

GREENHOUSES

Discover Your Growing Potential



Since 1998, Solar Innovations® has grown to become a leader in the architectural glazing industry, providing innovative solutions to customers all over the world. With over 30,000 projects completed, our Pine Grove, PA LEED Gold-designed manufacturing facility produces the most complete product line in the industry. With this capability, we provide a cohesive look across the entirety of a project's glazing needs. Our door, window, skylight, and structure systems have been recognized to be among the highest in quality and performance for both the commercial and residential markets. As a single-source manufacturer of aluminum and wood products, we tailor our systems to meet the project's specific needs. To further stand out, our custom hardware is machined in-house, delivering a level of craftsmanship to our products that is unmatched in the industry. Also, most of our engineering and product testing is done in our modern testing facility, providing our customers with exacting standards and specifications.

While we already offer the most comprehensive product line in the architectural glazing industry, we continuously partner with customers to stretch the limits of architectural possibilities. This expands our product offerings and fuels our company's growth.

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Why Solar Innovations®?

INNOVATIVE

Solar Innovations® — it's in the name. Our customers' needs force us to think outside the box. That, paired with creative thinking from our team, makes our products stand head and shoulders above the rest. No project is too big or too small for us to handle.

HIGH-PERFORMING

With two state-of-the-art in-house test labs, our products exhibit some of the highest performance ratings in the industry. Solar Innovations® offers the largest, impact-rated folding glass walls and the only impact-rated glazed structure with operable vents, windows, and doors. Our products can be designed and engineered to your specific location.

Our product certifications include:

- NFRC
- AAMA
- Florida Impact
- Miami Dade
- Texas certification (TDI)

DURABLE

Our systems can be designed to meet coastal requirements, limiting visible wear and tear. We have advanced aluminum finishes and stainless steel components, reducing the corrosive effects of the elements in coastal regions.

SINGLE-SOURCE PROVIDER

We are a single-source supplier of aluminum and wood glazing systems. With the most complete product line on market, our systems bring complete cohesion across your project. Solar Innovations® machines much of its own hardware, bringing our systems to the highest level of quality.

ECO-FRIENDLY PRODUCTS

By using local suppliers we not only boost our local economy, but also reduce transportation times and fuel emissions. Our thermal-performance products as well as our skylight and structure solutions for daylighting reduce energy consumption. Also, our products include recycled content and are LEED friendly.

LEED credit categories (other credits may also apply.)

- Materials & Resources (recycled content)
- Indoor Environmental Quality (daylight)
- Energy & Atmosphere (performance)
- Regional Priority (within 500 miles of our facility).

ECO-FRIENDLY FACILITY

Solar Innovations® takes environmental responsibility seriously; our LEED Gold designed facility includes a solar array that meets 85 percent of our electricity needs and an expansion plan to put us at Net Zero. Through aggressive recycling policies, our waste is 98.5 percent landfill free.

MADE IN THE U.S.A.

All of our products are designed, engineered and manufactured in our 360,000+ square foot facility in the rural setting of Pine Grove, PA.

EASY TO OPERATE

All of our systems are user-friendly and straightforward. No matter the shape, size, or type of project, our products remain practical and manageable.

INSTALLATION

Whether a product is purchased directly from Solar Innovations® or through our dealer network, we can install and service all of our products within a six-hour radius of Pine Grove, PA. Our expertly-trained team is registered to complete installation and service work in at least 18 states.

REPAIR & REPLACEMENT SERVICES

Our products are backed by an industry-leading warranty. In the event of a problem, our team has the technical skill and experience to evaluate your situation and determine the most effective options for repair, service, or replacement of your product. All drawings and information are saved for each project, so a preliminary site visit isn't always required.



Get in Touch

There are three convenient ways to work with Solar Innovations®. If you aren't quite sure please feel free to call us directly at 800 618 0669.

1. SOLAR INNOVATIONS®' DEALER NETWORK

Our extensive network of dealers throughout the United States has experience in the glazing industry and with our products. Dealers are frequently able to visit the job site and work one-on-one with the customer, aiding in design, local permits, and installation.

2. ARCHITECTS, GLAZIERS OR CONTRACTORS

Your architect, glazier, or contractor can work with our inside sales designer to ensure you receive the best product information. Specifications, quotes, and drawings can be directed to you to review.

3. INSIDE SALES DESIGNER

Contact our inside sales designers directly to help plan and specify your project at 800 618 0669.



Solar Innovations® offers greenhouses that range from hobby greenhouses to huge research facilities with multiple zones and sophisticated environmental control systems. Whatever your requirements are, we have the perfect solution.



Research/Educational

These greenhouses are primarily used in agricultural extension departments, universities, medical and commercial research facilities, biotechnology labs, and even K-12 schools. They allow for meticulous control over propagation, growth, and the environmental conditions needed for precise data collection. They provide students a unique opportunity to study horticulture first hand or even raise butterflies! Multiple zones can be incorporated into your greenhouse, allowing for separate research projects in each room. With this, cross contamination is reduced and each zone can maintain specific growing conditions and control systems. Temperature, lighting, nutrients, shading, water, and air circulation can be controlled and monitored electronically, allowing educators to focus on the lesson rather than greenhouse and plant maintenance.



Commercial

Commercial greenhouses are designed to generate revenue and are tailored to fit specific business needs. They are commonly used by florists, restaurants, grocery stores, and wineries. These greenhouses are typically used to grow flowers and vegetables, as dining space, or as product display areas. Structures and floor plans are designed to suit specific needs, ranging in style from decorative to contemporary. If guests utilize the space, shading and drip irrigation systems can be installed to establish an ideal environment that is suitable for both plants and people.



Institutional

Institutional greenhouses are often used by both private and public entities, such as clubs, foundations, and retirement communities. Retirement community residents can benefit greatly from the addition of a greenhouse, because gardening is seen as a low-impact solution to the elderly's need for physical activity. Studies have also shown that exposure to the sun's rays can provide health benefits. Depending upon your application, Solar Innovations® can work with you to ensure safety concerns are addressed and building codes are carefully followed.



Atrium

Atriums are a blend of traditional construction and glazed aluminum design. Originating in ancient Rome as open air courtyards, today they are generally enclosed structures with glass roofs, traditional construction framing, and large windows, creating a greenhouse environment. Many atriums are decorative and follow classic styling, often with columns lining the walls, finials and ridge cresting adorning the skylight, and grids in the windows. The frame finish of both the skylight and windows can be custom matched to any existing frame. This type of structure will provide adequate lighting from both above and through the windows, allowing virtually any type of plant to flourish.



Urban

Urban gardening has become popular as gardeners are revitalizing unused spaces such as small parks, yards, terraces, balconies, and rooftops by growing vegetables or converting small backyards into flower beds. Many people believe greenhouses require a large plot of land, but this is not the case. Urban greenhouses are smaller and well-suited to city spaces. They can produce vast quantities of plants in a controlled and protected environment. Floor to ceiling trellises can be installed for climbing plants, such as cardinal vines, vining beans, and honeysuckle. To utilize space, tiered benches can be added while areas underneath the benches can be used for plants with low light requirements.



Propagation

The addition of a propagation greenhouse with adequate bench space and a potting area can lead to a flourishing summer garden. Temperature, water, and sunlight can easily be monitored and controlled for the cultivation of a variety of seeds. Also, plants can be hardened in preparation of outdoor transplant at the end of spring. Our sales designers can work with you to make the appropriate accessory selections.



Dual Function: Plants and People

A dual-function greenhouse is dedicated to both plants and people. Growing areas can line the walls or groupings can be arranged in such a way to reserve space for other activities. Plant stands and hanging baskets can maximize the vertical space of the greenhouse. The addition of a sitting area allows the weary gardener an opportunity to bask in the fruits of his or her labor, enjoying the beautiful flowers and fruits produced by their plants. The utilization of this space is only limited by the imagination.





Tree/In-ground greenhouses

Greenhouse growing is not limited to small- and medium-sized potted plants. Parts of the floor can be exposed to the earth beneath, allowing for the grower to let plants flourish in the ground itself. For the tree grower, the height of the greenhouse can be increased to accommodate mid-sized trees that will thrive in any weather. For removal of these trees, giant swing doors can be incorporated into the design.





Hobby

Hobby greenhouses are perfect for enthusiasts whose collection has outgrown their window sill, but are not ready for a sizable structure. These greenhouses are designed to meet the needs of entry-level gardeners. It is perfect for the gardener who wishes to start a few trays of seedlings in the spring or overwinter potted deck plants. Hobby greenhouses typically feature simple configurations and only include a door, windows, roof ventilation, and possibly a greenhouse bench. These structures are typically not equipped with motorized accessories.

Specialty Structures



CITRUS

Originally called an orangery, which featured cement or brick walls with windows, today's citrus greenhouses are all glass and aluminum. They can be designed for specific growing temperature ranges to foster trees such as oranges, mangoes, papaya, guava, kumquats, and an assortment of tropical plants. They are typically decorative with traditional styles featuring ridge cresting, finials, and decorative grid work. The interior environment can be equipped with benches and climate-control accessories like heaters, evaporative coolers, humidifiers, and shades, all of which can be automated.

BONSAI

Bonsai is an ancient form of botanical art. A bonsai grower may begin their collection in the house, but as the collection grows, it may become time to consider a custom bonsai greenhouse. Multiple zones can be incorporated to accommodate various growing requirements. One zone can be designed for tropical trees with high temperature and humidity requirements, while another can have cool temperatures and dormancy hours for evergreen varieties.

PALM

Tropical trees, like palms, need warm temperatures and proper humidity. Solar Innovations® offers several humidifier options to stabilize humidity levels. Circulation fans can be added to move air and help prevent the spread of disease.



ORCHIDS

Raising orchids in a residential setting can be challenging because orchids thrive in humidity above 50 percent. Certain varieties require high temperatures, humid environments, and frequent watering and do not thrive in most environments. An orchid greenhouse can include multiple zones that differ in temperature, light range, humidity, and water supply and can be precisely monitored by an environmental control system.



Even though any two greenhouses may be made of the same materials and have the same functionality, the aesthetics can be drastically different, as illustrated by the English and Contemporary greenhouses.

English

An English greenhouse is the epitome of traditionally classic appearance. They are highly ornate, yet functional and add charm to a home or business. English greenhouses may include decorative elements such as dormers, ridge cresting, finials, grids, masonry base walls, or raised panels. Pilasters, historically-designed gutters and Palladian arches also enhance the structure's traditional appearance on the exterior. Crown molding, bar caps in various profile options and decorative castings bring the same character into the interior space.



