interference with the tension adjustment eye screw.



Taut wire anchor on a lateral support

Assemble taut wires before installing

It is much easier to assemble the taut wires on their supporting components before they are installed in the greenhouse. Tighten the wires after the profiles are in place.

A taut wire must be anchored to a robust horizontal structural component. The gables and side wall arches alone cannot tolerate the tension.

Search eBay for stainless steel wire rope, aircraft cable, thimbles, clamps, and eye nuts.

Assemble taut wires on their supports before installing

Espalier on wire panels

Heavy gauge galvanized steel wire panels are offered by farm supply stores in a variety of configurations. Used for heavy duty fencing these 16-foot-long panels are known by several names, one of which is “hog panels”. A panel hung from a lateral support is ideal for espaliering your plants. Use stainless steel hose clamps to attach it to the lateral support.

Espalier your plants on wire panels

Growing Tomatoes in Your Riga XL

When Riga owners are asked what they grow in the greenhouse nearly all answer “Tomatoes”. There is a special synergy between tomatoes and a greenhouse. Not surprisingly nearly all tomatoes for the fresh market are greenhouse-grown. This section suggests some approaches to greenhouse tomato culture, but there are many others.

With nearly 10 feet of clearance from floor to roof beam, your Riga XL is ideally sized for continuous production from indeterminate tomato plants. You can achieve professional results if make some advance preparations and use a few special techniques. You should consider these specializations before ordering your Riga (you may need extra parts), and before you build the foundation for it.

The best location for tomatoes

Arrange tall indeterminate plants in a row at the center of the greenhouse to make best use of height. Use the space near the walls for smaller plant varieties. Design your foundation to accommodate the growing containers below the floor level to fully utilize the growing height and help isolate the plant root zone from high temperatures inside the greenhouse.

Growing container recessed below floor level

Support indeterminate tomatoes

Tomato plants cannot support themselves. Left alone they will sprawl on the ground and much of their fruit will spoil. Professional tomato growers support each plant with a single string that hangs from an overhead taut wire. Plastic vine clips placed beneath leaf branches fasten the plant to the string and provide vertical support. Additional string is dispensed to lower the plant when it grows inconveniently high. Truss hooks can be used to help support heavy fruit clusters.

String dispensing hanger

Vine clip

Truss hooks on a young upright cluster

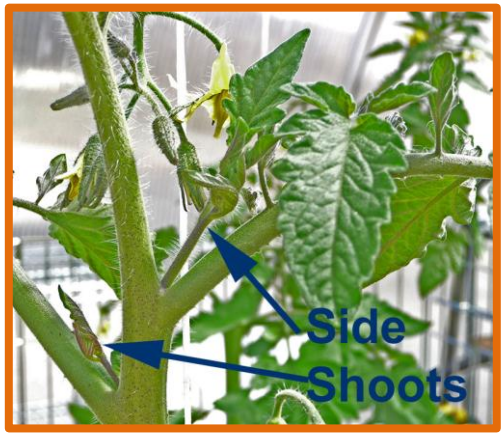
Truss hooks for a cluster with a kinked truss

A heavily-laden fruit truss might bend and kink, putting the fruit at risk. Truss hooks will defend against downward bending, helping the truss bear the weight. Truss hooks are best installed on young clusters when the truss is still upright. A kinked truss usually cannot be safely raised upright again and should be braced in its downward position to prevent further damage.

Prune indeterminate tomatoes

Indeterminate tomato plants grow vigorously in a controlled greenhouse environment, and will quickly become unmanageable unless properly pruned. Train the plants to a single leader (stalk) with no side shoots to make best use of the single-string plant support method. Fruit clusters will develop at regular intervals along the stalk and ripen in succession for frequent harvests.

Side shoots will appear at almost every leaf branch and should be removed when they are about an inch long. Allow enough stalk growth above the shoots so they can be distinguished from the apical meristem (the continuation of the main stalk), which must not be damaged.



Remove all side shoots to keep plants manageable and assure continuous fruit production.

