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VERTICAL GARDEN (DESIGN PROCESS)

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ABSTRACT:

A vertical garden, sometimes called a living wall or green wall, is a free-standing vertical garden dependent to the inside or outside walls of a building.
The green facade stains only the base of the wall, and the vines supported by the wall form the vegetation and greenery of the façade. Green walls, on the other hand, have a growth medium supported by the walls. Instead of getting nutrients and water from the soil, plants get nutrients and water from inside the vertical support.

Keywords: Green building elements, green walls, hanging gardens, urban architecture, advanced agriculture: uses and benefits.

1.INTRODUCTION:

1.1 GENERAL ANALYSIS:

One of the most popular trends in the gardening world, vertical gardens allow plants to cultivate on vertical surfaces such as walls. They are very famous in gardening. For tight spaces with little soil or for decorating courtyards and outdoors. Placing plants at eye level brings new value to plants such as groundcovers and small perennials and succulents that must be stooped down to get a closer look.
It's very difficult to create a vertical garden. Some of the issues that arise are:

1. Make sure the messy bottom remains while the planter rotates her 90 degrees.
2. Problems with roots and watering.
3. The problem of vertical growth of plants.

1.2 VERTICAL GARDEN OR GREEN WALL DESIGN:

Each vertical garden has specific style and design choices.
When compiling, the specific environment in which the plant is built is taken into account, such as region and microclimate, solar radiation and environmental conditions.
The aim is to design unique site-specific gardens that are stunning all year round. A small scale is given for each species. character development environment. The natural forms and environments in which these plant species occur are the primary source of inspiration for the overall design.
The final product is a unique garden with lots of substance, surprises and variety.

Vertical gardens are flexible and can be used virtually anywhere as a living material.
The possibility of blending plants into the inner city environment is attractive.

In previously unthinkable locations, such as subway stations and other busy settings where horizontal space is scarce, plants can now survive.

SUPPORT STRUCTURE:

A 10 mm thick Poly vinyl chloride plate set up on a stud frame forms its support structure.

The air gap on the full PVC panel and the wall at the back of it, as well as the sealed joints, ensure double safety against the moisture.

The topmost of the board is lined with highly absorbent multi-layer synthetic felt.
In addition to evenly wetting the surface, it provides mechanical support for plant sensory cling.

Make a cut in the top layer of felt. Then put the plant inside.
Due to the smooth surface, the weight of the building is lesser than 25 kg/m2 (including plants).
Typical surface depth get increased by 200-500 mm depending on the type of wood used.

FIG.1. Supporting structure of vertical garden

IRRIGATION:

Water consumption is reduced by irrigation systems.
It consists of an automated unit with a machine that manages the irrigation and nutrient injection cycles.
With different surface irradiation, the irrigation is divided into sections and programmed individually for each section.
The multi-layer felt surface contains a drip tube.
Although it uses less water than regular green spaces and lawns, water consumption fluctuates about 2-5 liters /m2 daily, depending on temperature and sun exposure.

