

Green Roof

The roof of a building that is partially or completely covered with vegetation and soil, or growing media, planted over a waterproofing membrane.

Benefits of a Green Roof

Storm Water Retention

- ❖ Summer: 70–90% Storm water Retention
- ❖ Winter: 25–40% Storm water Retention

Water Filtration & Runoff:

- ❖ Moderates temperature – acts as a natural filter
- ❖ Reduces the amount of storm water runoff
- ❖ Decreases stress on sewer systems at peak flow periods

Energy Savings

- ❖ Up to 50% Savings on energy heating and cooling costs; insulator
- ❖ Acts as an insulator

Sound Reduction

A green roof with a 12 cm (4.7 inches) substrate layer can reduce sound by 40 decibels; a 20 cm (7.9 inches) substrate layer can reduce sound by 46–50 decibels.

Improved Air Quality

Filtration of Airborne Particulates:

- ❖ A green roof will absorb heat and filter the air moving across its surface.

Carbon Dioxide/Oxygen Exchange:

- ❖ Through the process of photosynthesis, plants convert carbon dioxide, water, and sunlight/energy into oxygen and glucose. This cyclical process supplies animals and humans with oxygen and food.
- ❖ 1.5 m² (16.15 ft²) of uncut grass produces enough oxygen per year to supply one human with their yearly oxygen intake requirement.

Temperature Regulation: Moderation of the Urban Heat Island Effect

Creates a Habitat for Birds and Wildlife

GREEN ROOF SYSTEMS

EXTENSIVE

- 2" to 6" of growing media;
- Low growing;
- Planted with ground covers (sedums) that are drought tolerant;
- Can used as a living space with sitting areas, patios, walking paths

INTENSIVE

- Growing media is usually 6" or deeper;
- Perennials, shrubs, trees as well as sedums and ground covers are typically used;
- Amenity/recreational spaces may include patio cafes, water features, paved walkways, seating, and activity areas.

Comparison between Solite® & Planting Soil

Solite®

1. Lighter in weight (1,700 +/- pounds / cubic yard range)
2. When saturated (1,800 +/- pounds / cubic yard range)
3. Less structural reinforcement
4. Less expense

Planting Soil

1. Planting soil weight (2,000 to 2,600 pound / cubic yard range)
2. When saturated (extremely heavy)
3. Structurally – Roof loads will need to be increased if at all feasible
4. Additional expense

As important as soil volume is to the physical quality of **the growing medium**, soil structure is critical to plant growth because it determines the amount of pore space within the soil.

Under urban conditions, the soil structure is altered by compaction from heavy traffic, which squeezes out air and water and reduces pore space. When bulk density, optimally 1.32 grams/cubic centimeter, is increased by compaction to 1.60 grams/cubic centimeter or higher, the soil retains too little oxygen to sustain root growth and prevents drainage, resulting in root rot and ultimate death of the plant.

Good soil composition and structure must be satisfied as part of the growing medium for proper drainage and plant growth. The addition of Solite® provides the necessary component to realize this end result.

A typical growing medium consists of 1/3 sand, 1/3 organic material, 1/3 Solite®. However, as SPECS have become more sophisticated, blenders are tweaking their additives and the final blends are more proprietary in nature.

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Benefits of Solite® Additive & Structural Soil in Green Roofs and Landscaping Applications

Structural soil is an air-entrained mixture of Solite® and “soil” formulated to support various pavement types while allowing voids for air exchange, water movement, organic matter, and root growth.

Important Factors When Designing a Solite® Structural Soil Mix

High Load Carrying Capacity:

The Solite® particles touch allowing for load transfer.

Long-Term Sustainability:

The strength of Solite® is sufficient to withstand standard compaction, while providing additional aeration and water retention capabilities. Helps to hold root systems in place and reduces the impact of rain drops.

Optimum Ratios:

Voids between the particles must be filled through the proper mixing of materials so as to be relatively free of any compactive stress. Solite® will control the *moisture* and *aeration* properties of the mix, and provide the media for *root growth* holding onto beneficial nutrients and fertilizers necessary for plant growth.

Proven Quality and Technology:

The Solite® mix, when properly tested, installed and compacted will meet the specified requirements. ASTM C-330 certified.

Unique Physical Properties Include:

High Degree of Compaction	
High Angle of Internal Friction:	>-42°
Permeable and Free Draining:	>3cm/sec
Low In-place Compacted Density:	60 pcf
Non Corrosive:	ph 7.0±
Resistant to Chemical Degradation	
Acid Insoluble	
Chemically Inert	
Durable	>95% after 300 cycle of Freezing and Thawing

Unique Physical Properties Allow:

Easy “all weather” Installation

Easy Compaction

Readily Available:

Bulk

Barge

Truck

Rail

Custom Gradation for Custom Solutions

Reliability:

Projects completed on time and cost effectively

CONSTRUCTED WETLANDS/WASTE WATER TREATMENT

CONCEPT:

Most constructed wetlands for wastewater treatment are *subsurface-flow* wetlands in which the wastewater flows through the aggregate and remains below the surface.

