2008 ASLA Annual Meeting & EXPO
Continuing Education: Friday October 3, 2008. 3:45 – 5:15pm
Session: Fri-B4 Room #103AB

Green Wall Technologies, Benefits and Design, James Sable, greenscreen®

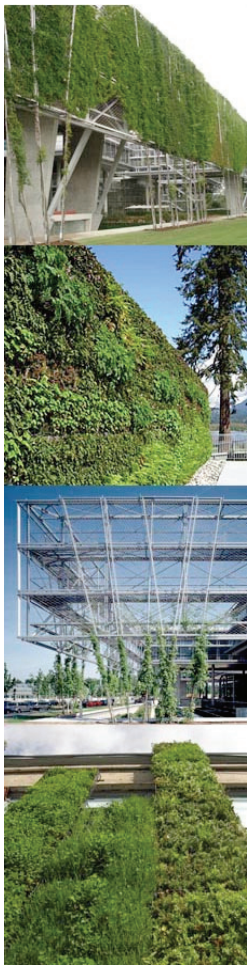
Case Study #1: U.S. Census Bureau, Catherine Mahan, FASLA, Mahan Rykiel Associates, Inc.

Case Study #2: Phoenix Metro LightRail, Caryn Heaps, ASLA, A Dye Design

Presentation structure:

- Discussion of Green Wall technologies
  - Green Facades
  - Living Walls
- Use of green wall design and technologies for specific benefits
- Issues related to successful installation for green walls and specific system technologies
- Survey of sites in different geographic regions of North America
- Case Study #1
- Case Study #2

Green walls:



As we search for inventive ways to respond to environmental issues, an *Old World* idea has been given new life by the application of today's technology and the advance of new concept developments. This evolution provides an opportunity for Landscape Architects, Architects, and Engineers to use Green Walls as an important feature to partner with other sustainable site design practices.

Currently there are two main groups defining green wall design technologies. Those that use structural systems to support vines and adaptable woody stem plants to cover a building facade can be called *green facade* green walls. A second group uses soil or growing media supported vertically from which a variety of plants may grow, and can accurately be called a "living wall." We will take a look at both and identify various design considerations for adapting each to a building facade, or for creating a freestanding green wall.

Green Facades

The development of 'systems', using new materials and structures to create green facades came about for two reasons: First, reliance on the structures of plants, such as aerial roots or sucker pods to attach to a building can damage the surface of the building membrane and contribute to obvious maintenance headaches. This natural system of attachment is also subject to failure from the stresses of accumulated weight and mass of a mature vine that can break these bonds with an assist from the elements, such as the wind. Secondly, many

examples of green walls that are created with the support of structure are made from organic materials such as wood trellis arbors or rope-lattice combinations that may have a shorter life span than the living plant material they support.

There are many materials, connectors, and fasteners available that can be used to design and create a structure for supporting plants as a green facade, and the solution might prove to be quite adequate in many instances. Fortunately we now have available two specific technologies that have been engineered to provide flexibility in design and reliability in the most demanding applications of scale and exposure.

Cable and Wire-Rope Net Systems

Flexible steel cables are used in a variety of configurations to create support for vines. Connectors hold a pattern of cables in tension off the surface of a building and can be adapted to attach to almost any surface or structure. This mostly two-dimensional solution relies on the structure of those plants that twine, either at the stem or from a leaf structure. Twining vines might only require a single vertical cable element for climbing. Plants that climb with the aid of leaf tendrils or are scramblers that use hooks or thorns are most adaptable to a rectangular structure with closer supports. These systems can also be used in combinations with various rods or intermediate members that create variety of surface and may add integral structural support. Wire nets can be created from cable elements and are usually custom designed for a specific installation.

Cable systems are lightweight, can cover large surfaces and have flexibility in design. They are easy to ship, but may require installers with specific knowledge of the product being specified.