Shoots are best removed by breaking them off at the joint rather than cutting. Breaking allows the wounds to heal more quickly. As you remove the shoot take care that there are no unbroken strands that might peel skin from the stalk.

Occasionally a plant will develop twin apical meristems. Allow both to grow to about two inches so you can determine and pinch off the weaker one. If the meristems are equal, keep the one that has the best growing orientation.

A side shoot or a twin meristem that escapes your attention for a while may be too robust to be safely broken if reaches several inches in length. To resolve this simply pinch off the terminal bud to stop its growth. Allow the spur to remain, but do not allow it to fruit.

Remove the weakest or poorest-positioned of twin apical meristems.

Lean and lower

An indeterminate tomato plant quickly reaches inconvenient height. Dispense string to lower the plant while sliding the string dispenser along the cable. The plant will lean to one side and a portion of its stalk will rest on the floor. Before lowering, remove all foliage below the lowest fruit cluster.

Ripening is delayed during cool early season so it is not unusual for the first or second truss to reach the floor after lowering. Fruit will ripen faster as the weather warms and can be harvested before reaching the floor.


Lower stalk of a young indeterminate plant after its first "lean and lower" maneuver.

Tomato stalks are quite brittle and must be carefully bent. A fractured stalk can usually be repaired by wrapping with vinyl pipe-wrap or electrical tape. Brace with splints while the tissue mends.

The stalks of your indeterminate plants can reach 30 feet or more in length by the end of a long growing season, nearly all of which will lie on the floor. Keep the stalks out of walking areas as the vertical portions of the plants move to the end of the greenhouse, then make a U-turn and continue laying stalks in the opposite direction. This maneuver works best if you have two overhead taut cables; one on each side of the center ridge. Change to the opposite cable when you make the turn.

Young indeterminate plants with 12-foot stalks.

The length record for an indeterminate tomato stalk is 65 feet. This cultivar was Sun Gold, a particularly vigorous cherry-sized variety.

Growing determinate varieties

Determinate tomato varieties have different growth patterns than indeterminate varieties and pruning is neither required nor advised. A support system is still needed but the plants do not grow tall so "lean and lower" maneuvers are not necessary. Determinates deliver their entire crop over a short period of time so a succession of plantings may be necessary if you want continuous production. This said, some determinate varieties may start a second bloom as their first crop ripens.

Determinate tomato plants need multiple supports.

It is claimed that one well-cared-for Red Robin, a small determinate cherry tomato variety, has repeated many bloom and fruiting cycles over a three year period. The determinate Bella Rosa shown in the adjacent picture delivered two large crops during its 2012 summer season.

Thermal Performance

This section is preliminary and incomplete. Use the information as a guide but do not rely on it.

Controlling a greenhouse environment through winter is energy-intensive. As greenhouses go your 275 square-foot Riga XL-VI is a better winter performer than most, but you should expect its winter climate control cost to approach or exceed that of a modern 2,000 square-foot house.

Preliminary findings based on limited testing

- There is significant heat loss through aluminum profiles. This can be somewhat improved by packing the screw capture slots with ½" closed-cell backer rod and covering the interior aluminum surfaces with closed-cell PVC foam tape.
- There is significant heat loss through the polycarbonate glazing, but no practical way to improve this.
- Heat loss through substrate is less significant. An insulated foundation is helpful and will reduce condensation near the floor profiles.
- The measured overall thermal coefficient is approximately 430 btu per hour per degree Fahrenheit of temperature differential.
- 1250 Watts of continuous resistance heat (4,263 btu/hr) will maintain a 10° Fahrenheit inside-to-outside differential.
- A ductless mini-split heat pump rated 12,000 btu/hr, HSPF = 12, has been shown to maintain at least 35° rise from 40° outside temperature and at least 26° rise from 35° outside temperature.
- Temperature regulation by the heat pump is acceptable but varies with outside temperature. Typically the inside temperature drops 2 to 6 degrees during defrost cycles.
- Heating a closed populated greenhouse must be accompanied by dehumidification and frequent air changes. Some bonus heat is produced by dehumidification as latent heat is recovered from the water vapor. Air changes are most efficiently accomplished with a heat recovery ventilator. Carbon dioxide enhancement may be a substitute for air changes.

