

1. GENERAL

1.1 Summary

This section describes the Vegetated green wall panel system designed to provide a vegetative cover on sloped (greater than 20 degrees) and vertical surfaces. Vegetated Wall Panels are delivered as pre loaded with growing media to be planted in place, or a fully pre-grown system. Vegetated 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.**

1.1.1 Related Sections

Section [0] – [Waterproofing Membrane]

Section [0] – [Plumbing]

Section [0] – [Electrical]

LEED Qualifications

1.2 SUBMITTALS

1.2.1 - Product Data

Manufacturer's Technical literature showing compliance of components

Product data sheets on all irrigation components

1.2.2 - Shop Drawings

1.2.2a - The client must provide scale CAD drawings to the authorized agent / installer for quotation and design purposes.

1.2.2b - The Living Wall Supplier will provide shop drawings to client indicating:

1.2.2c - Panel layout with dimensions, irrigation layout, installation layout

1.2.2d - connection details, mounting details, side and top trim details

1.2.2e - Irrigation diagrams indicating zones and control room location

1.2.2f - diagrams indicating irrigation supply line routes from control room to green wall panels. Diagrams for drain pan waste lines. (if required)

1.2.2g - Planting layout indicating plant types and list species.

1.2.2h - Color rendered elevations of the proposed plantings.

1.2.3 Certification of Installation Contractor

The Vegetated Living Wall Panels must be installed by an certified installer of PGW (Philly Green Wall) products or local labor in addition to PGW (Philly Green Wall) supervision. In the event the Vegetated 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.

1.2.4 Certification of Structural Load Bearing Capacity

An engineer's report certifying the load bearing capacity of the existing structure *must be provided by the client*. The Living Wall Supplier 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 The Living Wall Supplier in any legal actions, disputes or other.

1.2.5 Certification of Waterproofing Membrane

1.2.5a - If a waterproofing membrane is required under the Living wall system prior to installation of the Living wall, the waterproofing installer must certify that the membrane is installed water tight and in accordance with manufacture's instructions.

1.2.5b - The waterproofing manufacturer specifications must allow for the membrane to be installed in a vertical position.

1.2.5c - The waterproofing membrane will be covered by a separate warranty issued by the waterproofing provider.

1.2.5e - The Living Wall Supplier 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 The Living Wall Supplier in any legal actions.

1.3 DELIVERY, STORAGE HANDLING

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

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

1.3.3 - 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 The Living Wall Supplier for further instructions.

1.3.4 -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.

1.3.5 - All interior plants must be stored in a temperature equal to that of the installation area or as specified by The Living Wall Supplier authorized growing agent.

1.4 QUALITY CONTROL

1.4.1 - WARRANTY ON WORKMANSHIP: A Two (2) year standard warranty on workmanship is to be provided by the installer. This does not include a plant warranty.

1.4.2 - WARRANTY ON COMPONENTS: The Living Wall Supplier shall warrant all non-living components of the system will perform as specified for 2 years provided it was installed by a Certified installer. All warranties are void if the installation is maintained by a non certified installer or if the client named or other non-certified person(s) attempt to service the wall. All and any work performed on the system has to been done by the Living Wall Supplier or the Living Wall

Supplier's approved agent.

1.4.2a - Irrigation components are warranted for one (1) Year.

1.4.2b - The 2 year warranty for the brackets, spacers, green wall panels, catch basins and edging details of the 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.

1.4.2c - All warranties are void if the approved Living Wall Supplier's maintenance agreement is not current.

1.4.3 - **WARRANTY ON VEGETATION:** 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 Living Wall Supplier's 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.

1.4.4 Extended Warranty and Maintenance Program

1.4.4a - An extended warranty and maintenance program can be purchased for the system.

1.4.4b - The warranty and maintenance program is available in the form of a renewable contract between the Living Wall Supplier's approved agent and the client. The warranty will cover all system components including plant performance provided that all maintenance has been performed by the Living Wall Supplier's approved agent since the date of plant installation.