Contemporary

Unlike their decorative counterparts, contemporary greenhouses consist of large glass areas, clean lines and a linear format. Mullions are used to allow for long projections. The greenhouse's finish can enhance the modern appearance. Popular choices include white, black, and clear anodized, which is often used in industrial settings. Stainless steel cladding can be applied directly to the aluminum frame as well. The interior of the greenhouse achieves a modern flare through the use of flat rafters and commercial-grade accessories.



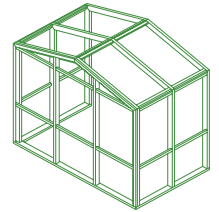


Once you have decided upon the style of your greenhouse, it is helpful to determine the overall shape of your structure as you begin to design your greenhouse. There are six standard configurations, but Solar Innovations® will work with you to design whatever structure your plan requires.



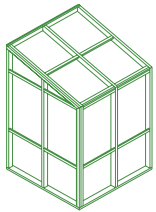
Straight Eave, Double Pitch

Double pitch is a classic shape for greenhouses and is the most common configuration for free-standing units. It provides a uniform space that is tallest at the ridge. As you determine the roof pitch, keep in mind the surrounding structures, as well as the fact that each plane of the roof can employ a different pitch.



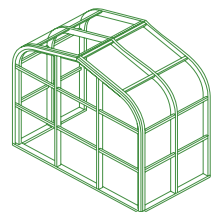
Straight Eave, Lean-to

A straight eave, lean-to design is the most common configuration for greenhouses attached to another structure. They tend to require a smaller investment of materials when compared to a double pitch, but can provide the same interior area. This configuration is an excellent option if you only have a small amount of space, though it works just as well over large spans along a building. An advantage to this shape is the solid rear wall, which can act as thermal storage for solar heat and a suitable place for shelves.



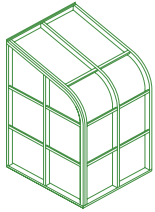
Curved Eave, Double Pitch

Reminiscent of wooden greenhouses of the past, a curved eave, double pitch configuration, exhibits a classic look, especially when adorned with decorative elements, such as finials and ridge cresting. The curve in the wall can begin high on the rafter to allow for taller interior elements, or low on the rafter for a more traditional look.



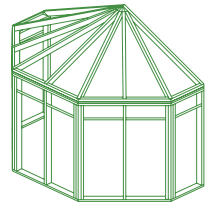
Curved Eave, Lean-to

Curved eave, lean-to structures have eaves that are curved and can evoke two distinct styles depending on how they are configured. Curves that begin high on the rafter tend to exhibit a more contemporary aesthetic while curves low on the rafter allow for a more traditional look.



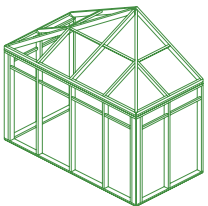
Bull Nose End

This roof design includes a double-pitch section that tapers into a nose. It is also known as a conservatory nose or Victorian-style nose. The nose typically projects half the width of the structure with six to nine segments comprising the radial shape. This feature can be utilized as a lean-to or grouped on opposite sides, creating a stand-alone octagonal structure that resembles a gazebo.



Hip End

In a hip end structure, all sides of the roof slope downward to the walls, usually at a gentle pitch. A hip end is easily adapted to numerous design styles. The size of the structure is typically smaller than a comparably sized gable end greenhouse, which can correlate to lower heating and cooling costs. Hip end greenhouses can be attached to a building or constructed as freestanding units.



Structural enhancements

Structural enhancements can add architectural appeal to your greenhouse. These elements often reflect traditional greenhouse styles. The most commonly used units are lanterns and dormers. Both designs will enlarge the size of the greenhouse and help to create a distinct design.



DORMERS

Dormers project from a sloped roof, interrupting the roof line with a double-pitch sub-structure. They typically begin at the ridge line or in the middle of the roof. Multiple dormers can be used along a long span or one on each pitch of the greenhouse.

LANTERNS

A lantern is located atop the roof and can span the entire length of the roof or occupy only a small section. It can feature a hip end, bull nose, or double pitch configuration. Vents can be incorporated for natural air circulation. Lanterns add a decorative element, and give English character to your greenhouse.



ENTRYWAYS & VESTIBULES

An entryway or vestibule may act as an air-lock and reduces cold air from infiltrating the greenhouse. This can prevent cold shock to the plants closest to the door. An entryway or vestibule can also offer storage and increase energy efficiency.



Design For Your Climate

When designing your greenhouse, it is of the utmost importance to take into consideration where you live and design your greenhouse accordingly, so that it will endure the weather extremes of your climate.

ZONE 1 – During winter, these states face extremely low temperatures and greatly reduced sunlight. Energy efficiency is paramount. Greenhouses should be designed with high-performance insulated glass that allows more light transmission and solar heat gain. In some circumstances, triple-pane glass is recommended. Larger-sized heaters and grow lights are needed for year-round growing.

ZONE 2 – These states experience moderate temperatures that may exceed both the high and low extremes of the plant growing range. Most greenhouses will require insulated glass, and need less light transmission



and solar heat gain than in Zone 1. During the winter, heaters are required for plant survival, with some varieties requiring grow lights. In the summer, an evaporative cooler and/or shades may be needed.

ZONE 3 – High temperatures and extreme sunlight intensity are common in these states. Most greenhouses will require insulated glass, but some may be designed with monolithic (single-pane) glass. Specialty glass may be incorporated in the roof of

the greenhouse to reduce light transmission and solar heat gain, especially in the summer. Most greenhouses will require evaporative coolers and/or shades for the summer season. During the winter, heaters are required for most plant types.

ZONE 4 - Sunlight can be intense in these states. A specialty roof glass will reduce light transmission and solar heat gain throughout the year. Most greenhouses will require insulated glass, but some may be designed with monolithic (single-pane) glass. This region can experience fluctuations between winter and summer, so an evaporative cooler, heater and shades are recommended.

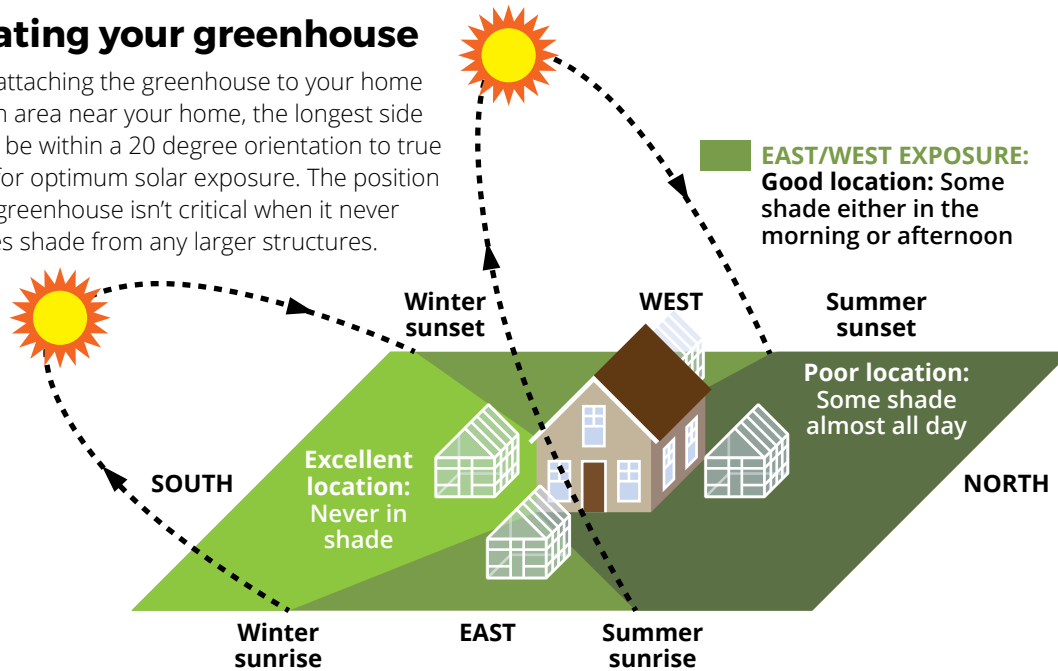
Note: These are general climate characteristics for regions of the U.S. This information is intended for initial greenhouse design. For best greenhouse performance, location specific data must be used.

Placement

The position of the greenhouse on your property is key to the success of how it will perform. Maintaining proper sunlight, taking advantage of trees and ease of access are all concerns that should be addressed before ground is broken.

Locating your greenhouse

When attaching the greenhouse to your home or in an area near your home, the longest side should be within a 20 degree orientation to true south for optimum solar exposure. The position of the greenhouse isn't critical when it never receives shade from any larger structures.



TREES

There are pros and cons with having trees near a greenhouse. The most common concern is that falling trees or limbs will damage the structure. Solar Innovations® uses tempered and laminated glass to reduce damage in the event of an impact. Deciduous trees can be beneficial because their foliage provides shade during the summer and allows for solar heat gain when their leaves drop in the winter.

Foundations

While Solar Innovations® does not provide the foundation, we do make recommendations based on the greenhouse's use and structure type. Please consult your local code official for regulations.

CONCRETE FOUNDATIONS

For greenhouses larger than 200 square feet, a concrete slab, continuous concrete footing, or a concrete block footing is required and should extend below the frost line. Concrete block footings should extend a minimum of six inches above grade. Embedding anchor bolts into concrete is the best way to tie down the structure. It is recommended that a waterproof compound be applied as a moisture barrier and surround the foundation with insulation panels.

KNEE WALLS

Knee walls (base or pony walls) are typically between 30-36 inches tall and are a common feature in greenhouses. Applying a stone or brick veneer to a concrete knee wall is a cost-efficient way to achieve a classic look. Solar Innovations® recommends insulating the knee wall to optimize energy efficiency.

Flooring

Your greenhouse floor needs to be comfortable for the gardener, allow for drainage, and be sterile. A French drain can be used for drainage, but must be installed as the foundation is poured.



CONCRETE

Concrete can increase thermal mass storage and does not harbor mold or disease; however, it will require regular cleaning due to soil build up.



TILE

Tile is durable and easy to clean and offers many color and pattern options. Use slip resistant or textured tile to help prevent falls.



PAVERS WITH GRAVEL

Pavers are a great way to reduce costs and can be placed in footpaths for better footing, while the gravel acts as a perfect drain for water.