Specific tests were done during January, 2012 on the Olympic Peninsula of Washington; 48 degrees latitude. A representative 24-hour period was about 8 ½ daylight hours at 35 to 38 degrees under heavy overcast and tree shadows with little or no solar assistance, and 15 ½ dark hours at 31 to 35 degrees. Inside temperature was 61 to 66 degrees daytime and 53 to 57 degrees night. On a few days with moderate sunlight interior temperatures easily reached 73 degrees. Relative humidity was maintained between 58% and 65% and two oscillating fans operated continuously to disrupt stratification. Plant population was six 9-month old hybrid indeterminate "Sweet Cluster" tomato plants, 9 broccoli plants forming crowns, and one mature pepper plant. Electrical cost was 6.5 cents per kilowatt-hour.

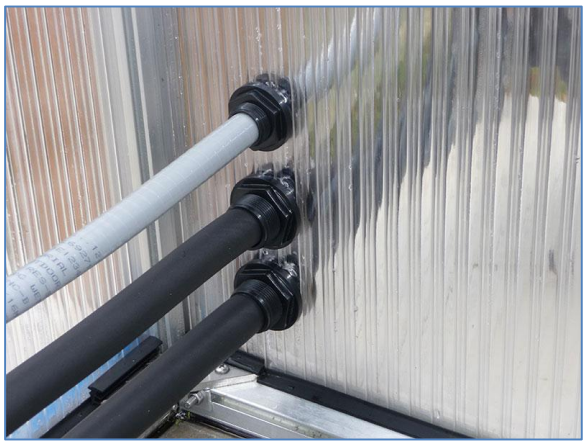
Under these conditions the average 24-hour energy demand and cost was as follows:

Heat pump	22.3 kilowatt-hours	$1.45
Dehumidifier	6.4 kilowatt-hours	$0.42
Fans and hydroponic pumps	1.4 kilowatt-hours	$0.09

Climate control

Ductless mini-split heat pump indoor unit

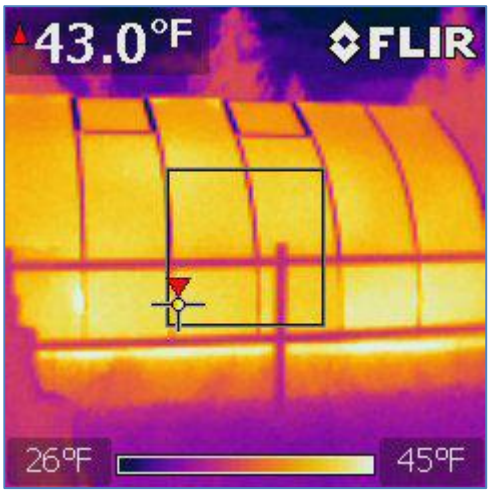
Ductless mini-split heat pump outdoor unit



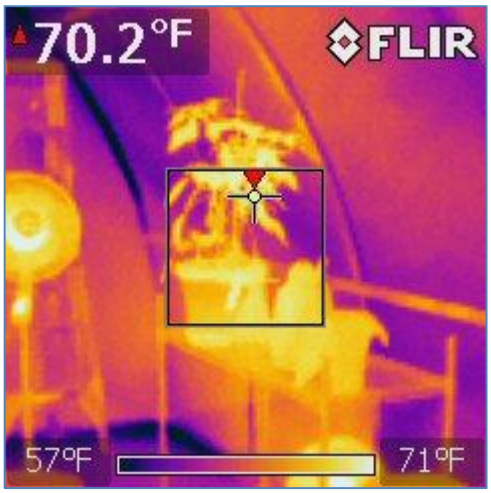
Glazing penetrations for refrigerant lines and power

