Green Roofs
&
Living Walls

The Intelligent Use of Water.™
Green Roofs

- **Definition:** Greenroofs, eco-roofs, nature roofs, or roof greening systems are living, vegetative roofing alternatives designed in stark contrast to the many standard non-porous roof choices.
History of Green Roofs

- Hanging Gardens of Babylon to Le Corbusier’s “New Architecture”
- Sod roofs of Iceland and Scandinavia
Types of Green Roofs

Extensive Greenroofs

- Lightweight
- Drought tolerant self-seeding vegetation
- Plants replicate dry and semi-dry grass conditions or rocky surfaces
- New up to 33% slopes
- Existing structures
- Not intended for recreation
- Less costly
Types of Green Roofs

Intensive Greenroofs

- Elaborate design such as roof gardens
- Intended for human interaction
- Require engineering to conform to the load requirements.
- Distinguished from the popular roof garden by underlying greenroofing layer system.
- Relatively flat to mild slope (1 - 3%)
- Different growth media types
  - Flowering shrubs
  - Trees
  - Water features
Construction of Green Roofs
Benefits of Green Roofs

- Thermal / Heat Island Effect

- Aesthetics/Beauty
Purpose of Green Roofs

Purpose

- Energy Reduction
- Brown Roof
- Rooftop Garden
- Public Relations
- Artistic
Irrigation and Green Roofs

- Extensive Green Roof:
  - Temporary irrigation - Limited to establishment of sedum.

- Intensive Green Roof
  - Drip Irrigation
  - Small sprayheads/rotors – Dependent on soil layer.
Cost of Green Roofs

- $5 to $35 dollars per square foot.
- Roof structure additions
- Waterproofing materials
- Plant containment
- Transportation of materials to rooftop.
Top Ten U.S. Green Roof Cities

1. Chicago, IL (517,633 sq ft)
2. Wilmington, DE (195,600 sq ft)
3. Baltimore, MD (121,550 sq ft)
4. Brooklyn, NY (102,908 sq ft)
5. Virginia Beach, VA (100,500 sq ft)
6. Royersford, PA (100,000 sq ft)
7. Washington DC (55,046 sq ft)
8. Philadelphia, PA (46,820 sq ft)
9. Amery, WI (30,928 sq ft)
10. Germantown, MD (25,740 sq ft)
Green Roofs for Healthy Cities

- Founded in 1999
- Mission: To increase awareness of the economical, social, and environmental benefits of green roof infrastructure.
- Green Roof Professional (GRP) Exam – Program Launch June 5, 2009
Urban Landscape

- 30% of total land area are roofs
Living Walls

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Definition: A green wall is a wall, either free-standing or part of a building, that is partially or completely covered with vegetation and, in some cases, soil or an inorganic growing medium. They are also referred to as living walls, biowalls, or vertical gardens.
Types of Living Walls

- Green Facades
- Living Walls
Applications of Living Walls

- Urban Environment
- Vertical, featureless walls of buildings
Benefits of Living Walls

- Water Reuse
- Air Quality
- Urban Architecture
- Urban Gardening
- Sick Building Syndrome
- Sound Barrier
- Advertising
Irrigation and Living Walls

- **Green Facades:**
  - Drip Irrigation utilizing emission devices at the base of every plant or incorporated into a surrounding sprinkler system.

- **Living Walls:**
  - Drip Irrigation utilizing emission devices at every “panel” or “cell”.
Integrated Green Infrastructure

- Urban development of the future?
Living Architecture

- Today…. Mumbai, India
Living Architecture

- Vertical Farms.....Toronto, Canada
Living Architecture

- EDDIT Tower Singapore
Living Architecture

- Nanyang Technological University, Singapore
Living Architecture

- Solstice Lawn Club Turf Assembly
If We Were To Dream……