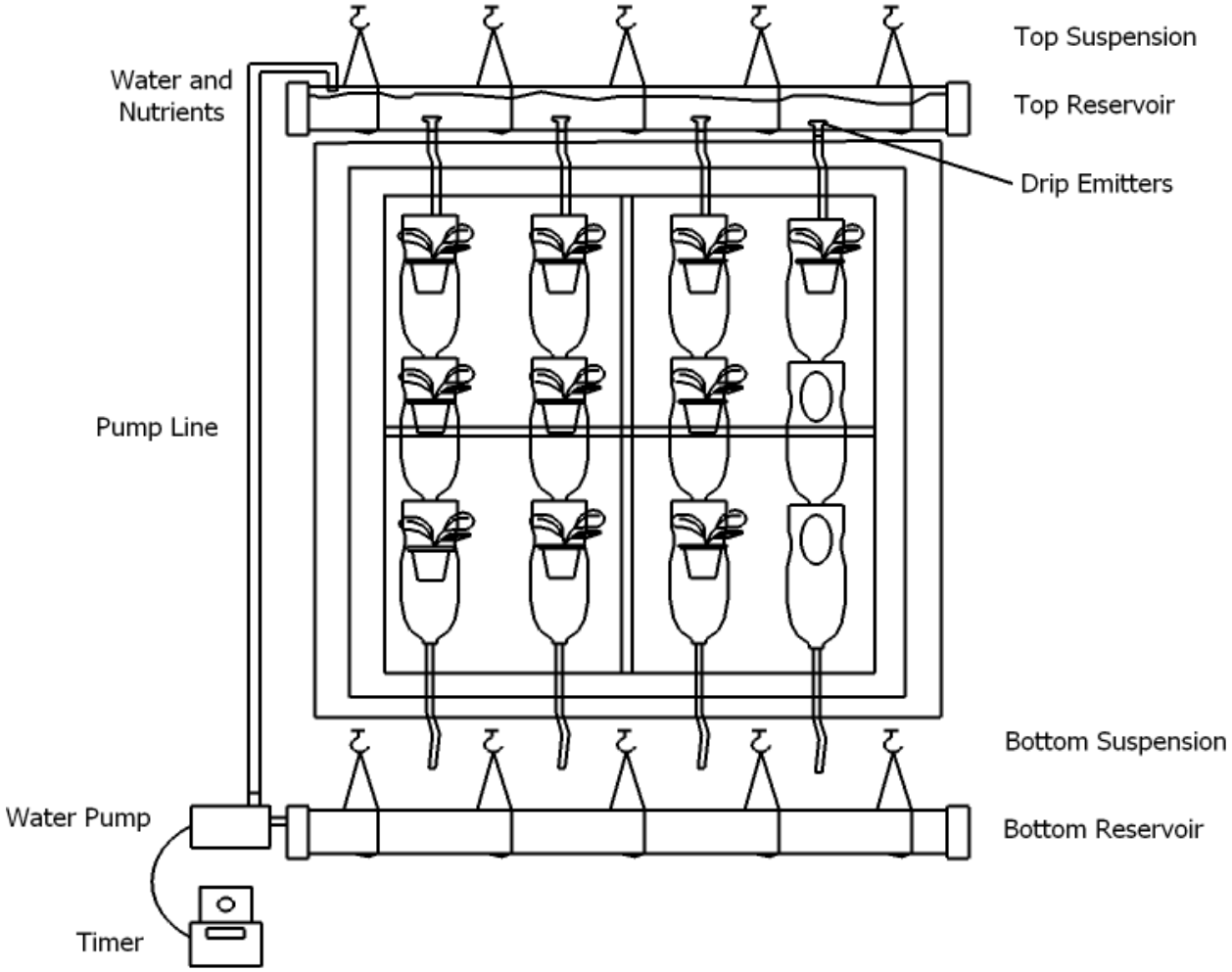


FIG. 2:

Irregation vertical garden system

LIGHT:

Typical light levels in the workplace are 300-500 lux, but direct sunlight can exceed 100-1000 lux.
Even with species that require minimal light, artificial lighting is usually required indoors.
900 lux is sufficient for some species, but some areas of the surface have a better species diversity that can be used at slightly higher levels.
Considering that the intensity of light decreases with the cube of the distance from the light source, artificially illuminated surfaces will have different light levels.
Some places are 900 lux, others 3000 lux. Botanical designs have been developed with this in mind to accommodate more demanding and interesting species.
Metal halides are excellent light sources.
Produces the critical wavelengths your plants need while using less energy and money.
A research is being conducted to determine the number and the model of anchors required using preliminary computer simulations.