Modular Trellis Panels

This solution for creating green facades was developed to keep the plant material from attaching to the surface of the building. The basic element of this system is a three dimensional panel consisting of a two inch face grid and a three inch depth. The depth of the panel is created from the use of a structural truss element that makes this simple panel shape very strong. It is constructed from a welded re-cycled steel galvanized wire and is finished to provide a durable solution for exposure to the elements.

These modular trellis panels can be stacked vertically or aligned horizontally to cover large surfaces. Because they are rigid they do not need to be held in tension like the cable systems; they are able to span between structural supports and are often used for free standing applications. The panels of this system can be custom sized and shaped or curved, and attachment hardware can be adapted to almost every structure.

A unique characteristic is the depth of these panels and the size of the grid that provides support for the plant materials. A wide variety of plants can be used that do not have twining characteristics.

Living Walls

The concept of a living wall is to provide soil or growing media vertically so that plants can grow from this source in cliff-like fashion. Systems that are modular have developed in part from the idea of trays that are similarly used for green roofs. These modular units can be constructed from a variety of materials and attach to a wall or structure designed to carry additional loading. Irrigation and the delivery of nutrients are usually from an integral source designed into the system and are distributed with the use of gravity. Because of the moisture content of these systems a vapor barrier is usually a very important design consideration in protecting the building membrane.

Living walls can take other forms, such as planted blankets that create a sandwich of seed and nutrients with pockets from which the plants can sprout. Irrigation can be delivered at the top of this unusual substrate and flow downward. Other similar systems might combine a fabric structure with pockets that hold soil or growing media.

In general the plants used for living walls can be of a much larger variety because creating a vertical coverage does not require a climbing or trailing vine. Many living wall installations are pre-grown and provide a nearly instant green wall.

Designing for Specific green wall Benefits

The most obvious benefit of installing a green wall would be to create an aesthetic improvement. Creating living patterns of texture, shapes, or changing color fields against the materials and scale in our urban environment is a benefit in both a public or private setting. With the development of the technologies we have described there has also been discussion of how green walls can become contributing solutions to issues for site design, sustainability, building and urban planning.

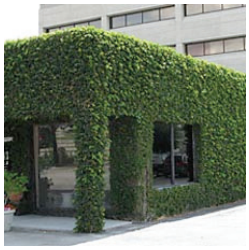
Areas of Design for Potential Benefit: (examples shown and discussed)

Cooling effects and Heating efficiencies
Building Protection
Noise reduction
Air Quality Improvement
Integration into storm water management
Psychosomatic effects for comfort and healing
Biodiversity and Habitat reestablishment
Urban Agriculture
Screening and Security
LEED qualification and Marketing benefits

Green Wall Issues in Design and Installation

Green facades and living walls each have important issues to be considered for achieving a successful installation. (examples shown and discussed)

Geographic region and hardiness zone for plants selected
Soils and irrigation + Nutrient delivery
Maintenance considerations
Aesthetic expectations
Support structure and engineering for loads
Moisture proof membrane (Living walls)
Microclimate conditions, interior and exterior



Survey of Installations in North America

Slide review of installations in a variety of geographic regions and with a variety of design intentions.

Case Study:

US Census Bureau – greenscreen®

Outline:

1. Project description – review team structure, player's roles (design build, bridging documents, etc.)
2. Site description
3. Design concepts, LEED goals
4. Final design – review overall concept, "Green" components
4. Green Garage design:
   - Size, codes re ventilation, etc.
   - Elevations – show ground level changes
   - GreenScreen selection
   - Plant material selections
   - Installation – strategies, challenges
5. Lessons learned; project evaluation

Case Study:

The Project: Starter Line Light Rail, Phoenix/Tempe/Mesa, Arizona
- 20 miles, $1.4 billion, set to open December 27
- It's a dry heat
- Public outreach – show me the green
- Platforms Plus

The Concept: Vertical Shade
- Shading
- Security
- Kit of Parts

The Materials: greenscreen® and Vines
- Perfect Fit
- Vines?

The Execution
- Testing
- Standardization and Modularity
- Customization and the Artists
- Lessons learned

THANK YOU