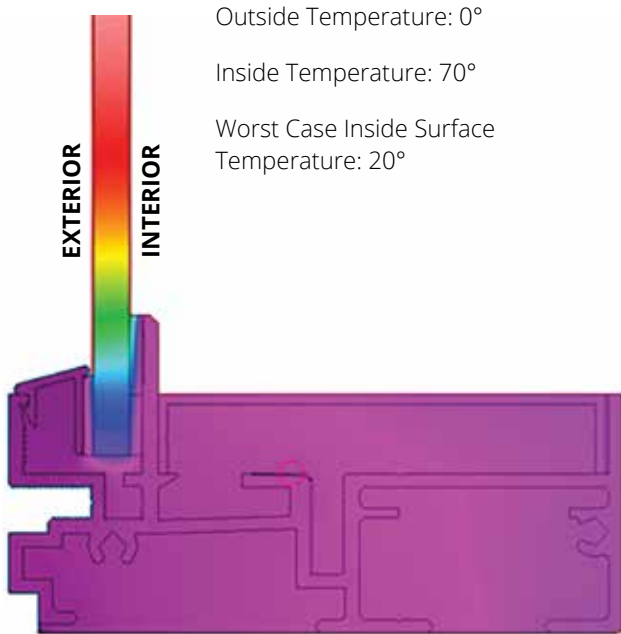
GRAVEL

Gravel is the most economical choice and reduces the spread of mud and dust. However, the gravel may need to be replaced and weeds may sprout.

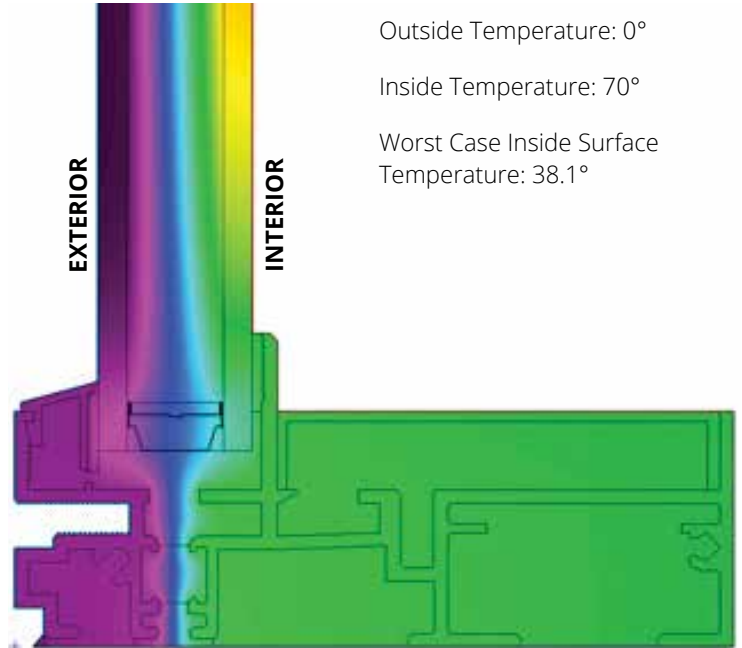
Thermally-Enhanced Structures

The energy efficiency of your greenhouse can be greatly enhanced through the use of high-performance glazing and thermally-broken aluminum framing.

NON-THERMAL STRUCTURE SILL WITH MONOLITHIC GLASS

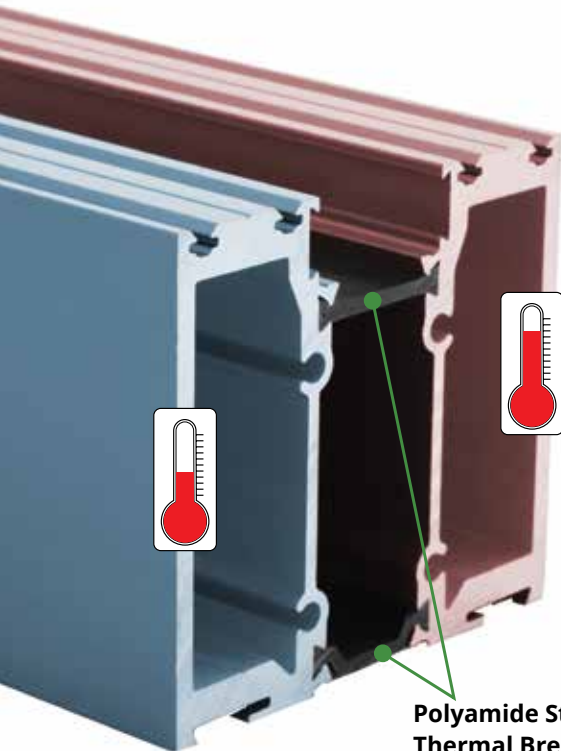


THERMALLY BROKEN STRUCTURE SILL WITH INSULATED GLASS



THERMAL BREAK

A thermal break separates the aluminum and minimizes conductivity of heat and cold from the outside to the inside while ensuring the structure's interior remains comfortable all year long. Solar Innovations® offers two types of thermal break systems; Polyamide Strut and Pour and Debridge. In the first method, a Polyamide Strut is threaded into the cavity between two aluminum profiles and crimped into place. In the Pour and Debridge system, liquid polyurethane is poured into aluminum cavities that have been machined with an Azo-Brader, that allows for the polymer to mechanically lock in place. Both methods improve thermal efficiency by breaking the highly conductive properties of aluminum. Non-thermal aluminum frames should only be used for interior spaces or where thermal conductivity is not important.



Polyamide Strut Thermal Break



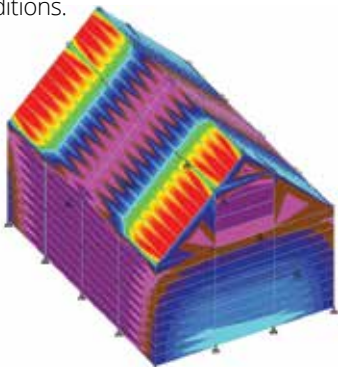
Pour and Debridge Thermal Break

Aluminum Frame



Impact-Rated Structures

For coastal applications Solar Innovations® is proud to stake claim to the industry's only hurricane impact-rated glazed structure with operable vents, windows and doors. Our products are not only tested through structural analysis software, but also physically tested in our in-house test lab. Build with the peace of mind that your greenhouse can withstand the harshest conditions.



TESTING RESULTS

SI5200 Lean To Structure as manufactured by Solar Innovations®. NCTL-110-20222-1

Air Infiltration Test (ASTM E283):

- Pressure of 1.6 psf (75 Pa): 0.06 CFM/ft² 18 (L/min)/m² infiltration.
- Pressure of 6.2 psf (300 Pa): 0.14 CFM/ft² 42 (L/min)/m² infiltration.

Air Exfiltration Test (ASTM E283/ ASTM E547):

- Pressure of 1.6 psf (75 Pa): 0.05 CFM/ft² 15 (L/min)/m² infiltration.
- Pressure of 6.2 psf (300 Pa): 0.11 CFM/ft² 33 (L/min)/m² infiltration.

Water Penetration Test (ASTM E331):

- Water pressure of 15.0 psf (718 Pa) and 5.0 (gal/h)/m² 204 (L/h)/m², no leakage.

Uniform Structural Load Test (ASTM E330):

- Positive Design Pressure: 65 psf (3112 Pa)
- Positive Design Pressure: 65 psf (3112 Pa)

Florida Product Approval: Impact FL Approval No. Pending

For more information on testing visit solarinnovations.com/information/testing



Insulated Glass Recommendations

Glazing choice plays a critical role in the performance of your greenhouse, and the selection is both location and design specific. Low-E coatings allow the sun's rays to pass through the glass while reducing the amount of heat transfer. U-values measure the amount of heat transferred through glass. The lower the value, the better it insulates. The value for a typical single pane of glass starts around 6.0, whereas you can expect values of around 0.13 for insulated glass with Low-E coatings, stainless steel spacers, and argon infill. Solar Innovations® sales designers will work with you to determine your best options.

Double and Triple Glazed Glass Specifications

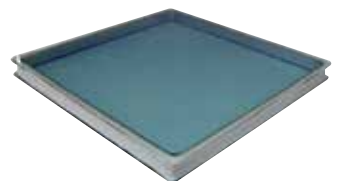
	Overall Unit Thickness	U-Value	R-Value	Solar Heat Gain Coefficient	Visible Light Transmission	Reflectance Out	Reflectance In	UV Transmittance
DOUBLE GLAZED Outside Lite/Inside Lite								
Clear/Clear	1"	0.46	2.17	0.78	82%	15%	15%	58%
180/Clear	1"	0.26	3.85	0.64	79%	15%	15%	29%
272/Clear	1"	0.25	4.00	0.41	72%	11%	12%	16%
366/Clear	1"	0.24	4.17	0.27	65%	11%	12%	5%
340/Clear	1"	0.25	4.00	0.18	39%	11%	13%	2%
180/i89	1"	0.21	4.76	0.62	77%	15%	14%	27%
272/i89	1"	0.20	5.00	0.41	70%	11%	11%	16%
366/i89	1"	0.20	5.00	0.27	63%	11%	11%	5%
340/i89	1"	0.20	5.00	0.17	38%	11%	12%	2%
Gray/Clear	1"	0.45	2.22	0.60	57%	9%	13%	32%
Gray/180	1"	0.26	3.85	0.49	53%	9%	14%	17%
Gray/272	1"	0.25	4.00	0.38	50%	8%	9%	10%
Bronze/Clear	1"	0.45	2.22	0.62	61%	10%	13%	31%
Bronze/180	1"	0.26	3.85	0.61	59%	10%	14%	17%
Bronze/272	1"	0.25	4.00	0.39	54%	8%	10%	10%
TRIPLE GLAZED Outside Lite/Middle Lite/Inside Lite								
180/Clear/180	1½"	0.15	6.67	0.56	70%	20%	20%	13%
272/Clear/180	1½"	0.15	6.67	0.37	63%	15%	18%	8%
366/Clear/180	1½"	0.15	6.67	0.25	57%	14%	18%	2%
340/Clear/180	1½"	0.15	6.67	0.16	34%	13%	19%	1%

Low-E Glazing



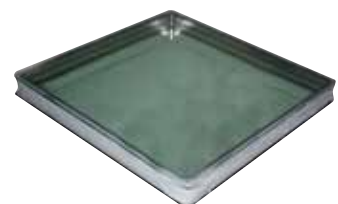
LoE²-272

LoE²-272 is the most common and has a very slight green tint and assists in regulating temperatures in a greenhouse, keeping it cooler in the summer and warmer in the winter.



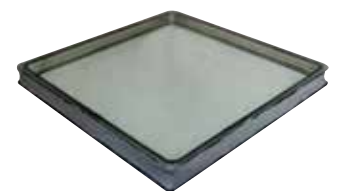
LoE³-340

LoE³-340 is used when a greenhouse needs to be shaded from intense direct sunlight, protecting delicate plants like orchids. A coating is applied to clear glass, which blocks the sun and causes a soft blue tint.