MAINTENANCE:

By automating a plant's essential needs (light, water, nutrients), it ensures extremely healthy plants, significantly reduces maintenance, and facilitates access to tall buildings and other structures.
Vertical gardens may only be used in areas that are easily accessible.
The gardens are designed to allow space for natural plant growth patterns, so many species live dynamically with their neighbours.
Garden pruning should be done once or twice a year throughout the year.
All plants used are perennials, but some will need to be replaced over time. In the long run, these precautions will ensure a rich and beautiful landscape.

FIG. 3: Maintenance of Vertical Garden

Create a design strategy while setting the framework for realizing the character you want.

The final choice of species is determined throughout the design phase based on physical characteristics, aesthetic preferences, and accessibility.

Support structures are built on site first to handle irrigation needs.

After completion of the technical equipment with felt and integrated drip line installation, the area will be ready for planting.

There is constant communication between architect and client throughout the process to get the intended result.

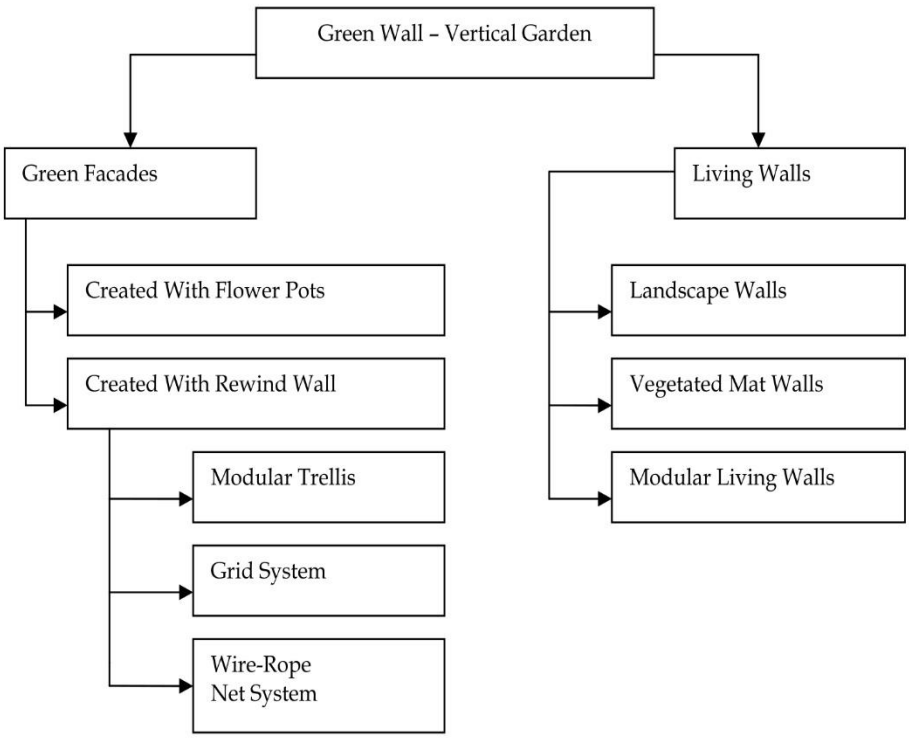
1.3 PLANTS FOR VERTICAL GARDEN:

Vertical surfaces such as tree trunks and tall cliffs are common places where plants grow in nature. Understanding this dynamic environment is critical to the long-term success of your company.

REQUIREMENTS:

In nature, plants grow on vertical surfaces such as sheer cliffs and tree branches. Recognizing this dynamic context is critical to the success of your project in the years to come.

1.4 Many categories of vertical gardens:



1.5 ACTIVE LIVING WALL:

Additionally, there are important considerations for "active" living walls.

The HVAC system in the building circulates air throughout the structure by actively drawing air over the plant growths, roots and leaves that grow along the walls.

The problem with these systems is that even with the wall units installed, building codes still mandate the installation of all traditional air filtration devices.

This means that you cannot save money by installing additional air quality monitoring equipment, as active biological walls do not significantly improve air quality.

