Specifying, Installing and Maintaining a Tournesol VGM living wall –
A series of answers to the most commonly asked questions

As green roof technology has become an accepted standard throughout the construction industry, more designers and owners are considering installing green on the walls of their buildings. The traditional strategy of installing trellis systems achieves many of the functions desired in a green wall, but recently the option of living walls has become viable.

The concept of a living wall is to mount a series of living, growing plants on a vertical surface. There are several manufacturers of these types of systems currently offering solutions to the North American market, including Tournesol Siteworks. The purpose of this brief is less to provide background on the "why?", but rather to address the practical questions on how a living greenwall can be specified, installed and maintained.

The brief is based upon the use of Tournesol VGM, a commercial-grade modular greenwall system. Some answers may be applicable to other manufacturer's systems, although some are rather specific to the business practices and characteristics of Tournesol Siteworks' products.

This brief is written as a series of typical questions that Tournesol encounters during discussions with designers, contractors and owners contemplating installation of the living greenwall. It is not meant to be exhaustive, but rather to provide information as a basis for evaluation.

Who Does What?

Design - A common source of confusion when considering a living wall is who should be responsible for each phase of the specification, design and maintenance of the living greenwall. Tournesol Siteworks believes that as a manufacturer, we don't add much value providing design services. The customer is better served using local knowledge rather than "importing" it from elsewhere. A local architect/landscape architect/designer does the system design, usually with Tournesol Siteworks input. Irrigation is laid out by the landscape architect, an irrigation consultant, or the installing contractor. Tournesol typically provides irrigation strategy recommendations that can be modified as local codes and conditions require.

Growing & Installation - The assembly & installation of the system can be done by any contractor, even one with little experience with this type of installation. The growing-in of plants takes place at a local nursery or grower's facility, often using their labor for module assembly, soil filling, planting, growing, and any necessary acclimation. Either the grower or the installing contractor would transport the fully grown modules to the site. The contractor would execute the final step, fastening the framesets on the modules, hanging the units and installing the final irrigation elements. Traditionally the installing contractor will be responsible for the first 3 months of maintenance on the living wall, and then the project is handed off to a maintenance contractor. At each phase of the process Tournesol Siteworks is available to discuss the details of the project.

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The other manufacturers sell a complete package – why doesn't Tournesol Siteworks?
This goes back to the approach that we take to the marketplace. We're a manufacturer of landscape systems. If we sold units grown in, we'd contract with a grower here (and mark up that charge), buy soil here (and mark up that charge), buy irrigation here (and mark up that charge) then ship it all around the country (and mark up that charge). You can get the picture. It would cost more to the eventual owner, and neglect those who have local expertise that is likely more useful than our guesses about your conditions. We also believe that the green aspect of the product is reinforced if most elements don't have to be shipped in. Our product is shipped flat, so that it is cost effective and energy efficient to transport. We've spoken with clients who have experienced things the other way, and they tend to agree with us.

Is there a limit to the height of the system?
Because the modules are held in place with a series of rails extending at most up to 8', there is never more than approximately 125 lbs. of weight on any given anchor on any point in the wall (assuming a 50 lbs/pcf soil is used, without a wind load). There is no practical limit to the height of the wall (no "stacking issues"), simply the height to which the client is willing to do maintenance on the system.

Do the walls require special preparation?
The rails & modules provide a minimum of 2.5" of clearance between the soil and the wall. Although there is no water running down the walls, the wall should be waterproof. You can expect humidity to be somewhat higher in the areas between the wall and the greenwall system.

Is there a difference between a wall-mounted system and a screen?
The VGM system, because of the universal nature of the rails, can be mounted on nearly anything. To make a screen, the rails only need to be mounted to a simple metal frame. The modules are one-sided, growing out from the front. If a double-sided screen is desired, a separate layer of rails & modules needs to be mounted on the backside of the support frame. While a simple solution, special care should be taken in evaluating the growing conditions of each side. Frequently a plant that works on one side won't on the other due to exposure, prevailing winds, or the like.