Heat recovery ventilator

Thermal images



Night time exterior thermal image

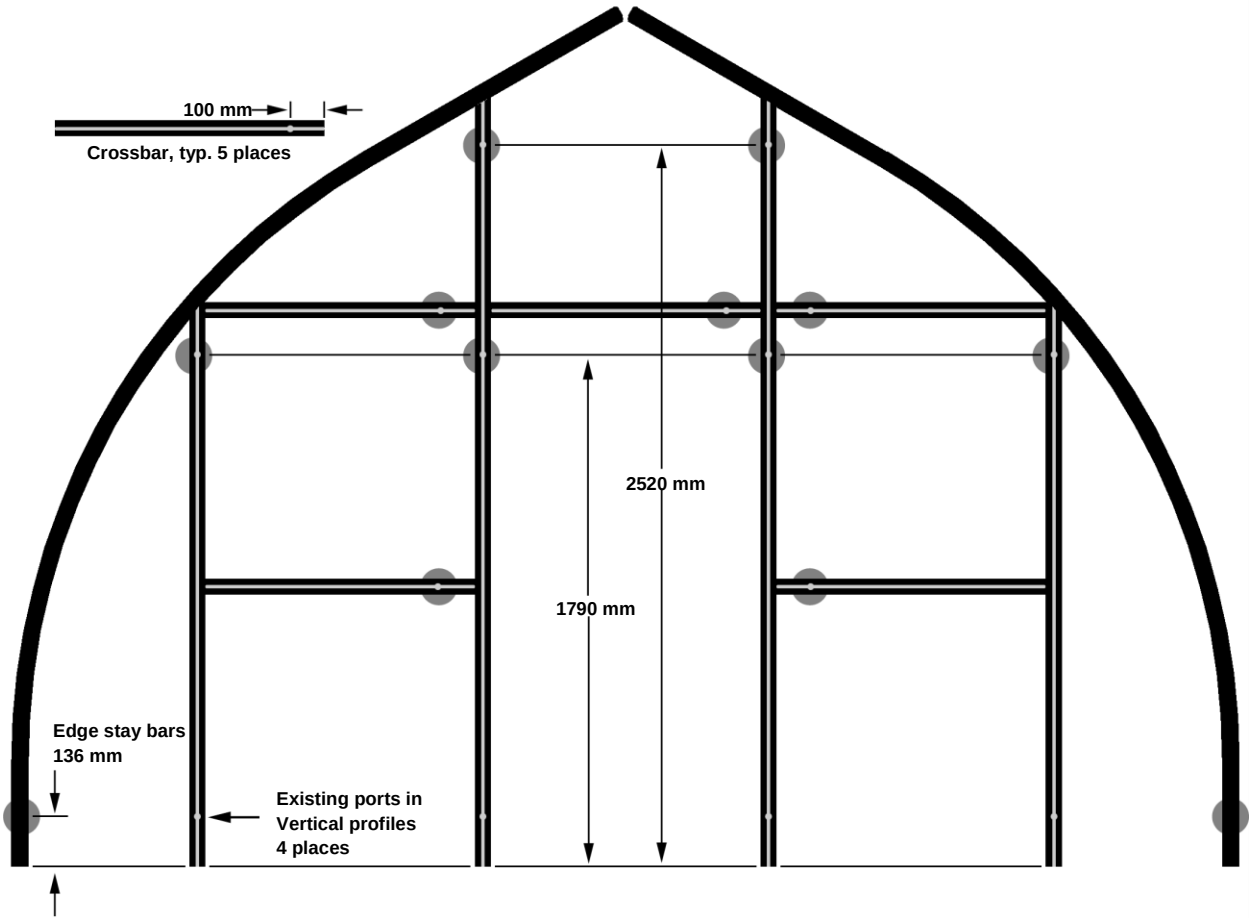


Night time interior thermal image

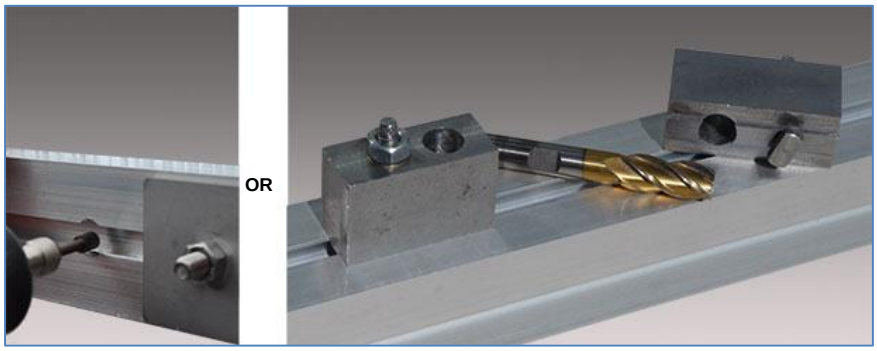
Cut Screw Loading Ports in Gable Profiles

If you expect to ever load post-assembly screws into the gable profiles (or any other profile), the best time to cut loading ports is before the profiles are in place. The ports can be located at any accessible spot, but not beneath a connector plate or where a screw might be needed. The drawing below suggests some convenient locations.

An ordinary twist drill bit is not an appropriate tool for this job and, if used, may damage the profile.



Cut the port with a small round file or a rotary file. Alternatively a pilot tool with a bore to guide a $^{7}/_{16}$ inch end mill can be fabricated that will clamp onto a screw capture slot, retained by a cam-head screw.



Keep Extension Cords Out of Walkways

Electric power is sometimes needed for small temporary loads inside a greenhouse, and there is no quicker solution than an extension cord. But cords can be a trip hazard unless they are properly stowed.

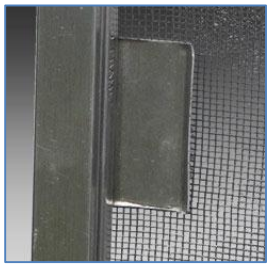
An ordinary 16 gauge extension cord fits nicely in the screw capture slots. Press it into the slots along its route to keep the walkways clear.

Control Humidity

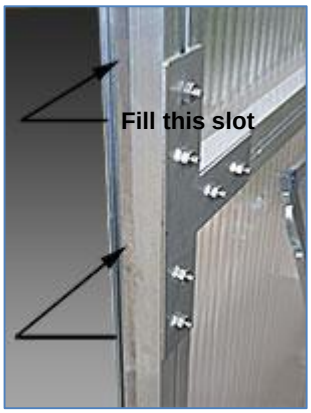
