Fri-D7 Sustainable Design Materials: Green Walls
Friday, 3:30 PM - 5:00 PM

Program Statement
In this session, participants will have the opportunity to review examples of established green wall technologies and the development of new systems and hybrids in the context of issues affecting long-term performance of installations. Case study examples will focus on both green facades and living walls. Participants will learn how to evaluate design intent, site conditions, and system selection, to produce a "checklist" of issues for initiating a successful green wall design.

Learning Objectives
1. Understand new systems and technologies for designing green walls for the long term
2. Study green wall installations that use the latest techniques and technologies
3. Learn how to create your own checklist for green wall design.

Introduction
With multiple benefits to improve the urban heat island, aesthetics, biodiversity, sound control, and building energy savings, the market for green walls is growing rapidly. The challenge is to develop wall systems that are durable and cost-effective for commercial applications, residential towers and prefabricated structures. There is a huge potential for inexpensive green facades on big-box retail, industrial buildings, freeways, rapid transit, and blank concrete walls, as well as for rooftops that cannot support the weight of a green roof. Modular living walls, if integrated with the building envelope and intensively maintained, can support higher density plantings of groundcovers, ferns and flowers. By transforming urban environments with green facades and living walls, cities will become more livable, cooler and quieter.
The North American City: Opportunities for Green Walls and Vertical Landscapes

Chicago is the host city for the ASLA Conference, and is typical of higher density cities in North America. The city is celebrating the 100th anniversary of the 1909 Burnham Plan and is implementing the Green Legacy Program for the next 100 years. The Centennial is a catalyst for realizing Burnham’s vision for a region-wide system of parks, trails and open space… Landscape Architects and City Planners are collaborating as they did during the era of Olmsted and Burnham.

The Bloomingdale Trail is proposed for an abandoned elevated rain line running from the Chicago River west to Central Park Avenue. This elevated 2.75-mile, linear park on a derelict rail right-of-way is an innovative approach to providing new greenspace, recreation and economic development opportunities in a dense urban area, underserved by parks. The potential uses for green walls include both the elevated rail bed and the facades of residential developments, where there is not space for high canopy trees.

Urban Green Infrastructure can comprise greening blank walls along freeways, elevated commuter trains, parking structures and installations of photo-voltaics. There are 70,000 vacant lots in Chicago often surrounded by brick walls that can be used for urban agriculture, climbing plants and espalier fruit trees.

New residential and mixed-use commercial infill projects are occurring around Chicago creating resilient neighborhoods. A recent design competition included a proposal by Perkins + Will for a new neighborhood spanning over the Dan Ryan Expressway featuring elevated gardens, sky courts and vertical landscapes on eco-towers. There are incredible opportunities for landscape architects to use our horticultural training, design skills, technical knowledge and creative ability to combine vertical landscape technologies for new applications.

Course Outline:

Green facades are trellis systems or cable structures installed for climbing plants to grow vertically without attaching to the surface of the building. In contrast, a living wall is part of a building envelope system where plants are actually planted and growing in a wall system. A living wall offers the chance to plant a greater variety of non-climbing species, yet they are also more technically challenging.
I. Overview of existing Green Wall systems

A. Facade Systems – Definition and examples
   1. Modular panels
   2. Cable technologies
   3. Alternative two-dimensional systems
   4. Materials, manufacturing, and costs
      a. Environmental aspect
      b. Dollar costs
      c. Irrigation and maintenance
      d. Plant performance and durability of materials

B. Living Wall Systems – Definition and examples
   1. Modular systems with growing medium
   2. Fabric soil based / hydroponic
   3. Materials, manufacturing, and costs
      a. Environmental aspect
      b. Dollar costs
      c. Irrigation and maintenance
      d. Plant performance and durability of materials
      e. Local manufacture and supply of products and materials
      f. Materials, alternatives to hydrocarbons, polyethylene etc.

C. Hybrid adaptations and Integrative technologies
   a. Automatic controls for irrigation
   b. Moisture / temperature sensors, flow meters
   c. IT telephone links for monitoring
   d. Nutrient supply / fertilization
   e. Rainwater collection and use
   f. Greywater treatment / phytoremediation
   g. Biofiltration / air purification
   h. Integration with building performance / renewable energy
   i. Urban agriculture / local food
II. Designing for Benefits
   A. Benefits list and examples
      1. Aesthetics and biophilia
      2. Shade and evaporative cooling
      3. Daylight and glare
      4. Acoustics and sound control
      5. Air Quality and airflow
      6. Water use and management
      7. Habitat and biodiversity
      8. Biofiltration and Phytoremediation
   B. Discussion of matching benefits to available Green Wall technologies
      1. Example and discuss: Effective system examples matched to benefits
      2. Example and discuss: Systems that would not support certain benefits