Are other module sizes available with the Tournesol VGM?
Currently the Tournesol VGM system is only manufactured in one size – 19-3/4"w x 22"h. They are stocked in two depths, 6" (4" soil profile) and 10" (8" soil profile). They can also be custom cut to other depths, as required.

How much does a living wall cost?
For budgetary purposes, the Tournesol VGM system is estimated on a square-foot basis. The typical material-only cost (stainless rails and framesets, recycled modules) cost approx. $60-90 per square foot, depending upon the scale of the installation. The "all-in" cost, including plants, soil, irrigation, and installation, may cost between $100-150 per square foot. Every installation is different, but typically a more experienced installer will be able to provide a more realistic estimate for grow-in and installation. They also will likely have a higher success ratio.

How difficult is it to assemble the modules? Do they come apart once they've been assembled?
All units are shipped flat, and assembled prior to planting. A rubber mallet is the only tool required. The bottom is attached to the back, the front attached to the bottom, and then the sides attached to all three. The soil retention bag is inserted in the module, and then the entire unit filled with soil. The module should be tapped or vibrated to promote settling, and the soil topped off several times. Once full, the bag is folded over and the top snapped on. To maintain the structural integrity of the box, the connections are designed as "one-way", so the top cannot be removed. Should the box need to be refilled, it must be done from the front.

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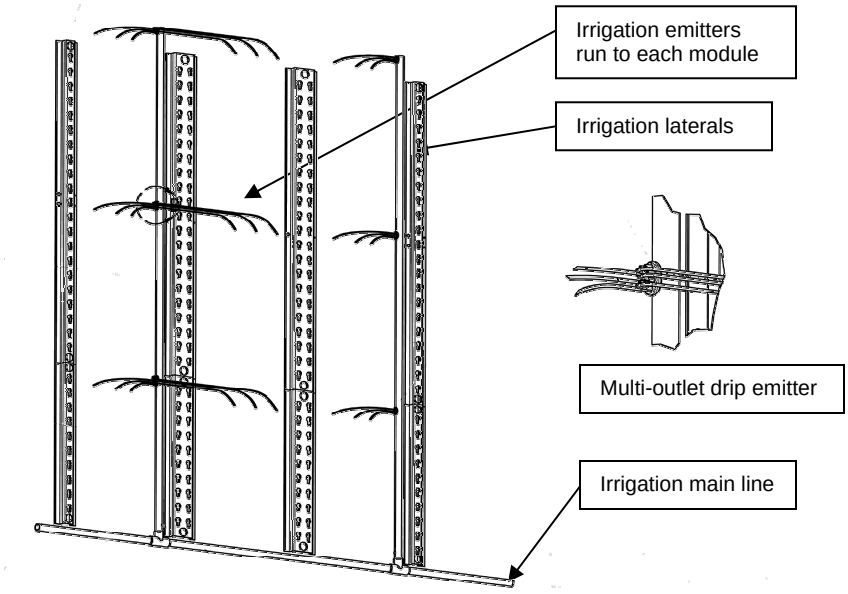
What sort of soil should be used in the system?
We typically recommend the use of engineered mixes similar to those used in greenroof applications. These mixes are usually highly inorganic, consisting of blends of calcined clay, expanded slate, sand, perlite, vermiculite and similar minerals. Organic components usually make up less than 10 percent of the mix. We strongly recommend mixes that test, saturated, to weights less than 50 lbs/per cubic foot. The use of non-decomposing inorganic mix is especially important in the Tournesol VGM, as the modules are difficult to refill. Organic components do provide beneficial nutrients to the plant as they decompose, but require premature replacement of the module. Most regional soil blenders will have a mix that has been formulated for green roof use. Tournesol Siteworks is happy to evaluate regional mixes to determine their suitability with the VGM system.