Plants exhale water vapor and a closed greenhouse quickly develops very high humidity levels. This moisture will condense on the glazing and aluminum surfaces and plant foliage, leading to fungal infections and other unpleasant conditions. Ventilation is the best solution but if you must keep the greenhouse closed you can use an ordinary residential dehumidifier to keep the environment healthy. Choose a model with about 70 pints per day capacity.

Screen Your Riga XL

When you leave the doors open for ventilation, place screens in the doorways to stifle flying insects, hummingbirds, and other uninvited visitors. You will find the tools and materials to make screens at your local home center. Use ordinary $^{11}/_{16}$ inch by $^{7}/_{16}$ inch residential aluminum screen frames to make both screens 37 inches wide, the upper screen 37 $^{5}/_{8}$ inches high, and the lower screen 37 inches high. Install two grips on the left side (door latch side) and two springs on the right side (door hinge side) of each screen.



The spring side fits nicely in the deep door slot but it is helpful to partially fill the left door slot for a snug overall fit. Place an extra piece of the aluminum frame material into this slot to take up the slack. You should drill a hole in this filler to clear the head of the Phillips pan head screw (Pos. 142) that secures the crossbar to the vertical profile.



Install the lower screen first, then the upper screen. Or you can install the upper screen alone and close the lower door. Install an extra sash lock (Pos. 136) on the outside face of the left vertical door profile to keep the lower door closed when the upper door is open. Tape the screen to the vertical door profiles with Scotch Blue Painter's tape to keep it in place when the lower door is opened.