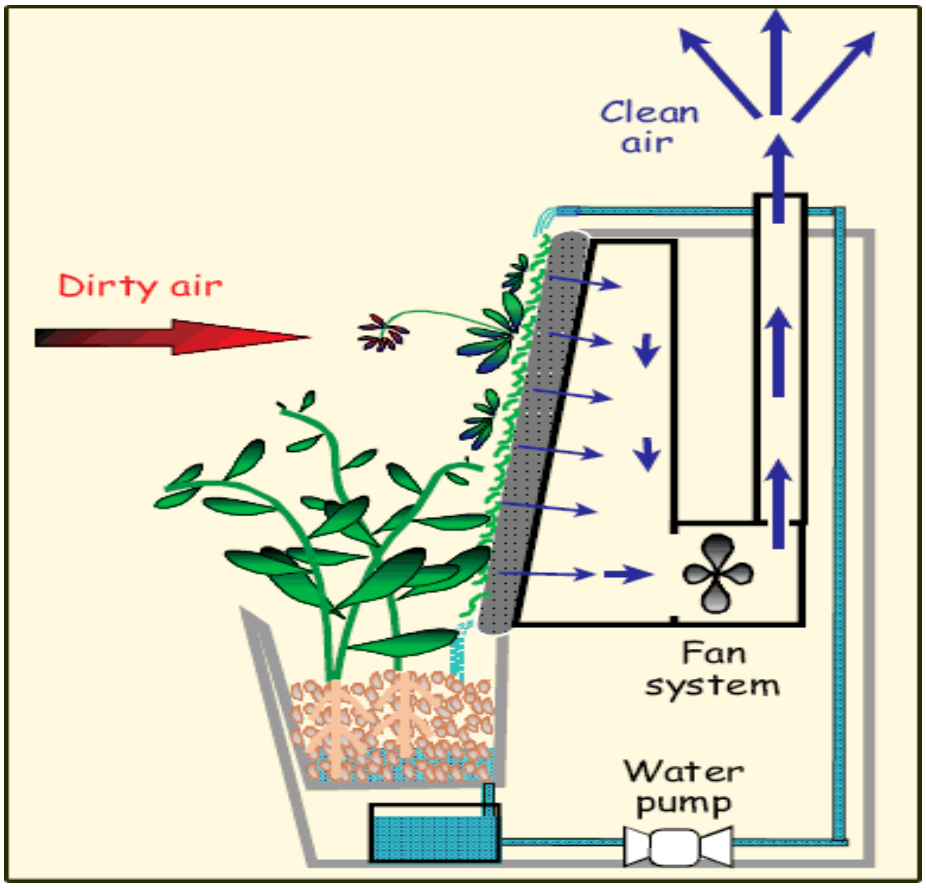
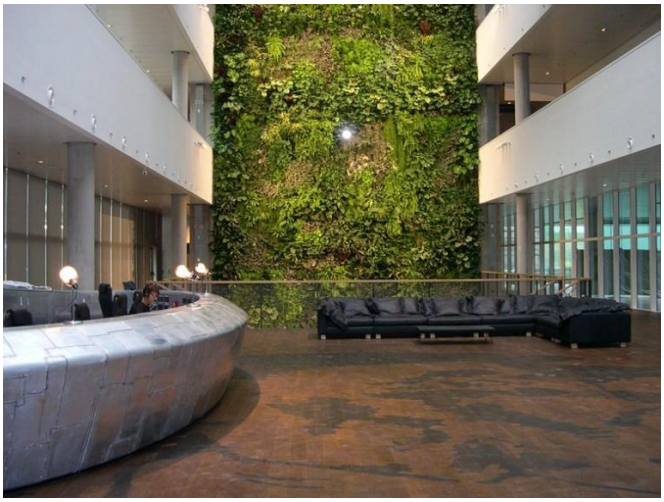


FIG. 5: Living Active Wall

1.6 VERTICAL GARDEN, EXAMPLES:



BENEFITS OF VERTICAL GARDEN :

Vertical gardens and green walls have several advantages.