How is the system irrigated?
Because of the nature of the soil systems recommended above, and the vertical nature of the planting, not much water is retained in the soil for the plants. For that reason we strongly recommend the use of automatic drip irrigation with the Tournesol VGM product. The irrigation strategy is relatively straight forward (see diagram to the right). An irrigation main is run below the green wall. Laterals are attached alongside every other rail. At the top of each level of modules, the lateral is pierced with a multi-outlet pressure-compensating drip emitter system (a 6-emitter system works best). Three supply tubes are spaced along the top of each module, so a single multi-outlet emitter can provide for modules on either side of the rail. The water is simply allowed to drip through the top of the module, fed from above. The desired irrigation application rate would be small amounts, frequently, to reduce the amount of unretained water drainage. A moisture sensor can be added to the irrigation specification, if desired. A drainage channel can either be attached to the bottom of the rail or to the wall below a living wall if required (for example, on a very tall wall or a wall over a doorway).



Do the plants require fertilization?
Because the soil mix doesn't provide much in the way of nutrients, fertilizer should be regularly applied to the plants. A fertilizer injector ("fertigation") can be installed as a component of the irrigation system. It is a common, inexpensive way to reduce maintenance and guarantee the longevity of the plantings.

What kind of plants can we use?
A wide variety of plants may be used in the Tournesol VGM system, depending upon the application. Considerations when picking plants for a wall include the appropriate plant selection for the horticultural conditions (the zone), the micro-conditions of the installation (temperature, sun exposure, wind), desired maintenance schedule, the soil profile of the Tournesol VGM system (4", 6" or 8"), and of course, the desired look of the wall. A few varieties that have been successful in these types of installations are listed below. By no means is this a definitive list - actual project success will depend upon a qualified review of the horticultural considerations listed above.

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Vine-type plants
Hedera helix var. – Ivy varietals
Gaultherias procumbens – Wintergreen
Ficus pumila – Climbing fig
Vaccinium ovatum – Huckleberry
Clematis pitcheri – Bluebill
Clematis alpina – Alpine clematis
Clematis macropetala – Downy clematis
Lonicera sempervirens – Trumpet honeysuckle
Lonicera albiflora – Western white honeysuckle
Ampelopsis brevipedunculata – Porcelainberry
Parthenocissus tricuspidata – Boston ivy
Parthenocissus quinquifolia – Virginia creeper

Ferns
Athyrium felix-femina & var. – Lady ferns
Blechnum spicant – Deer fern
Polypodium glycyrrhiza – Licorice fern
Dryopteris expansa – Spreading wood fern
Dryopteris affinis – Golden-scaled male fern
Polystichum acrostichoides – Christmas fern
Polystichum polyblepharum – Japanese tassel fern

Sedges & Grasses
Carex caryophylllea – Spring sedge
Carex dolichostachya – Gold fountains sedge
Carex morrowii – Japanese sedge
Carex cherokeensis – Cherokee sedge
Carex perdentata – Sand sedge
Carex planostachys – Cedar sedge
Eragrostis intermedia – Plains lovegrass
Nolina texana – Texas sacahuista

Color/Ground covers
Euonymus japonicus microphyllus & var. – Euonymus boxleaf varietals
Begonia var. – Begonias
Phlox subulata – Moss pinks
Allium senescens subsp. Montanum – Mountain garlic
Allium tanguticum – Ornamental chive
Campanula carpatica – Bellflower
Dianthus var. – Carnation groundcover varietals
Coronilla varia – Crownvetch

Sedum Varieties
Most sedums will perform well in this type of application. Consult with your local grower to discuss availability and appropriate varieties.

What about corners and ends?
Units at the end of a row or on a corner can be planted out the sides. A 3” or 4” hole can be made in 3 or 4 locations on the side of the module, and plants grown in during the establishment period. The plants may need to be fastened in with a plant staple or spike initially. Care should be taken not to get too close to the edges of the module to compromise the strength of the wall.

What maintenance is required?
Maintenance can be divided into three elements – building/structure, irrigation, plants. A thorough maintenance inspection should be conducted on the building/structure (including drains and gutters) and irrigation system a minimum of once per year. Regular maintenance to the plants will be required once they are removed from the nursery and hung on the rails until they stabilize. This may require weekly inspection/correction for the first few weeks, extending to monthly, then quarterly visits.

