

Vertical Garden

Introduction

- The lack of vegetation in urbanized areas, as result of human establishments, directly affects the quality of life, from physical and aesthetical point of view.
- The construction of vertical gardens is recommended both in interiors and especially in the exterior of buildings.
- Even if the price of constructing and maintaining the vertical gardens is higher than a classical landscape it's compensated by the environmental benefits, raising the vegetation surfaces, with impact for reducing the pollution effect.
- The new modern concepts for landscape development are keen on using any kind of concrete or glass, turning them in real vertical gardens, being possible to overcome the development of the urban areas making a smooth transition for a healthy green urban environment.



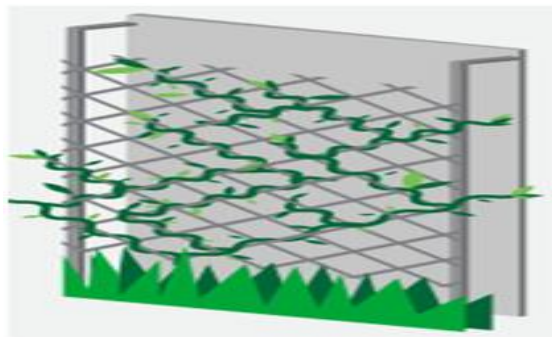
- Vertical Gardening is a special kind of urban gardening suitable to small spaces, particularly for decorating the walls and roofs in various styles.
- This is an alternative method for gardening by expanding the scope of growing plants in a vertical space.

Types of Vertical Garden

1. Green façade

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- Green facades are a type of green wall system in which climbing plants or cascading groundcovers are trained to cover specially designed supporting structures.
- Plants are either grown in the ground or in the elevated containers where they are watered and fertilized.
- Rooted at the base of these structure, in the ground, in intermediate planters or even on achieving full coverage.
- Green facades can be anchored to existing walls or built as freestanding structure, such as fences or columns.



2. Green walls / Living walls

- Green wall system composed of pre-vegetated panels, vertical modules that are fixed vertically to a structural wall or frame.
- These panels can be made of plastic, expanded polystyrene, synthetic fabric.
- The Green walls again divided into two types

a) Modular green wall

- Vertical garden modular green wall is made up of recycled poly propylene material.
- It has attractive look, highly durable in nature and it can be easily installed.
- It provides instant solution for making garden in your residing place.
- In modular green wall supporting panel made by plastic or steel attached to a wall.
- The supporting panel consist holes in which hang the easily detachable cups or pots.
- Mat media can be used for this type of plantation which is easily available in garden shop and nursery.
- Soil based and peat based media also used in modular green wall but mat media mostly prefer because mat media is light weight media.
- All indoor plant can be grown in modular green walls.

- Watering is done through rose can, 1 or 2 times per day.

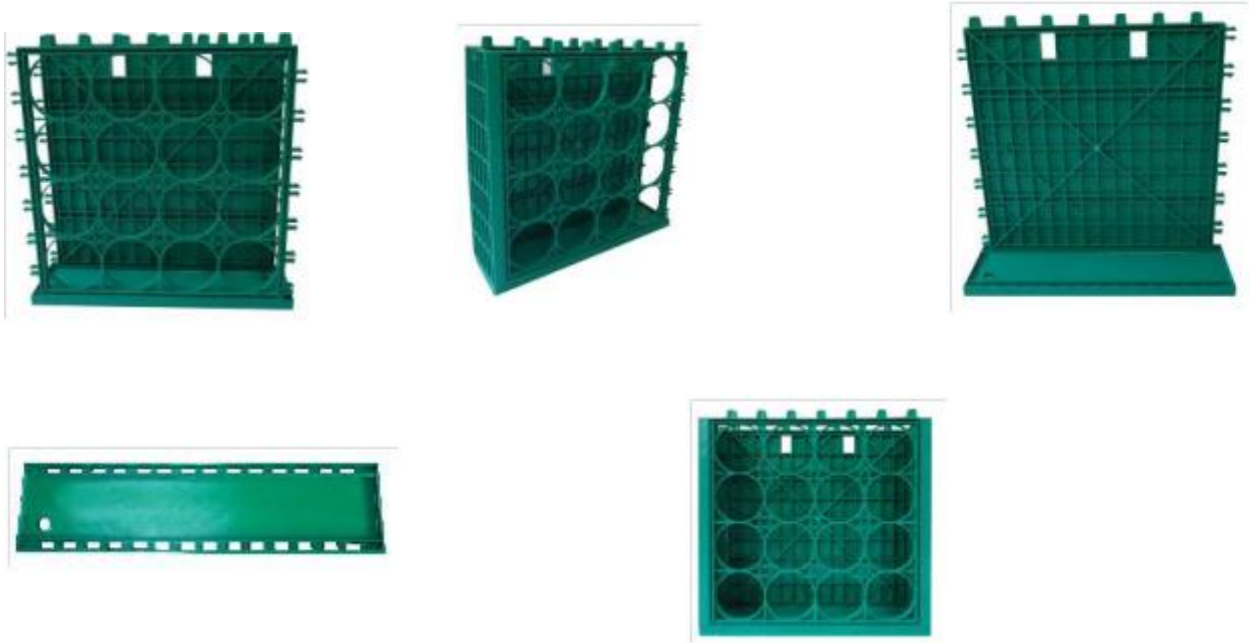


b) Vegetated mat wall

- This system, pioneered by Patrick Blanc, is composed of two layers of synthetic fabric with pockets filled with the plants and growing media.
- The fabric walls are supported on a framework and backed by a waterproof membrane against the building wall
- Nutrients and water are delivered through an irrigation system at the top of the wall.
- Different types of media can be used in the vegetative mat walls.
- Drainage plate inserted at the base to prevent the floor from watering.
- In this system auto irrigation system is inserted with the help of sensors and emitters.