This prevents odors and mosquito breeding and minimizes the risk of human contact. Aerobic and anaerobic bacteria in a constructed wetland, through a series of biochemical processes, convert nitrogen compounds into harmless atmospheric nitrogen, which escapes into the air. The treated effluent is then delivered (by gravity or pump) to the drain field. Depending on local codes, pretreating wastewater in a constructed wetland may allow drain fields to be downsized, which can offset some of the expense of the wetland.

Constructed wetlands require some maintenance, including regular inspections of all components and care of vegetation to ensure adequate growth. Water levels must be monitored and controlled: if too low, the wastewater may not make sufficient contact with the plants' root structure to perform properly; too high and it may reach the surface of the gravel media, creating smelly conditions and prime mosquito habitat. Cold weather can be another problem for constructed wetlands, slowing the flow of water and retarding biological processes. But a uniform layer of well-decomposed organic mulch can allow subsurface-flow wetlands to operate throughout the winter even in very cold conditions.

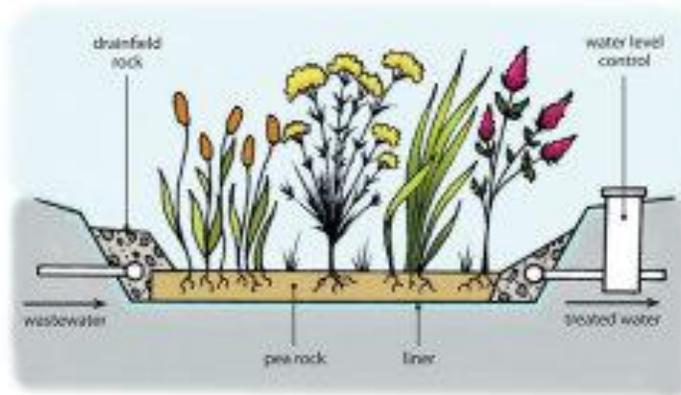
A manufactured wetland is similar to public domain storm water wetlands. In a manufactured wetland, gravel substrate and subsurface flow of the storm water through the root systems force the vegetation to remove nutrients and dissolved pollutants from the storm water.

ADVANTAGES:

- ❖ Constructed wetlands remove dissolved pollutants unlike many of the other treatment technologies, whether manufactured or in the public domain.
- ❖ Gravel substrate and subsurface flow of the storm water through the root systems forces the vegetation to remove nutrients and dissolved pollutants from the storm water.
- ❖ Unlike standard constructed wetlands (TC-21), there is no standing water in the manufactured wetland between storms after emptying with each storm. This minimizes but does not entirely eliminate the opportunity for mosquito breeding.
- ❖ Can be incorporated into the landscaping of the development.
- ❖ The gravel substrate likely provides a good environment for bacteria, facilitating the removal of nitrogen and the degradation of oil and greases, and other organic compounds.
- ❖ The gravel substrate can be augmented with media that is specifically effective at removing dissolved pollutants, increasing further the performance of the system.
- ❖ Vegetation is more easily harvested in comparison to a wet pond or standard constructed wetland (TC-21).
- ❖ Provides modest habitat for insects and other small invertebrates which in turn provide food for birds and other small animals.

SOLITE® ADVANTAGES IN A CONSTRUCTED WETLAND

- ❖ **Solite®** provides a good environment for bacteria, facilitating the removal of nitrogen and the degradation of oil and greases, and other organic compounds.
- ❖ **Solite®** in the substrate and subsurface flow of the storm water through the root systems forces the vegetation to remove nutrients and dissolved pollutants from the storm water.
- ❖ **Solite®** augmented with media in a specific blend is effective at removing dissolved pollutants, increasing further the performance of the system.



Solite® Benefits in Review:

A key factor in all the processes is Solite® lightweight expanded shale aggregate. The unique pore structure contributes to the high cation exchange of nutrients that helps to clean the effluents. Beneficial bacteria are able to colonize within the many voids on the increased surface area of the lightweight aggregate, breaking down or “eating” other organic compounds as the liquid passes through and around the aggregate.

Solite® can act as a recharging filter media in subsurface flow for the removal of phosphorous. It has a far greater P Sorption capacity than other natural aggregate filters as well as an increased hydraulic conductivity or other media. With an absorption rate of 18% and low bulk density (50 pcf), Solite® contributes to a deep root penetration, allowing the establishment of a far greater vegetative field in the early and extremely critical stages of development.

A manufactured or constructed wetland is yet another application for a completed landfill. In this instance the Solite® lightweight aggregate breaks down harmful compounds. The effluent passes through the aggregate that contains colonized bacteria that feed on the compounds. The native plants then complete the filtration process absorbing the converted material that is not a plant nutrient. The resulting effluent leaves the wetland via gravity in a purified state into a watershed.

A constructed/engineered wetland utilizing Solite®, which is manufactured with fossil fuels eliminating any hazardous waste to the environment, will improve the quality of area streams and rivers.