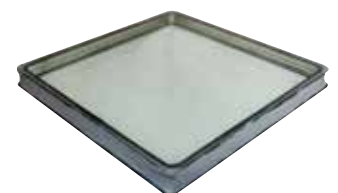
LoE³-366

LoE³-366 is the best insulation choice. It blocks 95% of the sun's harmful UV rays, which helps preserve the color and composition of furnishings, draperies, and wall treatments.



LoE-180

LoE-180 is an ideal choice for greenhouses attempting to generate solar heat gain, particularly with cooling accessories. This glazing is popular for colder climates.



LoE-i89

This energy-saving fourth surface, coated glass can allow for double-pane windows to meet ENERGY STAR[®] guidelines. LoE-i89 is applied to the indoor surface, preventing heat from escaping the room and lowering U-factors.

Note: Low-E = low emission; LoE = product name of Cardinal Glass Industries

Diffused Light Glazing

To protect fragile plants, like Bonsai trees and orchids, from direct sunlight, Solar Innovations[®] offers diffused daylighting solutions.



SOLERA[®]

With an opaque white appearance, Solera[®] offers greatly increased energy efficiency, thermal comfort, and glare reduction while allowing diffused soft natural light into the space.



LUMIRA[®] AEROGEL

When Lumira[®], an aerogel-filled polycarbonate, is installed, thermal ratings are increased and light transmission is decreased. At the same time, glare and sound transmission are reduced.

Dynamic Glazing



THERMOCHROMIC

Thermochromic glazing is a self-tinting glass technology that darkens gradually when heated by direct sunlight.



ELECTROCHROMIC

Electrochromic glazing changes between clear and tinted states with the flick of a switch, reducing glare and heat but requires a power source.

For more information on glazing visit solarinnovations.com/information/glazing

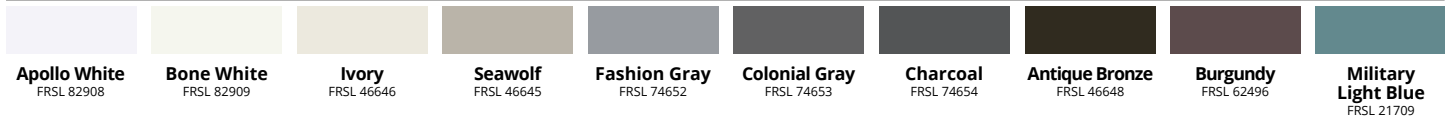
Aluminum Finishes

A painted finish is suitable for residential and light commercial projects. The finish will withstand exposure to the elements and is resistant to impact. Solar Innovations® offers a wide variety of colors, but will also match any custom color. An anodized finish is best suited for commercial jobs, due to harsher use. Anodized finishes are also designed to withstand the corrosive effects of salt water.

Powder Coat Solids STANDARD - AAMA 2605 (10 year; up to 20 year warranty). Scratch & fade resistant; contains no VOCs.*



Powder Coat Solids PREMIUM - AAMA 2605 (10 year; up to 20 year warranty). Scratch & fade resistant; contains no VOCs.*



Visit <https://www.ifscoatings.com/content/assets/Uploads/brochures/IFS-Architectural-Digital-Color-Card.pdf> for additional metallic and anodic finishes.

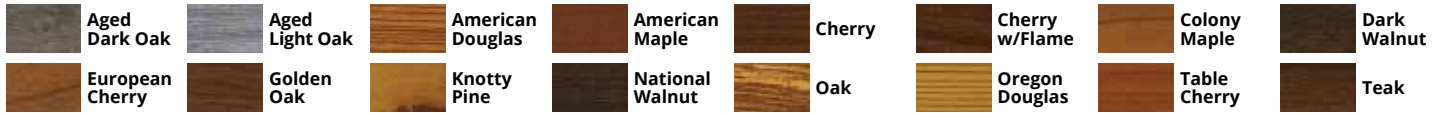
Metal Clad STANDARD* (EXTERIOR ONLY)



Metal Clad PREMIUM*



Decoral Finishes (Powder Coat)*



*Lead times subject to availability. ** Special order.

Note: Depending upon color selection, additional charges and increased lead times may apply. Extended warranties and service plans are available for an additional charge. Examples are shown as accurate as photography and printing processes allow. Final finish selection should be made from a physical sample; contact Solar Innovations® for samples. Product and finish options are subject to vendor availability. Solar Innovations® reserves the right to discontinue any option at any time without notice. Additional options, including custom color match, are available; contact Solar Innovations® for details.

Metal Cladding

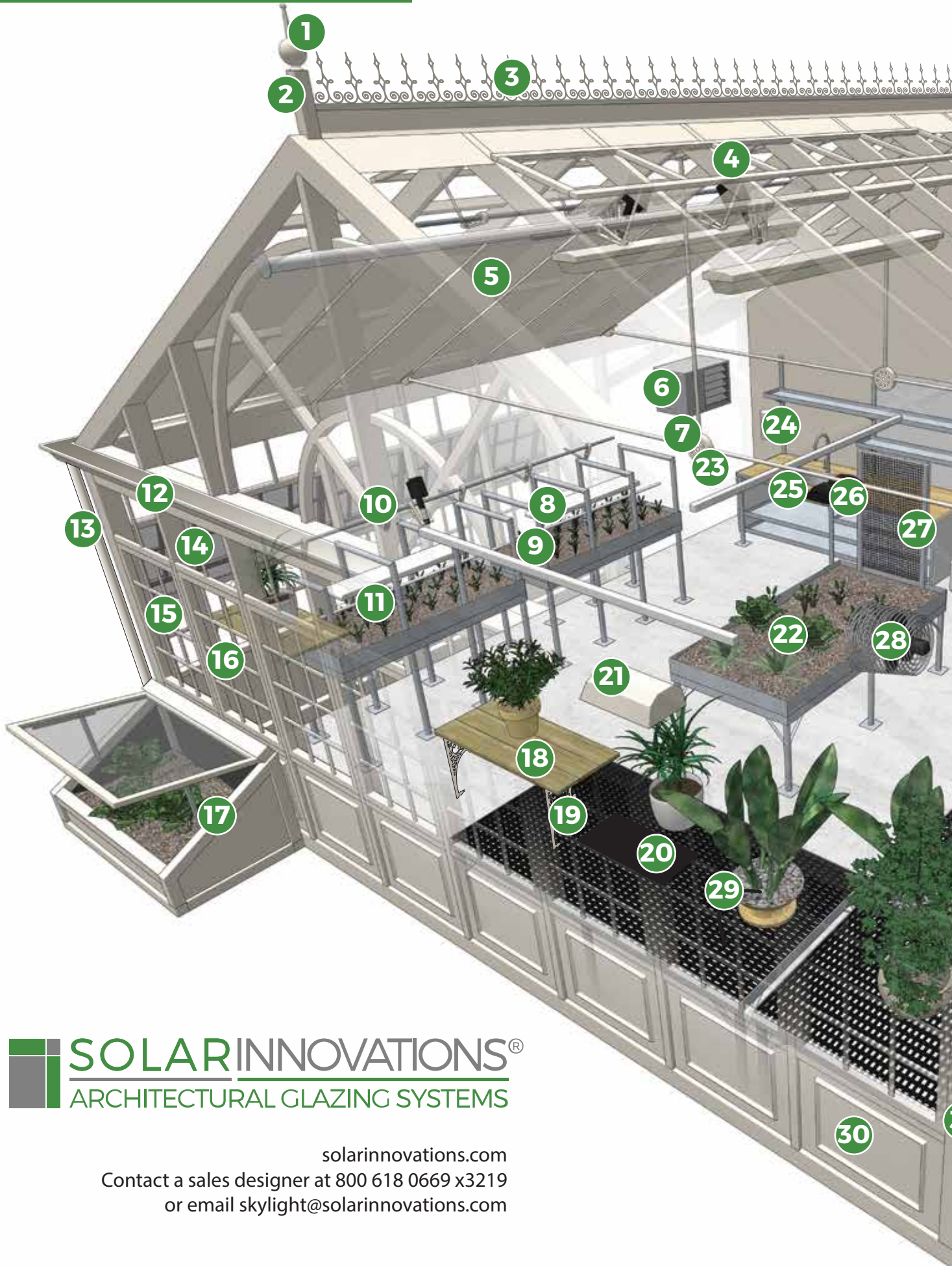
Cladding can be added to the exterior of a greenhouse for aesthetic purposes. Copper and bronze claddings are popular additions to historically-styled greenhouses. Stainless steel cladding is appropriate for a modern greenhouse or coastal applications and will not corrode.



Maintenance

A greenhouse, like any other building, will require maintenance from time to time. The frame and glass will accumulate dust through the seasons, and will need to be removed. Solar Innovations® does not recommend using harsh chemicals. A solution of water, vinegar, and dish detergent will work well to clean the glass and frame. The key is to remove any dirt build-up from the frame, which will prevent future maintenance issues. Operable window and vent tracks need to be cleaned and checked to maintain proper function. Always test your greenhouse accessories, including heating, cooling, shades, operable vents, and windows as a new season approaches. Motorized operations, such as ridge vents, will need occasional lubricating.