Keep Bugs Out of the Glazing

Flying and crawling insects that enter the greenhouse will eventually find their way to the underside of the roof beam, which is a short crawl to the open cells of the side wall glazing. Insects that enter the glazing cells almost never find their way out, and become unsightly blemishes that cannot be removed. You can defeat these wanderers by fitting the roof beam slots with open-cell plastic filter, such as that often used over rain gutters to deflect leaves and other debris. The goal is to exclude the insects without significantly blocking air ventilation.

Fix a Constricted Doorway

It happens! You were extra careful assembling the gable but the doorway is a couple millimeters too narrow and the door latch doesn't retract quite enough to clear the left vertical door profile. There are two things you can try to remedy this.

Use a scissor jack to expand the doorway.

This is best done early in the morning when the greenhouse is cold. Place the jack at the level of the crossbars. You can safely expand the opening as much as six millimeters, but no more. Leave the jack in place until evening. You will lose most of the expansion when you remove it, but hopefully enough will remain for the latch to clear.

File the tip of the latch.

If the scissor jack maneuver doesn't gain enough space, remove up to two millimeters from the plastic latch tongue as needed to clear the door profile.

FREQUENTLY ASKED QUESTIONS

What is the Riga XL Essentials Kit (REK)?

The Riga XL Essentials Kit is a collection of parts and materials that are needed to make assembly easier and assure the high quality of the finished greenhouse. These important items are not provided by the manufacturer but are added for your convenience by Exaco Trading Company, the U. S. Riga distributor.

Why Are Ratcheting Cargo Straps Recommended?

Widely available ratcheting cargo straps are helpful for many construction tasks and are indispensable if you are working without a helper. Select straps that are long enough to span the full twenty foot length of your Riga XL. An important feature for your greenhouse project is a double J hook on each end. Straps with ordinary S hooks will not be helpful to install the glazing.

Hold gable edges in place

Restrain mounting brackets

Help thread glazing

Why Are Additional M6x12 Cap Screws Recommended?

Historically M6x16 cap screws have provided with Riga XL greenhouses for nearly all fastening requirements, but in reality almost every place fastened with M6 screws will benefit from using shorter screws. For example the floor profile connectors (Pos. 105) cannot be properly installed with 16 mm screws because they mutually exclude each other from being tightened with a socket wrench.

Use M6x12 screws in all M6 positions except those retaining the lateral supports and the window uplift restraints. For these use M6x16.

Why Would Anyone Want Extra Lateral Supports?

Four lateral supports are installed in the Riga XL to longitudinally fortify the structure. An additional pair of supports near the ridge provides robust high-elevation anchoring rails for a **plant support** system. Serious tomato growers, among others, need such a system. **Click here** for information about growing tomatoes in your Riga XL.

If you want an extra pair of laterals supports they should be ordered with your Riga XL to avoid extra shipping expense. You will need 14 M6x16 cap screws with M6 nuts and fender washers to install them.

Why UNC ¼-20 Cap Screws Instead of M6 in the Windows, and Why Extras?

The capture slots in the window profiles are too wide to bind the heads of M6 screws. An M6 screw will turn in the slot as you try to tighten a nut on it but a UNC ¼-20 cap screws will be properly anchored.

Two cap screws are required in the lowest profile of each roof window to fasten the automatic window opener. An additional cap screw in the each side profile is recommended as a tie-point for uplift restraints, which are short tethers about 14 inches long.

Why #10 X ¾ Inch Pan Head and #8 X ¾ Inch Flat Head Phillips Screws?

The 3.5 x 16 mm pan head screws (Pos. 159) provided to fasten the door holder parts (Pos. 158) are not the right size for a proper and robust fit. You will need #27 and #31 drill bits to bore holes for the new screws, and four pieces of double-sided mounting tape to make installation easier.

Why Preload Extra M6x16 Screws in Each Edge Stay Bar?

The edge stay bars (gable arches) do not have post-assembly screw loading ports. They are impossible to remove for loading afterthought screws, and the nearby glazing makes it very difficult to cut a loading port. You should preload at least one and possibly two extra screws in each for these reasons:

1 You may at a future time wish to add an additional lateral support (Pos. 22) or other member to provide attachment points for a plant support system. This would require an extra screw in each edge stay bar above the slanted T connector. It would be prudent to also load each of the curved center profiles with an extra screw at the same elevation, although they are more accessible for cutting a loading port for afterthought screws.