1.4.4c - Upon completion of the 2 year warranty on the brackets, spacers, green wall panels, catch basins and edging details the system will retain the Living Wall Supplier's warranty beyond the 2 years if a maintenance agreement has been in place and continued, the Living Wall Supplier will extended the manufacture's warranty in conjunction with the maintenance agreement. Once the maintenance agreement is terminated the extended the Living Wall Supplier's warrantee become void.

1.4.5 Masonry Mounting Surface

1.4.5a - 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 current International Building Code (IBC).

1.4.5b - 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 Living Wall Supplier's details include a minimum of 1500 lbs of shear force specified by the hardware manufacturer.

1.4.6 Other Mounting Surfaces

1.4.6a - Other mounting surfaces may include but not limited to sheet rock, plywood and dens glass. These surfaces may require a dual layer three quarter inch plywood backer. Please refer to the Living Wall Supplier's details for installing the Vegetated Wall Panels on these surfaces.

1.5 Lead Time

1.5.1 – The General Contractor or Client shall coordinate with the Living wall Supplier to determine lead time for the particular project. It can take approximately 2 months for the to obtain planting material utilizing the standard planted in place method for the Vegetated Living Wall system. Full coverage of the wall is achieved after installation and usually requires more maintenance.

1.5.1a - It can take as long as 6 months of growing season to produce the optional 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 approved grower. Growing will commence within 3 weeks from the date set by the Living Wall Supplier.

Pre-grown systems have hardier plant material and better established root systems. Pre-grown systems also have higher shipping and other costs.

1.5.2 - Production of the Living Wall components can take as long as 4-12 weeks to manufacture depending on the particular project. 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).

2. PRODUCTS

2.1 Description

2.1.1 - The Vegetated Living wall system is made up of standard and potential custom modular sections of vegetation area that are delivered as a preassembled product to the site for installation. The plants are pre-grown into the modules or planted in place, and all components that make up the system are riveted 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 the Living Wall System supplier or Approved Agent.

2.1.2 - Approved Vegetated Living Wall System: Manufactured and supplied by Philly Green Wall / MNB constructs LLC Philadelphia PA, 19147 215 928 8900
Standard size: 2'x2' 4" deep. Optional sizes: 2'x1', 1'x2', 1'x'1 in 3" or 6" depths
Corner panels and any customize sizes are also available with additional lead time

Material: Multipurpose Aluminum (Alloy 6061)

Prefinished powder coat dark bronze Finish

Thickness .050" (case and shell) & 040" (internal framing) Tolerance ±.003"

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

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

2.1.4 - The Vegetated Living Wall system is also available as a freestanding (Defined as: Not being mounted to a solid vertical surface)

2.1.5 - 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 sheer force of 1500 pounds (680 kilograms) as specified by the hardware manufacturer.

2.1.5a - 1/2" (minimum) (1.27 cm) to 3/4" (maximum) (1.905 cm) green wall bracket spacers. Material: Plastic Recycled Polyethylene or PVC

2.1.5b - green wall brackets drilled at a minimum 16" (40.64 cm) on center for mounting hardware.

Material: Multipurpose Aluminum (Alloy 6061) mill finish

Thickness .025" Tolerance ±.002"

Temper T6

Hardness: 95 Brinell

Yield Strength: 35,000 to 40,000 psi ASTM B209

2.2 Substrate

2.2.1 - A locally produced growing media must be applied to the interior cells of the system for the purpose of plant sustainability.

2.2.2 Soil based Growing medium required must be provided by the Living Wall Supplier or authorized agent to ensure viability and performance of the system as per the specifications.

2.3 Vegetation

3.3.1 - The plant list must be approved or provided by the Living Wall Supplier's authorized growing agent to ensure viability and performance of the system as per the specifications.

2.3.2 - Planted in place panels, the standard planting method, provide much shorter lead times and will achieve full maturity after installation.

With Optional Pre Grown systems, provided at additional costs, The vegetation shall have root establishment into the green wall cell perforations and substrate, and 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.*

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

2.4 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

2.4.1 - Various irrigation solutions are available depending on the situation. All irrigation designs must be approved or designed by the Living Wall Supplier or their authorized agent.