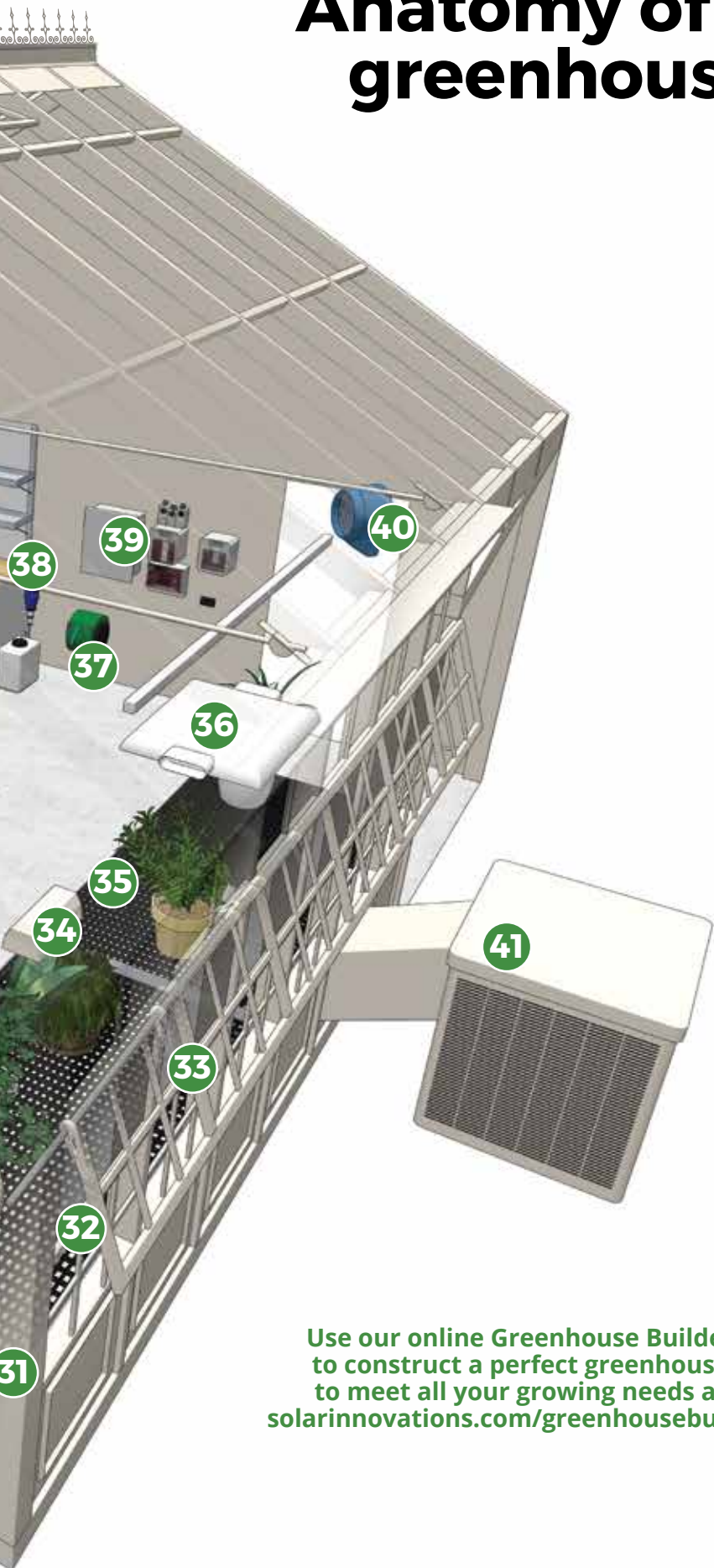




 **SOLAR INNOVATIONS**[®]
ARCHITECTURAL GLAZING SYSTEMS

solarinnovations.com
Contact a sales designer at 800 618 0669 x3219
or email skylight@solarinnovations.com

Anatomy of a greenhouse



Use our online Greenhouse Builder to construct a perfect greenhouse to meet all your growing needs at solarinnovations.com/greenhousebuilder

- 1 Finial
- 2 King post
- 3 Ridge crestring
- 4 Operable ridge vent
- 5 Operable shades
- 6 Heater
- 7 Ring & collar tie
- 8 4' grow light
- 9 Ebb & flow bench
- 10 Gable pediment
- 11 Misting irrigation system
- 12 Gutter
- 13 Downspout
- 14 Transom
- 15 Window
- 16 Grid
- 17 Cold growing frame
- 18 Plant shelf
- 19 Eave spandrel
- 20 Heat mat
- 21 Medium grow light
- 22 4'x8' bench with soil tray
- 23 Appliqué
- 24 Greenhouse sensor
- 25 Potting bench with sink
- 26 LED lamp
- 27 Trellis
- 28 Circulation fan
- 29 Drip irrigation system
- 30 Base panel
- 31 Decorative corner post
- 32 Screen
- 33 Operable eave vent
- 34 Small grow light
- 35 4'x8' bench
- 36 Flat grow light
- 37 Hose reel
- 38 Fertilizer injector
- 39 Environmental control system
- 40 Humidifier/fogger
- 41 Evaporative cooler



TERRACE AND FRENCH DOORS

Terrace doors are single swing doors, while French doors are a set of two swinging doors that operate opposite one another. Units can be hinged left or right and swing in or out. Sizes are custom designed and are constructed of the same materials of the structure.



PIVOT DOORS

Pivot doors have a similar operation to swing doors but are not hinged at the jamb. The pivot points are located on the head and sill and can be placed anywhere along the width of the door. Multiple pivot doors can be installed directly next to each other.



CASEMENT WINDOWS

Casement windows hinge on the left or right and open like a book. They allow for more air circulation than awning windows and can be inswing or outswing.



TILT-TURN WINDOWS

A tilt-turn window is a hybrid of a casement and hopper window with a single dual-operation handle.



AWNING WINDOWS

An awning window is the most common type used for ventilation. The window is hinged at the top, cranks out, and can be left open during light rain showers.



PIVOT WINDOWS

Pivot windows function just like pivot doors and work well when the jamb is not a suitable location to hinge.



TRANSOM WINDOWS

A transom window is located above a door or window and are often fixed, but are available in awning or hopper configurations. Grids and etchings allow for an ornate appearance.



HOPPER WINDOWS

A hopper window is an operable window typically used above a door or window to ventilate the greenhouse.



FIXED WINDOWS

Fixed windows do not operate and are appropriate for areas where the window is difficult to reach.

For more information on doors and windows visit solarinnovations.com

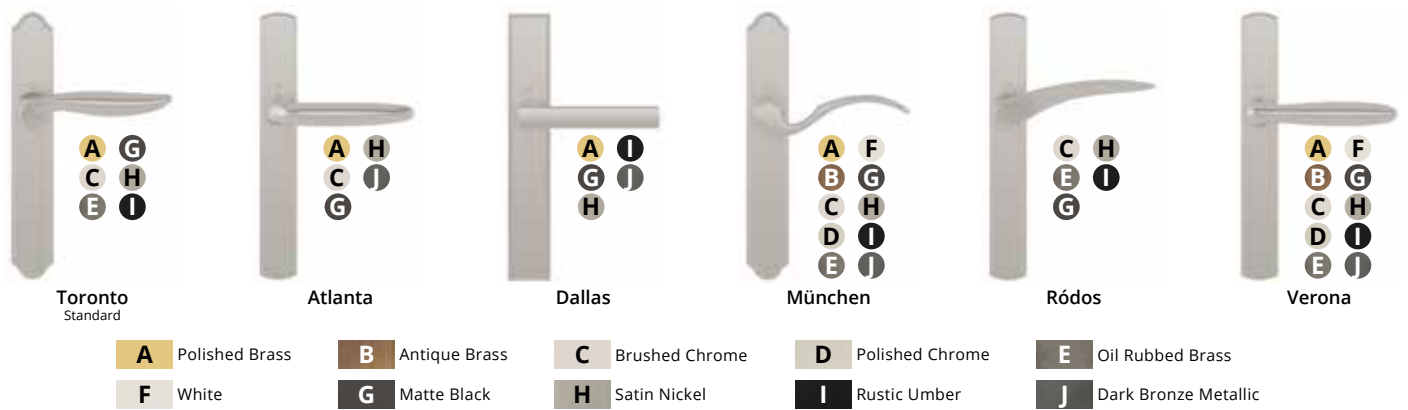
Handles

BRASS — INLAND APPLICATIONS

ALUMINUM — INLAND APPLICATIONS



SOLID BRASS — COASTAL APPLICATIONS



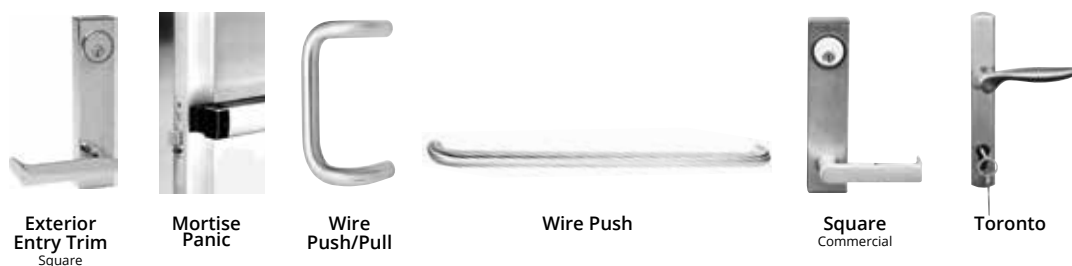
CONTEMPORARY



Closers, Catches, & Limiters



Commercial Hardware

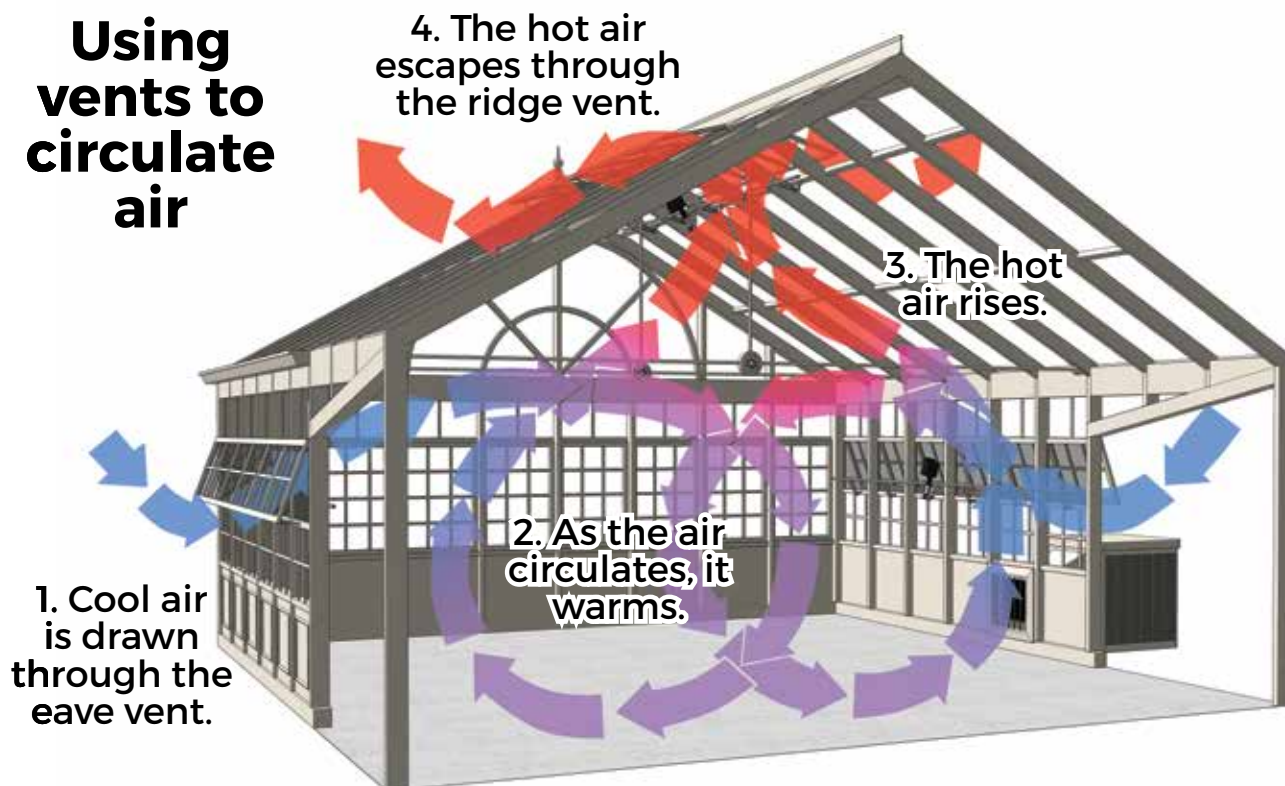


Please Note: All hardware is subject to vendor availability. Custom finishes may be available upon request at additional lead times and/or cost. Solar Innovations® reserves the right to discontinue any hardware option at any time. Please visit solarinnovations.com for additional product information.

