

SPECIFICATION Living Wall System

This specification describes the green wall panel system designed to provide a vegetative cover on sloped (greater than 20 degrees) and vertical surfaces. Green Living Wall Panels are delivered as a pre-grown system. Green Living Wall Panels are also used as a freestanding (Without being mounted to an existing vertical surface) system with multiple freestanding options and custom configurations. This specification is intended to be included in any **Sections or synonymous descriptions titled – Green Walls or Living Walls.**

1. General**1.1 Related Sections**

Mounting Surfaces Hardware Panels Trim and Catch Basins Irrigation
LEED Qualifications

1.2 Installation Contractor

.1 The Green Living Wall Panels must be installed by an authorized installer of GLTi products or local labor in addition to PGW (Philly Green Wall) supervision. In the event the Green Living Wall Panels are not installed by authorized agent or in fact installed by authorized agent PGW shall not be named in any legal actions, disputes or other. Installation contractor will be solely responsible for any legal actions, disputes or other.

1.3 Proof of Structural Load Bearing Capacity

.1 An engineer's report confirming the load bearing capacity of the existing structure *must be provided by the client*. PGW will not be held responsible. This report must be furnished to the named installer. It is assumed that the client has accepted all responsibilities related to the structural integrity of the wall or roof in relation to installing a green wall or sloped green roof and will not name PGW in any legal actions, disputes or other.

1.4 Plans & Shop Drawings

.1 The client must provide scale drawings to authorized agent / installer for quotation and design purposes.
.2 If acceptable scale drawings are not available, authorized agent or approved alternate will be required to produce said drawings at the client's expense.
.3 PGW will provide shop drawings to client showing all material terminations, transitions and penetrations upon a complete contract including monetary deposits. PGW will not provide shop drawings without a deposit and / or a paid fee for services.

1.5 Waterproofing Membrane

.1 There may be a need for an approved high quality waterproofing membrane in place under the wall system prior to installation of the green wall.

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.2 The waterproofing manufacturer specifications must detail approval for the

membrane to be installed in a vertical position.

.4 The waterproofing membrane will be covered by a separate warranty issued by the waterproofing provider and will not be covered under the PGW product warranty.

.5 PGW or Green Living Technologies will not be held responsible if this report is not furnished. It is assumed that the client has accepted all responsibilities related to the waterproofing capabilities of the membrane and will not name PGW in any legal actions.

Accessories

.6 All other components or accessories must be approved or provided by PGW to ensure viability and performance of the system as per the specifications. This includes any flashing, trim and other materials.

1.6 Masonry Mounting Surface

.1 Include but not limited to: Cinder Block, Stone Wall, Masonry Wall, Brick Walls, Marble and Granite. Generally masonry mounting surfaces must conform to the requirements specified in the 2006 International Building Code (IBC) Section 2103.

.2 Masonry mounting surfaces must be in a condition to accept suitable hardware to meet a minimum sheer force of 1500 pounds (680 kilograms) as specified by the hardware manufacturer. The PGW details include a minimum of 1500 lbs of shear force specified by the hardware manufacturer.

1.7 Other Mounting Surfaces

.1 Other mounting surfaces may include but not limited to sheet rock, ply wood and dens glass. These surfaces may require a half inch to three quarter inch ply wood backer. Please refer to the Green Living Technologies detailed specification to installing the Green Living Wall Panels on these surfaces.

1.8 Lead Time

.1 It can take as long as 6 months of growing season to produce a pre-grown system depending on plant species and propagation method. The decision to purchase a pre-grown system must be made 6 months prior to the installation date to allow sufficient time for this production by a local PGW grower. Growing will commence within 3 weeks from the date set by PGW. A signed contract does not commit PGW to the 6 month growing period (See .3) until all the panels are manufactured.

.2 Upon contractual obligations and deposit confirmations PGW will issue an anticipated ready date for the delivery of pre-grown green wall panels.

.3 Production of PGW components can take as long as 4-6 weeks to manufacture. A lead time of 2 months should be anticipated when ordering any components. Projects that are fully engineered or custom designed may take up to 3 months depending on the total number of square feet (square meters).