What is involved with building/structure inspections? - Building/structure inspections will ensure that the greenwall doesn't cause significant damage to the building by catching problems before they become critical. Typically the wall and its surroundings, including drains and gutters, should be inspected a minimum of once per year. Random modules should be removed from the rails to inspect the wall and rails behind. The condition of the wall and its waterproofing, the rail anchors, the rails, drains and gutters should be checked. Note and repair any damage. Should a significant problem exist, a thorough inspection (removing all modules) may be called for. Clogged drains and gutters should be cleared.

What is involved with irrigation inspections? - Irrigation inspections, due to the nature of plumbing systems, are recommended several times per year. The valves and fertilizer injectors should be checked for function, and the irrigation pipes checked for leaks. The modules should be examined for plant health, as a proxy for irrigation function. Should the plants in a module look out of the ordinary, check the emitters during a cycle to ensure that they function. Note and repair all damage. Consult with the original irrigation specification to determine the proper end-of-season winterization (if required), or suggested maintenance schedules. The original irrigation specification should also include a recommended irrigation frequency and time, based upon the season and plant requirements.

What is involved with plant maintenance? - Plant maintenance, assuming that the plants specified thrive in the wall, should be an infrequent (bi-monthly or quarterly) affair. Issues to look out for include pest infestations, plant disease, weed growth, over- or under-fertilization, and soil erosion. The plants may require some pruning to prevent overgrowth. Should an entire module of plants suffer decline (due to a broken drip emitter, for example), it may be easier to replace an entire module than attempt to replant and grow in the field. The same frameset may be used with a new module.

How long should a living greenwall last?
Tournesol Siteworks manufactures the elements in a VGM system to last. The rails and the frameset are made of powder-coated stainless steel, to prevent rusting and corrosion. The modules are entirely made of recycled polypropylene, and will not be affected by roots, fertilizers, chemicals, etc. With proper inspection and maintenance, the system should be able to easily last 20-30 years. The plants, depending on the horticultural conditions, may be able to last as long as the wall. Maintenance to the irrigation system will be a key element in keeping the plants healthy through the life of the project. One thing to keep in mind – the thicker the soil profile the more root space the plants will have to thrive throughout the life of the project.

What is the history of the VGM?
The product was originally developed in Singapore by Elmich, a major supplier of commercial landscape and roofing solutions. After being challenged by the Singapore National Horticultural Society, they adapted their incredibly strong drainage panels into a small modular structure, with the goal of creating a living wall. While the panels went up and the plants thrived, it took some time to develop a suitable mounting strategy. With dozens of installations throughout Southeast Asia, Australia, and even India since 2004, they have had time to perfect the system. Tournesol Siteworks, already a leading manufacturer of landscape solutions for the urban environment in North America, introduced the product in 2008. It complements their current strategy to offer a one-stop shop of landscape products for on structure.

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Can I get replacement parts?
Tournesol Siteworks stocks all replacement parts required. We have been in business since 1979, and are a multi-product company selling through over 300 distributor locations nationwide. You won't need to worry about us being around in a few years for parts and support.

What is covered by warranty?
Tournesol Siteworks warranties all their products for 3 years against defects in craftsmanship and materials, three times longer than the industry standard. We cannot warranty plants, irrigation systems, installations or designs by others. However, you'll find your regional Tournesol Siteworks sales representative a great asset when resolving issues with living wall systems.

Can Tournesol VGM be used indoors as well?
The VGM system has been installed in interior applications as well as exterior. However, interior applications have a completely different set of requirements and horticultural conditions. Specifically, interior plants are typically subject to lower light levels than exterior plants, and need to be replaced due to decline more often than exterior plants. There are also issues with directional lighting and water that complicate matters. Tournesol Siteworks, working together with an interior landscape specialist, has developed a greenwall product specifically for interiors, the TerraScreen™ Interior Greenwall System. It uses a different strategy - rather than direct planting into a soil profile, the TerraScreen uses acclimated plants in 6" growpots slid into cachepots without holes. The system is easy to maintain, and the irrigation integrated into the frame. Call 800-542-2282 or visit www.tournesolsiteworks.com/products/gr_tw.asp for more information.

For more information about the Tournesol VGM system, you can visit www.tournesolsiteworks.com/products/gr_vgm.asp. CAD details, guide specifications, and images are available for download.

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