III. Designing for Sustainability: Fulfilling Design Intent - Case Studies
   A. Material and system choice: Preparing for longevity
      1. Living Wall Examples and issues affecting long term Sustainability
         a. Irrigation
         b. Soil preparation, area, and nutrient delivery
         c. Exposure
         d. System degradation
         e. Recycling and renewal
            i. System components
            ii. Plant materials
         f. Structural considerations
2. Case Study – YVR Vancouver International Airport
   a. Green wall design and selection of a system
   b. Plants for shade and extreme conditions
   c. Pre-vegetation: plugs, coir block and fabric bag
   d. Stainless steel panels and straps
   e. Frame and irrigation
   f. Logistics and installation
   g. Lighting
   h. Maintenance and plant replacement

3. Green Facades Examples and Issues affecting long term Sustainability
   a. Irrigation
   b. Soil preparation, area, and nutrient delivery
   c. Exposure
   d. System degradation
   e. Recycling and renewal
      i. System components
      ii. Plant materials
   f. Structural considerations

4. Case Study – Valley Metro Light Rail, Phoenix
   a. Green wall design and selection of a system
      1. Cooling and shade studies
      2. Material testing
   b. Plants for shade and extreme conditions
   c. Soil prep and irrigation
   d. Logistics and installation
   e. Plant development and maintenance
   f. System evaluation and long term adjustments

B. Concepts of renewal and regeneration
   1. Evaluation in context of Sustainable Sites Initiative Qualifiers
      a. Integration into Site Assessment
      b. Consideration of Existing Opportunities
      c. Balance into Site goals
   2. Application and planning for variables
      a. Ownership changes
      b. Maintenance irregularities
      c. Affects of climate and weather
3. Plant life cycles
   a. Installation expectations
   b. Plant maturity changes
   c. Seasonal variations

Along with consideration of benefits and design intent, a green wall design consultant could evaluate all of the following in the context of long-term installation sustainability, integration with sustainable sites concepts, and selection of materials to be used:

C. The site:
   • Climate Zone
   • Microclimate factors
   • Orientation aspect
   • Horticultural options - choices
   • Available growing areas, sizes and depths of planting medium
   • Increasing root zones with continuous structural sol trenches and tree cells

D. Budget:
   • System hardware
   • Infrastructure: irrigation, drainage
   • Growing medium and plant materials
   • Installation and logistics
   • Maintenance costs over projected time (labor & material)

E. Logistics and System Delivery / Installation / Warranty
   • Full service contract: supply all components, pre-vegetate, install and maintain
   • Manufacture only: Shop drawings, fabricate and delivery
   • Separate contract(s) to assemble on site, install and plant in situ
   • Separate contract to assemble components, pre-vegetate, install and maintain
   • Coordination of separate contracts: 1) manufacturer, 2) growing medium, 3) plant supply, 4) irrigation, 5) installation, and 6) maintenance

F. Schedule:
   • Critical path plan
   • Maintenance program
   • Evaluation and feedback
Presenters

**James Sable**,
Director, greenscreen®

James Sable received his MFA at the University of Southern California in the School of Architecture and Fine Arts. He has served as a Project Architect on AIA Honors projects, worked with the United States Olympic Organizing Committee documenting venues, and has owned a custom manufacturing studio. As a member of greenscreen® he has been documenting green wall examples for more than ten years and manages an image library of several hundred installation sites. He is active in the promotion of green wall design and research, and recently coordinated the production of a new distance learning course, "Introduction to Green Walls: Technology, Benefits, and Design." [www.greenscreen.com](http://www.greenscreen.com)

**Randy Sharp, ASLA**
Principal, Sharp & Diamond Landscape Architecture, Inc.

Randy Sharp, ASLA, FCCLA, LEED® AP, GRP (Green Roof Professional) is a leading Vancouver Landscape Architect specializing in ecological based design solutions. With 30 years of experience, the firm's wide reaching portfolio includes civic spaces, park planning, regenerative places, and large scale infrastructure projects. Regarded as a pioneer in green roof and living wall design, he shares his extensive knowledge on green technologies through Green Walls 101, a course presented across North America. Randy is also the author of Metro Vancouver's Ecological Site Development: Regional Strategies for Design, Construction, and Maintenance. [www.sharpdiamond.com](http://www.sharpdiamond.com)

Reference/Source Materials