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Vegetated mat wall structure



Selection of Plants

- The best plants for vertical gardens are dense, compact and low growing.
- Make sure you choose species that suit the aspect of the wall on which they'll be growing.
- Understanding the prevailing growing conditions is essential to make the right decision when choosing plants.

Suitable Plants

Peperomia, Syngoniums, Philodendron, Epipremnum, Begonia, Alocasia, Colocasia, Daffodils, Sedum, Anthuriums, Nephrolepis, Chlorophytum, Lantana, Pilea, Rheo discolor, Cuphea, Fittonia, Spathiphyllum, Schefflera, Nephrolepis, Asparagus spp., Pileamicrophylla, Alternanthera, Mentha spp

Media

Requirements

- Weightless media
- High Water holding capacity
- High Nutrient holding capacity
- Good Porosity

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- Neutral pH
- Cocopeat, Perlite, Sphagnum moss, vermiculite, vermicompost, shredded bark and leaf molds are the common media combinations used. Soil is not used since it increases the weight of the green walls.

There are three types of growth media used

- **Loose media**
- **Mat media**
- **Structural media**

Loose media

- Loose medium systems have their soil packed into a shelf or bag and then are installed onto the wall.
- Loose soil systems are not well suited for areas with any seismic activity.
- Reparations are only achieved by re-stuffing soil into the holes on the wall, which is both difficult and messy.
- Loose-soil systems should not be used in areas where there will be a lot of public interaction as they are quite messy and lose their soil little by little over time.

Mat media

- Mat media are quite thin made up of by coconut coir, even in multiple layers, and as such cannot support vibrant root systems of mature plants.
- The method of reparation of these systems is to replace large sections of the system at a time by cutting the mat out of the wall and replacing it with new mat.
- This process compromises the root structures of the neighboring plants on the wall and often kills many surrounding plants in the reparation process.

Structural media

- Structural media are growth medium "blocks" that are not loose, nor mats, but incorporate the best features of both into a block that can be manufactured into various sizes, shapes and thicknesses.
- These media have the advantage that they do not break down for 10 to 15 years, can be made to have a higher or lower water holding capacity depending on the plant selection for the wall, can have their pH customized to suit the plants, and are easily handled for maintenance and replacements.
- They are the most robust option for a living wall for both exterior applications and for interior applications.

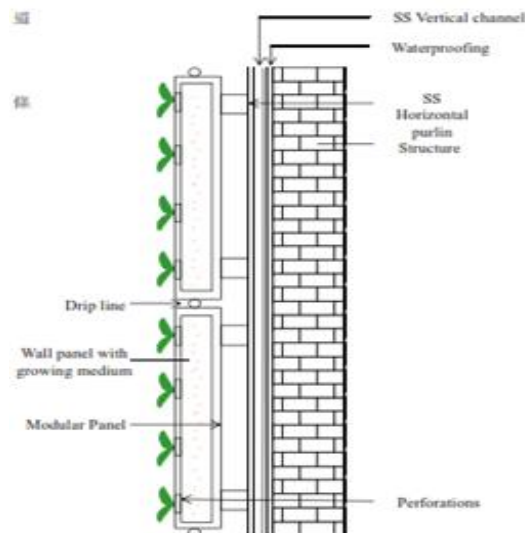
- They are also the best choice in areas where high-winds, seismic activity or heights need to be addressed in the design.
- Depending on the installation, they do tend to be more expensive to install, but lower cost to maintain.

Irrigation

- The irrigation system is designed to minimize water consumption.
- It consists of an automation unit with equipment for control of nutrient injection and irrigation cycles.
- When a surface has a variation of sun exposures, the irrigation is divided into segments in order to program it specifically for each part.
- Within the multi-layered felt surface a drip-tube is integrated. Water consumption varies with heat and sun exposure, but compared to normal green spaces or a lawn, the consumption is normally lower.
- It averages between 2-5 l/m²/day.

Design

- A well executed design is also a way to minimize the future maintenance demand of the garden.
- A plant's growth habit, size and behavior on a vertical surface is important knowledge for making the right combination of species, in order to keep the competition between plants at a healthy level.
- Designing of vertical garden is also depends on where it planted, size of wall, water supply and available space.
- A vertical garden can be installed in almost any location and as a living material; the potential of integrating plants in our urban environments is interesting.



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- Places never thought of as possible could be inhabited by plants, like subway stations or other intensely frequented places where horizontal space is difficult to spare.

Functions

- Aesthetic and decorative effects.
- Acts as natural insulation for hot and cold air and a save energy for your building
- Reduces CO2 levels and increases oxygen and improved air quality.
- Conserves water and watering takes less effort.
- Sound absorption and noise absorption.
- Improves thermal insulation and energy efficiency.
- Provides protection to buildings from adverse temperature and hence improves the life expectancy of the buildings.
- It holds rain water, providing food and shelter for wildlife.