VENTILATION

Operable vents, windows, and doors can promote convective air ventilation in your greenhouse. Proper planning will provide fresh air and cooling to the living space and lower energy consumption.

Using vents to circulate air



RIDGE AND EAVE VENTS

The use of ridge vents, which are placed at the roof's highest point, reduces the chance of the greenhouse overheating. When hot air rises and becomes trapped in the peak of the roof, the ridge vents open via a motor or a pole operator and allow the hot air to escape convectively. Multiple bays can be joined together, allowing the entire roof line to open. Windows and eave vents act in tandem with ridge vents to add natural air circulation and draw cool, fresh air into the greenhouse while forcing hot air out through ridge vents. To keep pesky insects from invading the space, screens can be added to both ridge and eave vents.



THERMOSTATICALLY CONTROLLED

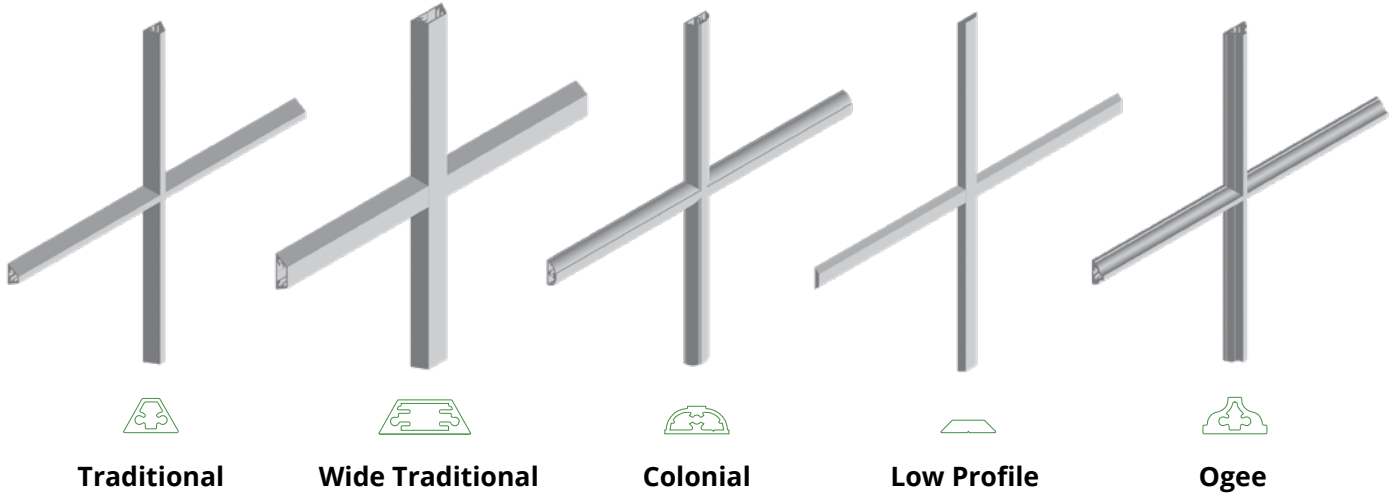
Ridge and eave vents can be mechanically controlled by linear actuator motors, contained in a weatherproof housing. Once the greenhouse reaches a designated temperature the vents will open or close. Each vent is operated from a thermostat mounted in the greenhouse. It is critical to place the thermostat away from heaters and direct sunlight. If needed, the automatic controls can be overridden by the operator.



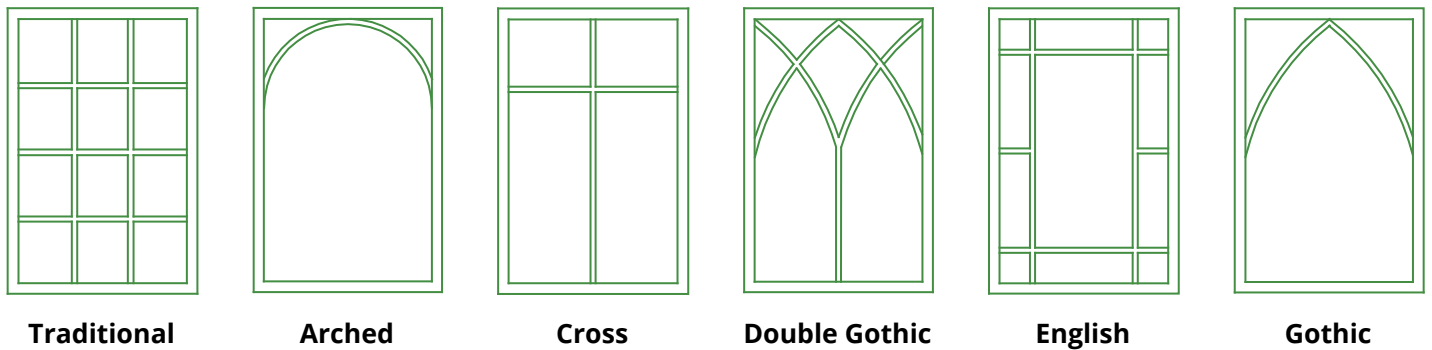


Decorative accessories will take your structure from the ordinary to the extraordinary. These features will give your greenhouse the classic English charm that our customers love and expect.

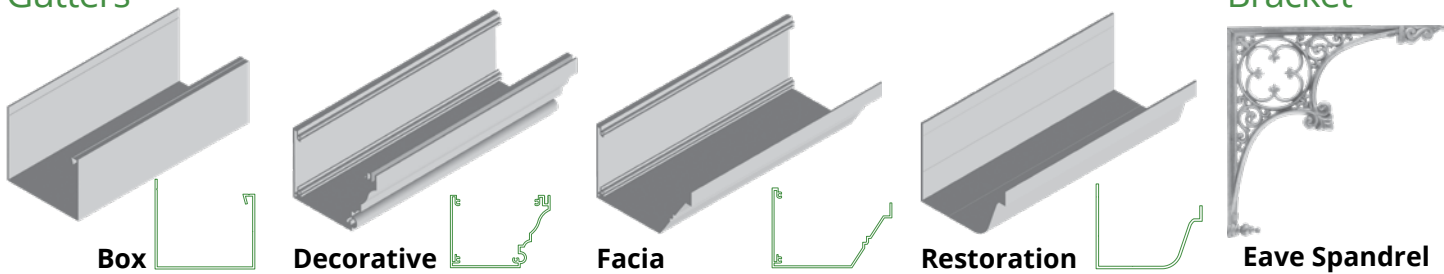
Grid Types (For windows, transoms and base panels)



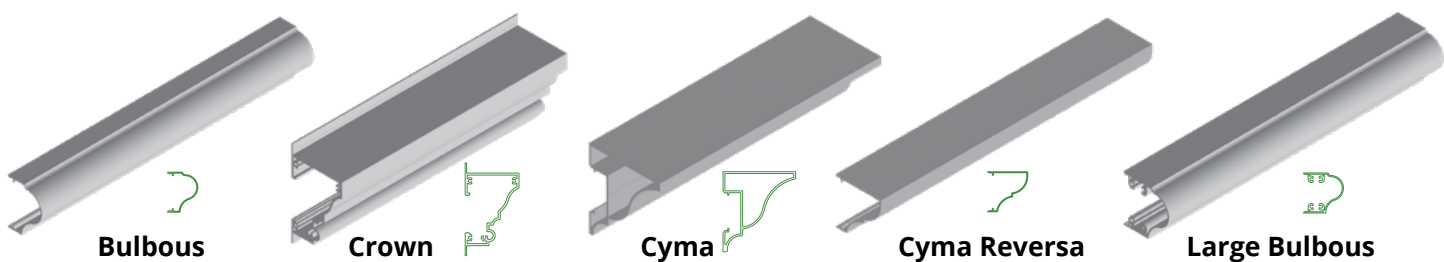
Grid Patterns



Gutters

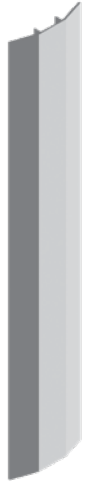


Horizontal Molding



DECORATIVE TOUCHES

Vertical Trim



Beveled



Concave



Flat



Ogee



1" Flat



Sunken Fillet

Finials



7" Fleur de lis



7" Fleur de lis with curve



6⁵/₈" Fleur de lis



6³/₄" Fleur de lis



7¹/₂" Spire



10³/₄" Spire



4³/₁₆" Ball



Bell Cap



16" Ball & Spire



15¹/₂" Ball & Spire



27" Ball & Spire



21" Ball & Spire



20¹/₄" Double Ball & Spire



25¹/₂" Double Ball & Spire

Appliqués



Fleur de lis
CA76



Round
CA35



Flower
CA28



Fleur de lis
CA27



Flower
CA23

Gable Pediments



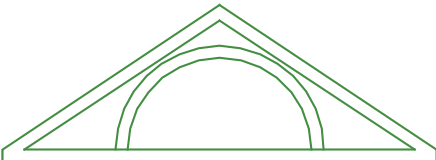
Arched Fan Option 1



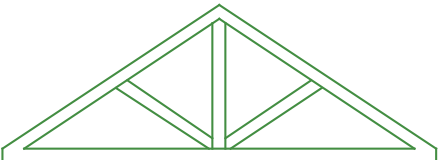
Arched Fan Option 2



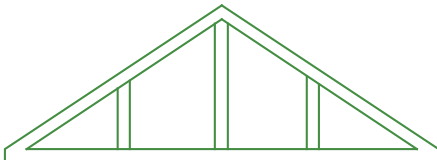
Arched Fan Option 3



Open Radius



Straight Fan



Traditional Gable

Ridge Cresting



Ivy
CA66



Spire
CA59

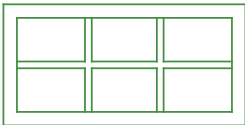


Fleur de lis
CA54

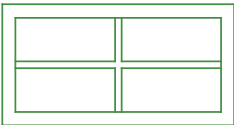


Gated
CA75

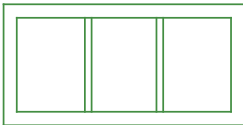
Gridded Transoms



Traditional



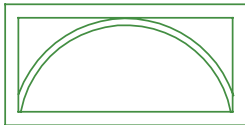
Cross



Double Divide



English

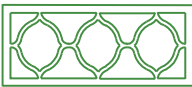


Radius

Etched Transoms



Pattern "A"



Pattern "B"



Pattern "C"



Pattern "D"



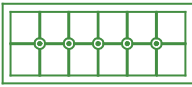
Pattern "E"



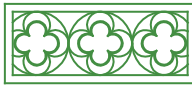
Pattern "F"



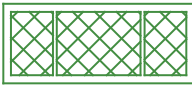
Pattern "G"



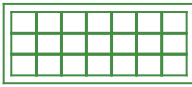
Pattern "H"



Pattern "I"



Pattern "J"



Pattern "K"



Pattern "L"

For more information on decorative touches visit solarinnovations.com/accessories

Heating and Cooling

The interior temperature of your greenhouse is critical to how well your plants will grow. Most greenhouses will need to be heated and cooled to provide the proper indoor environment for plants.