2.4.2 - An irrigation control room or area source must be provided at the vicinity of the green wall or in a remote irrigation control area with a shut-off valve and backflow prevention installed by certified plumber. A 15a 110v outlet must be provided in the irrigation room. For exterior walls a heated remote irrigation room is required.

2.4.3 - An individual pipe (1/2" PEX) from the irrigation control room for each zone and to each wall location is to be provided by others. The irrigation piping diagram to be provided in the shop drawing stage. 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.

2.4.4 - Grey water or rainwater irrigation water is encouraged for use with the Living wall system System. Water quality must be approved by The Living Wall Supplier or the authorized agent prior to installation.

2.5 Edge Trim

2.5.1 - The edge trim system is required to conceal and mount irrigation lines. The Living Wall Supplier 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.

2.5.2 - Standard color options: Mill Finish, White or Dark Bronze paint.
CUSTOM OPTIONS: Stainless steel, custom powder coated, ect

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

2.6 Optional Components

2.6.1 - 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 - 24 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.

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

2.6.3 - Optional: Provide 1/16" thick Stainless steel or 1/8" thick Aluminum break

formed brackets for mounting signage that will float in front of vegetated walls
2.6.4 - Optional: Provide .060 thick Mill finish aluminum custom sized blank out boxes for electrical fixture mounting to face of vegetated wall.

2.6.5 - Optional: Provide aluminum armatures constructed of ¼" min thickness structural aluminum sections, trussed together as needed for free standing and sloped conditions. Engineered shop drawings to be provided for all armature support systems.

3. EXECUTION

3.1 Site Protection

3.1.1 - 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.

3.1.2 - 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)

3.2 Installation

3.2.1 - Spacers and green wall brackets must be installed to support the green wall panels as per specification detail and only by certified PGW installers.

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

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

3.2.4 - The panels must interlock from the upper and lower sections of the panel with maximum spacing of ¼" (.635 cm) (6.35 mm).

3.2.5 - ¼" Irrigation drip lines must be installed above each row of panels. ½" poly irrigation header lines must be installed along both ends of panel arrays, with the ¼" drip lines pierce tap connected at each end. Irrigation lines must be connected to a water source at the irrigation control location within 48 hours of plant installation.

3.2.6 - Side and top aluminum trim brackets must then be installed to the hanger bars with ¼-20 stainless steel tapping screws.

3.2.7 - Brake formed aluminum trim shall then be installed onto the brackets. Side trim is friction fit into brackets and top trim is screw attached with ¼-20 stainless steel tapping screws.

3.3 Maintenance

3.3.1 - Maintenance must be provided by the Living Wall Supplier's approved agent.

3.3.2 - Provide a maintenance contract included in the green wall bid, commencing at completion of system's vegetation installation, and is provided with initial quotation by the installer or by the Living Wall Supplier's authorized agent.

RECOMMENDED FIRST YEAR MAINTENANCE PACKAGE INCLUDED IN BASE BID:
(3) LEVEL I maintenance visits

- (2) LEVEL II maintenance visits 20% Plant Replacement
- (1) LEVEL III maintenance visits with a maximum of 20% Plant Replacement

Maintenance options: These options can be added to the first year agreement or can be individually authorized by the owner after the first year.

LEVEL I Basic – covers system and Plant inspections with recommendations, check and adjust irrigation

LEVEL II Trimming and cleaning: includes all of Level I Basic Services and Trimming and cleaning foliage, catch basin cleaning, if needed, Apply pest management, antidiisicants (exterior walls) and fertilization.

LEVEL III Plant Replacement: Includes all of Level I & Level II Services and also covers Plant Replacement of Dead or unhealthy plants, Growing media replenishment

3.3.3 - Maintenance work done by an unapproved agent of the Living Wall Supplier may void any warranties made by the Living Wall Supplier.

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

3.3.5 - All maintenance contracts are subject to annual renewal. Failure to renew the maintenance agreement with the Living Wall Supplier's approved agent voids all vegetative warranties.

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

3.3.7 - 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.

END OF SECTION