2 The upper lateral support is normally installed above the gable K connector, and a screw is preloaded there for it. If you expect to install one or two optional shelving kits the upper lateral supports might be more convenient below the K connector. The preloaded screw cannot be moved past the connector, so the extra will be needed.

3 If your Riga XL is a stretched model with an odd number of 1-meter length increments, there may be one window in a bay next to a gable. An extra screw in this gable's edge stay bar is needed to fasten the crossbar beneath the window.

Why Must a Window's Installation Path Be Free of Glazing and Vertical Profiles?

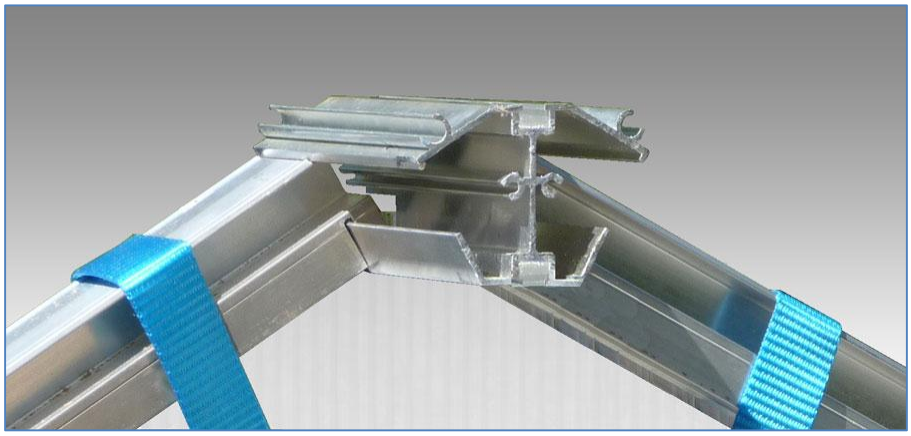
Side wall glazing exerts high upward force on the roof beam which bends the beam upward. The window's hinge engagement with the roof beam will bind if the path is not perfectly straight.

A window must be lifted high to pass over a curved vertical profile, exceeding the height limit for free movement of the hinge. The hinge engagement with the roof beam will bind at this height.

Riga XL builders faced with either of these situations might resort to heavy pounding with a rubber mallet, and gain about $^{1}/_{8}$ inch of movement with each blow. But the blows transfer forces through the roof beam, disrupting the alignment of other installed components and degrading the quality of the installation.

What Is a Roof Beam Fitment Tool?

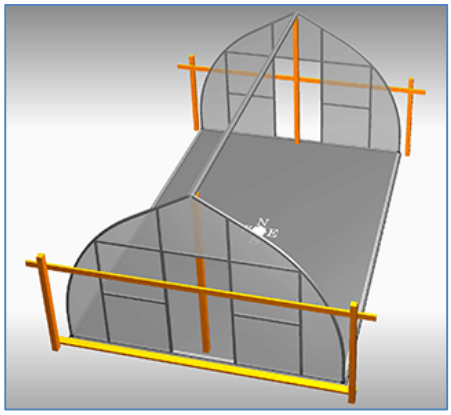
A roof beam fitment tool is a replica of one end of a roof beam. Use it during construction of each gable to assure proper alignment of the edge stay bars (gable arches, Pos. 2 & 3) so they will be ready to receive the roof beam in a subsequent operation. This tool is available from your Riga dealer.



The self-drilling screws that fasten the edge stay bars to the K connectors and slanted T connectors (Pos. 104 and 102) must not be installed unless the fitment tool or the roof beam itself is engaged. If the screws are installed without the tool or beam in place the ends of the bars are likely to be misaligned and it may not be possible to later engage the roof beam.

What If a Roof Beam Fitment Tool Is Not Available?

The roof beam itself can be used to align the ends of the edge stay bars. For this the roof beam must be safely braced and unencumbered by side wall arches, glazing, and roof windows.