.4 If the client named requests the system to be delivered sooner than the issued ready date, PGW or the PGW authorized growing agent will not be

responsible for immature plants and is assumed the aesthetic appearance is acceptable “as is”. However PGW reserves the right not to release any project if it does not meet the aesthetic approval by PGW.

.5 Some geographic regions provide stock panels already pre-vegetated for a premium fee. Not available in all locations.

1.9 Contract Documents

.1 In the case where PGW or PGW authorized agent / installer is hired to install the system a signed contract specifying the scope of work, terms and conditions, payment scheduling, warranties, and any other relevant information is required before plant propagation is started.

1.10 Warranty on Workmanship

.1 A Two (2) year standard warranty on workmanship is to be provided by the installer. This does not include a plant warranty.

1.11 Warranty on Components

.1 PGW warrants all non-living components of the GLTi system will perform as specified for 2 years (for Aluminum Panels) and for 5 years (for Stainless Steel Panels) provided it was installed by a Certified GLTi installer. All warranties are void if the installation is maintained by a non certified installer or if the client named or other non-certified GLTi person(s) attempt to service the wall. All and any work performed on the system has to been done by PGW or a PGW approved agent.

.1a Irrigation components are warranted for one (1) Year.

.2 The 2 year warranty for the brackets, spacers, green wall panels, catch basins and edging details of the PGW system states that these components will not degrade due to physical, chemical or biological processes that naturally occur in a green wall system. The labor and material cost of any warranty work is covered in this warranty. An extended warranty is available for this portion of the system but must be used in conjunction with the PGW maintenance program performed by a PGW authorized agent.

. .3 All warranties are void if a PGW maintenance agreement is not current.

1.12 Warranty on Vegetation

.1 A one (1) year warranty and maintenance contract for the approved vegetation shall be provided with the initial quotation for an extra cost as part of the PGW maintenance agreement. (*All vegetation warranties are voided unless an automatic low volume irrigation system is installed) This will cover all aspects of the vegetation, irrigation and system performance. An extended warranty (including vegetation) could be available as part of the continued maintenance program and can be extended for as long as a maintenance program is purchased through an authorized representative.

1.13 Extended Warranty and Maintenance Program

.1 An extended warranty and maintenance program can be purchased for the

GLTi system.

.2 The warranty and maintenance program is available in the form of an annually renewable contract between PGW approved agent and the client. The warranty will cover all system components including plant performance provided that all maintenance has been performed by a PGW approved agent since the date of installation.

3 Upon completion of the 2 year warranty on the brackets, spacers, green wall panels, catch basins and edging details the system will retain the PGW warranty beyond the 2 years if a maintenance agreement has been in place and continued, PGW will extend the manufacturer's warranty in conjunction with the maintenance agreement. Once the maintenance agreement is terminated the extended PGW warranty becomes void.

.4 SEE MAINTENANCE AGREEMENT AND PROCEDURES 3.5

2. Products

2.1 Description

.1 The PGW green wall system is made up of standard and potential custom modular sections (See Appendix A) of vegetation area that are delivered as a preassembled product to the site for installation. The plants are pre-grown into the modules and all components that make up the system are spot welded together to maintain structural integrity. The ability to customize and accessorize the system with various options is possible provided the design has been approved by PGW or Approved Agent.

.2 The PGW Green Living Wall system may also be custom manufactured or custom engineered to accommodate non-standard design and product options.

.3 The PGW Green Living Wall system is also available as a freestanding (Defined as: Not being mounted to a solid vertical surface)

.4 Required Components for a vertical surface (Exterior or Interior) Mounting surface (See Section 1.6 & 1.7) suitable for retaining hardware with a minimum 1500 lbs minimum shear force of 1500 pounds (680 kilograms) as specified by the hardware manufacturer.

a 1/2" (minimum) (1.27 cm) to 3/4" (maximum) (1.905 cm) green wall bracket spacers.