HEATING

While any heat source will keep a greenhouse warm, some tropical plants require it to be kept at a constantly warm temperature. Solar Innovations® sales designers will evaluate your structure's needs and plant types when recommending a heating source.

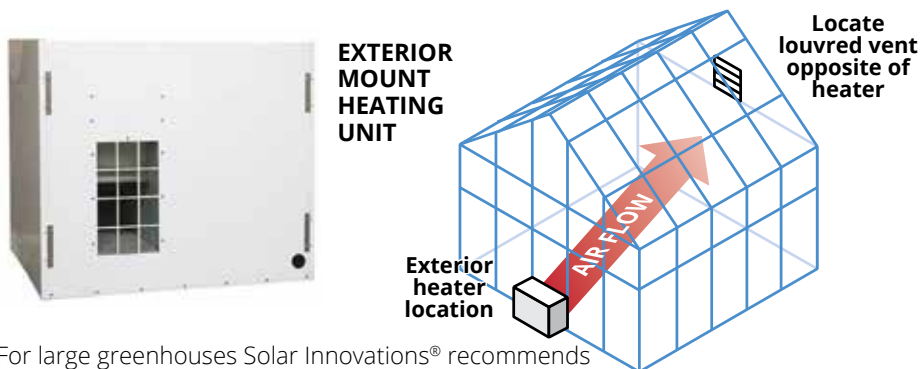


INTERIOR MOUNT HEATING UNIT



COOLING

Cooling a greenhouse is more involved and specific than heating. The wrong type of cooling can be detrimental to plants. Solar Innovations® recommends an evaporative method of cooling in addition to ridge and eave vents. As the heat accumulates and rises, ridge vents can be used to allow the hot air to escape. An evaporative cooler is needed when venting is not sufficient. This system blows outside air over a wet pad that dissipates heat, which in turn, blows into the greenhouse. This method is reliable, efficient, and can be automatically controlled.



For large greenhouses Solar Innovations® recommends an exterior mount heater with a louvered vent mounted opposite the heater..

Fan Options

Plant health is vital to your greenhouse's success, and air circulation plays a major role. Air movement reduces plant disease and can stimulate fertilization.



CIRCULATION FANS

Circulation fans are essential to the plant's health as they eliminate hot and cold pockets, reduce condensation, and keep temperature and humidity uniform. Placing fans in opposite corners keeps a consistent rhythm of air movement.



INTAKE LOUVERS AND EXHAUST FANS

Typically used with uninsulated greenhouses, the exhaust fan expels excess heat from your greenhouse, while the intake louver brings in fresh air, and together they regulate temperature and promote healthy plant growth.

For more information on heaters visit solarinnovations.com/accessories

Benches

Benches are not only an essential component to any greenhouse but also can be designed to meet the needs of a wide variety of growers. Solar Innovations® can build benches that best match the demands of each individual greenhouse. Here are just a few examples:

MASTER GARDENER POTTING BENCH

Potting benches are used as workstations to pot flowers, store tools, and prune plants. A sink can be incorporated to enhance its functionality.



FIXED

Fixed benches are a staple in greenhouses. They have aluminum bases and are available with mahogany, galvanized steel mesh, or black polyethylene crosshatched tops.



SEEDLING

Seedling benches are raised beds on legs which allow you to grow plants directly in the soil. The bench has a solid bottom and can be designed to accommodate varying soil depths.



SINK

Your greenhouse will be much more functional with the addition of a sink which can stand alone or be incorporated into one of our benches.



ROLLING

Rolling benches have fixed legs and a movable top, allowing for the workspace to shift from aisle to aisle, freeing up valuable space in the greenhouse.



TIERED

Tiered benches can stand up to three levels tall and can be placed above the bench to expand space or under the bench for low-light plants.



GRAVEL

Gravel benches consist of a solid bench top, which is filled with gravel and water. This is an ideal bench for humidity-loving plants such as tropicals and orchids.

For more information on benches visit solarinnovations.com/accessories



Trellises

Aluminum trellises are available in single or stacked configurations. Trellises can be as tall as needed and are appropriate for interior and exterior gardens.



Single Trellis



Stacked Trellis



Hangers

A variety of plants can be grown year-round in hanging baskets within the greenhouse. Solar Innovations® offers a variety of hangers.

Shelving

Shelving is a great way to expand your greenhouse's growing area. The units can be placed directly in front of a window, on a solid wall, or located high on the eaves and come in a variety of styles.



OPEN GRATE

Open grate shelves allow for optimal air flow and ease of maintenance and are available in galvanized steel or polyethylene plastic tops.



WOOD

Wood shelving inserts are made of hardwood species, like mahogany and cedar. These slats can be stained or left in their natural state.



TRUSS

A truss is a structural element that spans the width of the greenhouse and, with the proper design, can hold a high quantity of heavy plants.



ALUMINUM PIPE HANGERS

Aluminum pipe plant hangers are stationary tubes that can hold a large amount of medium to lightweight plants.



ADJUSTABLE METAL BRACKET

Metal bracket shelving supports are an economical choice, have a functional appearance, and can be mounted above or below the shelf.



DECORATIVE CASTING BRACKET

Decorative corner shelf supports work well with conservatory-style greenhouses and can double as a plant hanger.



RING AND COLLAR TIES

Ring and collar ties are a type of historical plant hanger and are attached to the structure. They can be adorned with an appliqué and hold medium weight plants in large quantities.



SINGLE RAFTER HANGERS

Single rafter plant hangers utilize hooks placed in rafters to hang a single plant.



SLIDING HANGERS

A sliding plant hanger is designed with wheels built into the unit that make a plant's relocation effortless.

For more information on plant storage visit solarinnovations.com/accessories

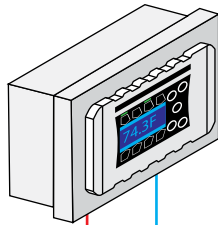
Irrigation Systems

Two-zone misting and drip irrigation system

An automatic watering system can regulate the flow of water and nutrients to your plants without the grower being onsite. Misting and drip systems are the types that are used most often in greenhouses.

Environmental Control System

Irrigation can be time-controlled or function through the use of sensors. An Environmental Control System can also monitor temperature, CO₂ levels and humidity and operate accessories such as heaters, evaporative coolers, vents and circulation fans.



ZONE 2: DRIP SYSTEM

16mm Easyloc Valve
Use to terminate system.

16mm Tubing
Cut 8" longer on each end of bench. 3 gal./min. Tubing comes in 100', 500' & 1,000' rolls.

Tie down to bench with zip ties.

16mm Tubing Punch
Punch tubing where needed. Dozens of drip tubes can be inserted into one system. Punch included with system.

Micro Valve
Allows shut-off on hose. Not included with Leader Hose.

Leader Hose
Available in 18", 24", 36" & 48" lengths. Includes insertion knob.

Perforated Drip Ring
Available in 4", 6" (1 gal./hr.), 8½", 10" & 13" (2 gal./hr.) diameters.



FOGGERS

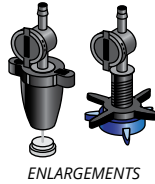
Tropical plants often need 60-80 percent humidity, which is difficult to achieve without a fogging system. The fan blows water that produces humidity, and creates a slight fog.

ZONE 1: MISTING SYSTEM

25mm Tubing
Cut 8" longer on each end of rail. Tubing comes in 100', 500' & 1,000' rolls.

End Plug
The system can terminate with a plug or continue to serve other benches.

360° Nozzle
Insert every 30". Use colored pins for specific mist patterns. Range varies upon pressure of system. Blue pronged nozzles are for 3' width benches or narrower.



ENLARGEMENTS

25mm PolyRail
PolyRail comes in 6' lengths and should be coupled to form a 12' rail. It can either be hung with jack chain from the ceiling or 2' risers installed on bench. PolyRail must be hung 2' above vegetation and no more than every 12' apart. Preassemble before inserting tubing.

PolyRail Riser

25mm-Tubing Punch
Punch tubing every 30" while inserted into PolyRail. Punch not sold as part of a system.

PolyRail Support Base

Spray should extend 6" - 10" beyond bench width.