You cannot use the roof beam itself to align the edge stay bars if side wall arches and glazing are in place. Upward thrust by the bowed glazing interferes with proper alignment, and the glazing blocks the space needed to safely drive the self-drilling screws.

If you use the roof beam to align the second gable, you must disengage it and move the gable away after the final screws are driven to make room for installing the side wall arches and glazing.

How Will the Polycarbonate Ultraviolet Protection Affect My Plants?

Like nearly all plastics, polycarbonate degrades in the presence of ultraviolet radiation (UV). Despite its many desirable attributes it is unsuitable for use as greenhouse glazing unless protected from UV. Since the protection is on the outside surface, little or no ultraviolet radiation enters the greenhouse.

UV is generally detrimental to plants in varying degrees, and somewhat inhibits their growth. It is not essential for plant growth, so your plants will not suffer deficiencies due to ultraviolet extinction.

Some plants, red leaf lettuce for example, have developed their own defense against damage from ultraviolet radiation. When exposed they develop protective polyphenol compounds that are powerful antioxidants, making red leaf lettuce a desirable food item.

Red leaf lettuce is often grown commercially in greenhouses. Initially growth is enhanced by the absence of ultraviolet B radiation, but the leaves do not develop the color that the fresh market expects. To counter this growers expose the plants to specific wavelengths of ultraviolet radiation from high power light emitting diodes inside the greenhouse. This treatment is usually done for a five-day period just prior to harvest, and the plants quickly develop their characteristic deep red color.

The UV protection treatment applied to the Riga glazing has been thoughtfully done. The UV wavelengths below about 390 nanometers are blocked but longer wavelengths representing a significant portion of the UV energy are shifted to the 420 to 430 nanometer range. This range is the visible blue area that is gratefully absorbed by plants, thus useless energy has been converted to useful energy.

What Is a Medium Modulus Neutral Cure Silicone Sealant?

It is recommended to seal certain areas of your Riga XL to prevent rainwater intrusion. Sealant also adds diaphragm strength that helps keep windows and doors square and true. Silicone sealant delivers the best performance for this application.

The modulus of the sealant refers to its rigidity after it is fully cured. Medium modulus is moderately rigid but sufficiently flexible to tolerate the minor stresses of thermal expansion and contraction. Medium modulus silicone sealants are commonly used as glazing sealants.

Silicone sealants utilize various chemical methods for vulcanization (curing). Most low-cost silicone sealants offered in retail stores use acetoxy curing in which acetic acid is released during the curing process. Acetoxy cure sealants should not be used on materials that might react with acetic acid. An acetoxy-cure silicone sealant commonly offered in retail stores is GE Silicone I, though it is not specified as such and the modulus is not specified.

Neutral cure sealants are less likely to react with other materials. A neutral-cure silicone sealant commonly offered in retail stores is GE Silicone II, though it is not specified as such and the modulus is not specified.

The modulus and cure chemistry of silicone sealants is rarely specified for the retail offerings. Specification-grade sealants can be purchased from professional outlets. One clear medium modulus neutral cure silicone sealant is BOSS 39900, which is offered by sources that cater to the professional trade. You might find a suitable sealant at a local glass shop. Your Riga dealer might also offer a sealant.

Silicone sealants have limited shelf life and are generally considered unfit for use if more than one year old. The consequence of aging is failure to cure, which will require a serious clean-up effort. Reputable manufacturers stamp a date code on the package which could be either the date of manufacture or the expiration date. This code is often disguised in a format that does not easily reveal a date. To cite an example, the BOSS 39900 sealant mentioned above is stamped with the date of manufacture as "yydddbbbb", where "yy" are the two least significant year digits, "ddd" is the day of the year, and "bbbb" is a batch code. A tube of BOSS 39900 stamped "121154433" was manufactured on the 115th day of 2012 (April 25) and its batch code is 4433. Its usage warranty will expire at midnight on April 24, 2013.

Before you accept a sealant you should insist that the seller clarify its age. If you suspect your sealant has gone geriatric, lay a test bead on a disposable material to test its curing properties before you use it.