Material: Plastic Recycled Polyethylene or PVC

b PGW green wall brackets drilled at a minimum 16" (40.64 cm) on center for hardware.

Material: Multipurpose Aluminum (Alloy 6061)

Mill Finish

Thickness 1.025" Tolerance ±.002"

Temper T6

Hardness: 95 Brinell

Yield Strength: 35,000 to 40,000 psi

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c. Green Living Wall Panels: As Manufactured by Green Living Technologies International, Rochester, NY (Aluminum or Stainless Steel), see appendix A for standard sizes Aluminum.

Material: Multipurpose Aluminum (Alloy 6061)

Mill Finish

Thickness .032" Tolerance \pm .003"

Temper T6

Hardness: 95 Brinell

Yield Strength: 35,000 to 40,000 psi

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Material: Multipurpose Stainless Steel Modified 440A

Mill Finish

Thickness .024" Tolerance \pm .001"

Temper T6

Hardness: 95 Brinell

Yield Strength: 35,000 to 40,000 psi

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**Green Wall Panel Depth (inches / cm) Pounds Per Square Foot Saturated
(Kilograms / Square Meter)**

3" depth (07.62 cm) 15 lbs per sf saturated (145.87 kg / m²) *ground covers and sedum

4" depth (10.16 cm) 20 lbs per sf saturated (145.87 kg / m²) *ground covers and sedum

6" depth (15.24 cm) 25 lbs per sf saturated (145.87 kg / m²) *ground covers and sedum

d. For Pre-Grown systems a PGW approved substrate:

(Proprietary and will require purchase via PGW)

e. Established vegetation with root growth. (Pre vegetated only)

.1 Optional Components

Irrigation catch basins and drainage required for all interior installations, and recommended for Exterior walls that do not extend to the ground level.

Standard: 20 ga break formed Stainless Steel welded water tight with 1-1/4" min. drain connection. Custom options are available for catch basins to allow attachment of other decorative finishes to the front face.

Optional: Provide gravel bed at base of exterior walls that extend to grade level.

Optional: Provide 1/8" thick Stainless steel break formed brackets for mounting signage that will float in front of vegetated walls

Optional: Provide .060 thick Mill finish aluminum custom sized blank out boxes for electrical fixture mounting to face of vegetated wall.

Optional: Provide 24 ga perforated Stainless Steel soil retention clips with flat black or brown paint finish

Optional: Provide aluminum armatures constructed of 1/4" min thickness structural aluminum sections, trussed together as needed for free standing and sloped conditions. Engineered shop drawings to be provided for all armature designs

1.2 Substrate

.1 A locally produced substrate must be applied to the interior cells of the system for the purpose of plant sustainability.

.2 Growing medium required must be provided by PGW or PGW authorized agent to ensure viability and performance of the system as per the specifications.

1.3 Vegetation

.1 The plant list must be approved or provided by PGW or PGW authorized growing agent to ensure viability and performance of the system as per the specifications.

.2 The vegetation with root establishment into the green wall cells and substrate must be mature enough to provide 90% cover upon installation. **PGW will and can deliver a pre-mature product prior to the required 6 month lead time. Less lead time equates to a less mature product and client assumes a product less than 90% mature to be acceptable. (See 1.8)*

.3 It is possible that climate regions will require growing in a green house. Additional costs may be applied to regulate green house temperatures.

.4 Some geographic locations provide stock pre-vegetated panels, not available in all locations. Contact PGW.

1.4 Irrigation

Irrigation materials: ¼" poly micro drip lines with emitters at 6" oc

½" Poly header lines with plastic compression fittings

Rain bird ¾" DVF series automatic solenoid operated control valves

Rain bird pressure regulating filters

Hunter X-CORE controller with Hunter solar sync weather sensor

.1 Various irrigation solutions are available depending on the situation. All irrigation designs must be approved or designed by PGW or PGW authorized agent.