It can be categorised into three groups:

1. Public assistance

2. Personal advantages

3. Benefits unique to the design

PUBLIC ADVANTAGES:

Cosmetic Enhancements:

By offering aesthetic stimulus where it would not otherwise be found, green walls can reclaim neglected space.

They can also lessen the unfavourable psychological impacts of property demarcation by fostering privacy and a feeling of enclosure.

Urban Heat Island Impact reduction:

As flora is reintroduced into urban areas, natural cooling processes like photosynthesis and evapotranspiration are encouraged to occur.

Plants can block vertical airflow by placing green barriers to create enough turbulence to slow and cool the air.

Enhanced Outdoor Air Quality:

By reducing sweltering summer temperatures, collecting gases, and trapping particulates through photosynthesis, green walls reduce air pollution levels.

Green walls may insulate buildings from the heat, which reduces the need for electricity and the amount of air pollution produced as a result.

Local Job Creation:

For their design, construction, and maintenance, green walls rely on specialists from a variety of fields, including irrigation consultants, architects, and landscape architects.
Further commercial activity is generated by the need for a local supply of plant products, a variety of growing mediums, and greenhouse production , and assembly frameworks for structures.

PRIVATE ADVANTAGES:

Increased Efficiency in Energy

Green walls lower the temperature. variations from the surface of the wall from a variety of 10-60 degree C (50-14 degree F) to one of 5-30 degree C, which can stop the passage of heat between building walls (41-86 degree F).

• Keeping an air layer trapped inside the plant bulk.

• lowering the surrounding temperature by shading and evaporation transpiration.

• Building a wind barrier throughout the winter.

By assisting in lowering the air temperature near intake valves, green walls can reduce the energy needed by HVAC systems to chill the air before it is cycled throughout a structure.

Structural Protection for Buildings:

During the course of a structure's lifetime, temperature changes can harm the organic building materials used in the facades.

Thermal fluctuations are reduced by the increased outside insulation that green walls offer.

Against UV rays and rain, green walls shield masonry and exterior finishes.

By lessening the impact of wind pressure, they are able to improve or the seal air tightness of cladding, windows, and doors.

A Better Indoor Environment:

North Americans use 80-90% of their time indoors, so efficient air circulation methods in buildings have a big impact on them.
It is estimated that US workplace productivity is greatly impacted by problems related to poor indoor air quality, which is estimated to cost $60 billion annually.
Air in structures with strategically placed green walls (such as next to intake valves) is more hygienic than air in unfinished structures.
Similar results are obtained when there is greenery in the room.
These processes remove volatile organic molecules such as xylene, toluene, and ethylbenzene, which are air pollutants.

Noise Cancellation:

Cleverly used urban greenery such as green roofs and green walls provide a plant surface that absorbs high frequency noise, and when constructed with growing media supports or substrates can also absorb low frequency noise. .
It has been used for over 30 years on highways, railroads and highways in America and Europe for this purpose.

Marketing Possibilities:

Green structures and services now have a aggressive advantage on the market.

Due to their visibility and direct impact on the amount of green space in urban areas, green walls are a readily recognisable symbol of the green construction movement.

Benefits Specific To A Design:

- Higher Biodiversity
- Enhanced Well-Being and Health

- In-City Agriculture
- Treatment of waste water on-site

CONCLUSIONS:

Basically, vertical gardening is the practice of growing plants upward on vertical surfaces such as the walls of a house or the facade of a solid building. There is definitely an opportunity to bring some greenery into your home or building. In addition to being aesthetically pleasing, vertical gardening can heat and insulate structures, reducing demand and costs for air conditioning systems. Planting plants within the structure improves air quality while also acting as a filter for airborne particles, bringing moisture to centrally cooled offices. Most vertical gardeners use no soil and require little maintenance or pruning. It also offers to water conservation by decreasing the need for irrigation. Vertical vegetation also used to soften the cold, hard, gray look, especially in urban jungles.

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