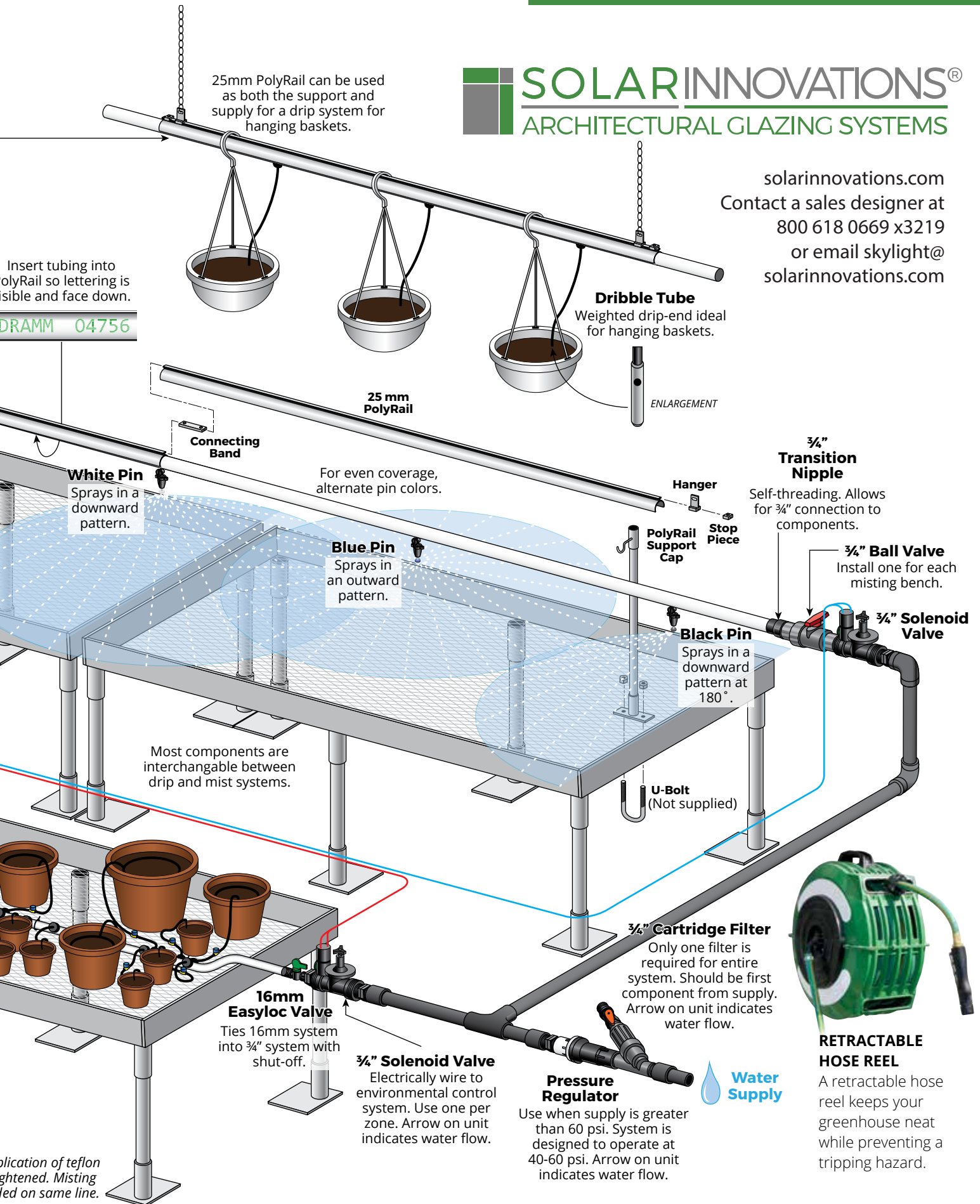
ENLARGEMENT

Drip Stake
½ gal./hr. Use in 4"-8" pots.

Note: All components require appropriate tape and only need to be hand-tightened and dripping are not recommended.

SOLAR INNOVATIONS®
ARCHITECTURAL GLAZING SYSTEMS

solarinnovations.com
Contact a sales designer at
800 618 0669 x3219
or email skylight@
solarinnovations.com



For more information on irrigation visit solarinnovations.com/accessories



Lighting

The amount of hours a plant grows can be extended with supplemental lighting known as grow lights. Most year-round greenhouses will require lighting during the winter so plants receive the necessary photoperiod for normal development. Grow lights can be used to produce artificial sunlight on shady days when plants do not receive sufficient sunlight. Plants can produce more flowers or fruit in a shorter amount of time with this additional lighting.

HIGH-EFFICIENCY LED LIGHT

Durable and energy efficient, an LED grow light provides uniform lighting and is designed to improve yield. These grow lamps are fully programmable and use 40 percent less energy than High Pressure Sodium lights. They are also easy to install and you never need to replace bulbs.



HIGH-PRESSURE SODIUM LIGHT

A high-pressure sodium light emits more light in the red/orange wavelengths to promote greater flowers and fruit. It is recommended for production of vegetables and cut flowers. Using this light constantly, even during daylight, can provide increased production.



METAL HALIDE LIGHT

A metal halide grow light emits more light in the blue wavelength spectrum to promote vegetative plant growth. Plants grown under this type of light are typically taller and bushier.



WORKSPACE LIGHTING

Most lights are not designed to withstand the amount of water and humidity in greenhouses. Lights will eventually rust, break, or stop functioning. Water-resistant systems with fluorescent lights can be mounted at the ridge of a structure for illumination.

For more information on lighting visit solarinnovations.com/accessories







GREENHOUSE SENSORS



WEATHER STATION

Environmental Control Systems

A fully functioning greenhouse often has many systems. They include watering, lighting, heating, ventilation, and various others. Plants will flourish if humidity, temperature, and air circulation are precisely controlled. Solar Innovations® recommends an environmental control system that can automate each accessory's operation, easing the burden of maintenance.

For the environmental control system to function automatically, data is collected from sensors positioned inside the greenhouse and from a weather station attached outside. The system monitors the data and controls the operation of accessories from predetermined settings. The ridge vents and windows will automatically open when the greenhouse becomes too hot. The evaporative cooler will start to operate if a desirable temperature is not reached. The same is true for heating and watering systems. Accessories can be grouped together or operated independently. For example, two ridge vents can be programmed to open simultaneously or independently. A staged opening allows ventilation units to open at varying degrees between the fully open and fully closed positions.

CONTROLLABLE ACCESSORIES

- Ridge Vents
- Eave Vents
- Motorized Windows
- Heaters
- Cooling Systems
- Circulation Fans
- Grow Lights
- Misting Systems
- Watering Systems
- Shade Systems

ADVANCED TECHNOLOGY

Software can be installed on your computer to control the greenhouse's settings. Daily records can be created and saved for future reference. The software is capable of setting off alarms if the temperature falls out of range, and can even send an alert to your cell phone.

For more information on environmental control systems visit solarinnovations.com/accessories

Shades and Blinds

The summer sun may be too intense for some plants, causing them to burn or die. One way to avoid this situation is to install a shading system. Solar Innovations® provides operable, fixed, interior, and exterior shading systems. Most of our shades and blinds are designed for high-moisture areas and are water, bacteria, and fungi resistant. Fixed shades permanently attach to the frame and are appropriate for greenhouses that are used to grow delicate plants such as orchids or other tropical flowers that may be sensitive to overexposure. Operable shades allow you to control the amount of light entering the greenhouse and are available in manual or motorized options.



MANUAL ROLLER SHADES



WIDE-SPAN SHADES



EXTERIOR SHADES



FIXED SHADES



GRAVITY-FED SHADES

For more information on shades visit solarinnovations.com/accessories

Accessory Packages

Choosing the right greenhouse accessories can be a challenge for even the seasoned grower. The Solar Innovations® sales designers tailored the following packages to set you on the right path toward a successful greenhouse.



Year-Round House Plants

- Circulation Fans
- Heater
- Evaporative Cooler
- Fixed Benches
- Potting Benches
- Retractable Hose Reel
- Sliding Plant Hanger
- Shelves
- Fixed Shades
- Thermostats

Seeds/Propagate/Vegetables

- Circulation Fans
- Heater
- Evaporative Cooler
- Fixed Benches
- Potting Benches
- Raised Seedling Benches
- Retractable Hose Reel
- Grow Lights
- Trellis
- Heat Mats
- Thermostats

Orchids

- Circulation Fans
- Heater
- Evaporative Cooler
- Humidifier
- Fixed Benches
- Gravel Benches
- Drip System
- Retractable Hose Reel
- Fixed Tube Plant Hanger
- Control System



Palms

- Circulation Fans
- Heater
- Evaporative Cooler
- Humidifier
- Drip System
- Retractable Hose Reel
- Shades
- Control System

Tropical

- Circulation Fans
- Heater
- Evaporative Cooler
- Humidifier
- Fixed Benches
- Retractable Hose Reel
- Sliding Plant Hanger
- Grow Lights
- Trellis
- Control System

Beginner Greenhouse

- Circulating Fans
- Heater
- Evaporative Cooler
- Standard Benches
- Thermostats

GREENHOUSE CHECKLIST

Use this checklist to help guide you through the greenhouse design process: *(check all that apply)*

Projected purchase date: _____ **Budget:** _____

Seeking LEED certification? Yes No

Must contractors be registered or licensed with the municipality? Yes No

Who will install the product? _____

Application (pages 2-7): Commercial Residential New construction Replacement Plants and people
 Some plants Lots of plants Freestanding Attached — open to interior Attached — separated by doors

What will you grow? Orchids Palms Vegetables Tropical House plants Citrus trees Other: _____

Intended use? Force bulbs Propagate Start seedlings Earth beds Raised beds Overwintering plants

Which seasons will you use the greenhouse? Spring Summer Fall Winter All seasons

Glazing by: Solar Innovations® Other

Attaching to: Steel Masonry/concrete Wood, Laminated veneer lumber (LVL) Other

Foundation (page 15): Concrete Block Knee wall **Flooring** (page 15): Concrete Tile Pavers Gravel

Performance requirements (DP): _____ **Wind speed** (MPH): _____ **Exposure:** _____

Water penetration resistance: _____ **Air infiltration:** _____ **Snow load:** _____

Testing: None Florida impact Texas certification (TDI) HVHZ Miami Dade

Florida non-impact Other: _____

Do you have power available? Yes No **Heating source:** Natural gas Propane

Do you have a water line? Yes No **Drains?** Yes No

Length: _____ **Width (projection):** _____ **On slope dimension:** _____

Eave height: _____ **Ridge height:** _____ **Roof pitch:** _____

Style (page 8): English Contemporary

Configuration (pages 11-12): Straight eave lean-to Curved eave lean-to Straight eave double pitch Curved eave double pitch
 Gable end Hip end Bull nose end Custom

Structural enhancements (page 13): Dormers Lanterns Entryways/Vestibules

Thermal performance (page 16)? Yes No

Glazing (pages 18-19): _____ **Frame finish** (page 20): _____

Doors (page 24): Terrace (swing) French Pivot

Windows (page 24): Fixed Casement Awning Hopper Tilt-turn Pivot Transom

Hardware (page 25); Handle: _____ Lock: _____ Hinge: _____

Closers, catches, limiters: _____ Commercial: _____

Vents (page 26): Ridge Eave

Decorative touches (pages 29-31): Grid type: _____ Grid pattern: _____ Gutter: _____

Horizontal Molding: _____ Vertical trim: _____ Finial: _____

Appliqué: _____ Gable pediment: _____ Ridge cresting: _____

Gridded transom: _____ Etched transom: _____ Base panels: _____

Heating (page 32): _____ **Cooling:** _____ Circulation fan Exhaust fan Louvered vent

Benches (page 33): _____

Trellises (page 35): _____ **Shelving:** _____ **Hangers:** _____

Irrigation (pages 36-37): Misting system Drip system Fogger Retractable hose reel

Lighting (page 38): LED High pressure sodium Metal halide Workspace

Environmental control system (page 41): _____

Shades (page 42): Gravity-fed Manual roller Wide-span Exterior Fixed

Accessory packages (page 43): Year-round house plants Seeds/propagate/vegetables Orchids Palms

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