.2 An irrigation water source must be provided at the vicinity of the green wall with a shut-off valve and backflow prevention installed by certified plumber. For exterior walls a heated remote irrigation room is required. An individual pipe from this room for each zone to each wall location is to be provided by others. Optionally, this can be provided as a conduit for flexible plastic piping to be run to wall locations. Conduit size to be determined in the shop drawing stage.

.3 Grey water or rainwater irrigation water is encouraged for use with the PGW System. Water quality must be approved by PGW or PGW authorized agent prior to installation.

1.5 Edge Trim

The edge trim system is required to conceal and mount irrigation lines.

PGW Standard: .032" Aluminum break formed side and top trim with 1/16" concealed Aluminum press fit clips. All trim to be removable to provide access to irrigation lines. Width and depth are made to order to fit project conditions.

Standard color options: Mill Finish, Charcoal Grey paint, or Dark Bronze paint.

CUSTOM OPTIONS: Stainless steel, powder coated, ect

Provide a rain capturing top trim on Exterior walls where possible that will assist watering the green wall. Rain capturing trim is not substitute for an irrigation system.

2. Execution

2.1 Delivery

.1 Co-ordination of delivery time lines is the responsibility of PGW or PGW installer. Five (5) days advance notice of delivery to the producer is necessary to ensure there are no delays.

.2 The pre-grown modules will be palletized or transported by the PGW panel carrier and delivered to site for installation on the date of installation unless otherwise specified.

2.2 Storage

.2 Palletized vegetated material must be stored in a secure, cool shady environment out of direct sunlight prior to installation. Vegetated panels must be protected from rapid temperature changes of more than 30°F (7°C)/hour. All vegetation is to be installed within three (3) days of being delivered. If this is not possible contact PGW for further instructions.

.3 All other materials (non-living) should be stored in a dry location out of direct sunlight with original packaging and documentation left intact prior to installation.

.4 All interior plants must be stored in a temperature equal to that of the installation area or as specified by PGW or PGW authorized growing agent.

2.3 Site Protection

.1 The work area is to be protected from damage by first sweeping off all debris and then laying protective covering in work and traffic areas.

.2 All areas below the installation area must be sectioned off with caution tape, protective cones and / or other means to prevent persons from walking under the installation work area. (Regional laws may apply)

2.4 Installation

.1 The PGW spacers and green wall brackets must be installed to support the green wall panels as per specification detail and only by certified PGW installers.

.2 The spacers must be filled with marine grade polyurethane or water cut-off if required (when using a membrane utilize the manufactures recommended water cut-off).

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.3 The modular trays can then be picked up by two individuals and placed in the proper area.

.4 The panels must interlock from the upper and lower sections of the panel with maximum spacing of 1/4" (.635 cm) (6.35 mm).

2.5 Maintenance (See Sample Maintenance agreement as Appendix B)

.1 Maintenance must be provided by a GLTi or PGW approved agent.

.2 Provide a maintenance contract included in the green wall bid, beginning from the completion of system installation and is provided with initial quotation by the installer or PGW authorized agent.

Maintenance options: select one to be included in Green wall bid

Basic – covers trimming, weeding, annual fertilizing, winterizing exterior walls, Cleaning drain troughs

20% Plant Replacement – (Recommended) includes all of Basic Services and covers 20% of plant replacement cost if needed

100% Plant Replacement – includes all of Basic Services and covers 100% of plant replacement cost if needed

.3 Maintenance work done by an unapproved PGW agent may void any warranties made by PGW.

.4 Additional maintenance programs and costs are subject to the type of plant species and growing mediums specified for the project.

.5 All maintenance contracts are subject to annual renewal. Failure to renew the maintenance agreement with PGW approved agent voids all vegetative warranties.

.6 Every year the client renews the maintenance agreement, PGW approved agent will renew the vegetative warranty.

.7 Upon completing the 2 year non-vegetative warranty every year the client renews the maintenance agreement GLTi - PGW will continue to warranty the non-vegetative components in addition to the plant material.

.8 To uphold the non-vegetative 2 year warranty a copy of the maintenance agreement must be left with the contact of the project site and a copy must be electronically submitted to PGW upon every site inspection, maintenance visit or service call.